Nudging People at Work and Other Third-Party Locations

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ABSTRACT
Nudging people towards positive behaviour change is an important issue recognised by academia, individuals, and even governments. Although much research has been published in this area, little has focused on non-domestic environments such as the workplace. It is widely reported that changing individual behaviour of employees can make a significant contribution to sustainable resource consumption. This position paper focuses on the unique aspects that make nudging consumption behaviour in third-party environments like the workplace a very different problem to that of nudging in people's domestic and private lives. Several studies are discussed to provide context as well as evidence towards our position.

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Persuasion, Nudge, Work, Ownership, Sustainability, Behaviour Change.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Theory, Human Factors, Design.

INTRODUCTION
The HCI community has recently shown a great deal of interest in the development of interactive systems that facilitate behaviour change for sustainability. Much of this research has exploited ideas recently re-popularised by Thaler and Sunstein [10] in that individuals can be 'nudged' to make better lifestyle decisions, given the right information and the environment in which to do so. Much of this work has focused on how individuals might improve their own private and domestic lifestyle, behaviour, and sustainable resource consumption; however such work has rarely taken account of the fact that people spend a significant amount of their waking hours at work where they also contribute towards resource consumption.

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A recent report [1] has indicated that if the 17 million UK workers, who regularly use a desktop PC, powered it off at night this would reduce CO2 emissions by 1.3 million tons - the equivalent of removing 245,000 cars from the road. Similarly, if a UK business with 10,000 computers leaves them on all night for one year, it will cost £168,000 ($220,000) and emit 828 tonnes of CO2. The same report, however, suggested that at least three in ten workers in the UK do not always power off their PC overnight. Further, many more machines are in use or provide services 24 hours a day, all year round.

As an example in our own context, Figure 1 compares the electricity usage at the University of Lincoln campus for the first week in December in 2009 and 2010. There are two compelling features of Figure 1 that characterise the typical energy consumption of a workplace. First, the graph clearly shows how little energy the university uses at the weekend. Second, this period in 2010 coincided with severe weather that meant that many staff members were unable to travel to the campus. The dramatic reduction in energy consumption can be clearly seen in the first 3 days of the graph and highlights that people can have a significant impact on consumption at work, as well as in their own personal environments.

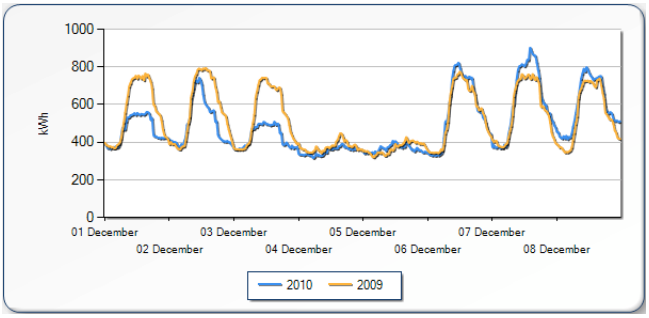

Figure 1 Campus electricity usage December 2009/10

Despite environmental concerns now playing an established role in the public sector, as well as the corporate and business agenda, there is still much to gain by exploring new ways of persuading people to adopt positive energy usage behaviour. The first and obvious research question is: Do domestic PINC (Persuasion, Influence, Nudge & Coercion) methods simply translate to workplace and other

third-party environments? In this position statement we review initial evidence that they do not, and discuss the reasons why. We propose a framework for thinking about Nudge methods in different contexts, and discuss our future work in this area.

RELATED WORK

Thaler and Sunstein [10] have recently re-popularised the interest in the idea of Nudge, where the right environments and the right information delivered at the right time can encourage people to adapt and improve their behaviours. Much research has focused on directly improving one's own behaviour, whether it be reminders to exercise, or to notably reduce energy consumption. Research into simple home energy monitors [3], for example, suggests that pay-as-you-go meters typically reduce consumption by only 3%, while those that focus on reducing their payments often reduce their consumption by 0-10%. Having an in-house monitor that provides instant feedback has been shown to reduce consumption by between 5 and 15%. Other prototype systems, such as Kuznetsov and Paulos's domestic ambient light display [7] successfully encouraged people to reduce their water consumption, by visualising better or worse consumption to their previous average use.

Other research typically provides anonymous averages from a group or community to a user, so that the user can see their own behaviour or consumption in the context of others. In previous work [5], we reduced domestic energy consumption through a carefully designed mixture of online social media and home energy monitors. Our findings suggested that the use of energy feedback delivered in a social context significantly reduced consumption when compared to energy feedback without a social context. We have also shown similar results in a personal fitness/activity domain [4].

A related approach involves facilitating 'friendly' competitive behaviour; for instance it has already been shown that the work environment affords powerful opportunities for facilitating such behaviour – for instance Siero et al [8] demonstrated that when a group of employees received information not only about their own energy usage, but also about that of a 'competing' group of employees from the same company but a different workplace, they significantly altered their energy usage behaviour compared to a situation in which they only received information about their own usage.

Despite the success of the work by Siero et al some thirteen years ago, little research since has explored energy behaviour interventions based on competition between employees. Therefore, a key question for Nudge researchers going forward is how do differences between the work and domestic leisurely sides of life affect the potential of behaviour change interventions? Also, what theoretical grounding can we draw upon to begin to explore any differences? Stebbins [9] introduced a seminal framework for understanding people's leisure time. For some, being environmentally friendly is, as Stebbins called it, a Serious Leisure, where people work hard at achieving their goals. Installing home technology is often a temporary project, and can be seen as Project Leisure, where people take behaviour change to be a new task. The aim of much nudging research, however, is to be embedded in people's Casual Leisure, so that good consumption is encouraged simply and unobtrusively within our lives. These forms of leisure, however, are very different from our work lives, which are goal-oriented, formalised, and externally driven.

EARLY EXPERIMENTAL FINDINGS

Study 1 – Water Consumption in the Work Place

One early finding in this space was from Kuznetsov and Paulos [7] who anecdotally saw unexpected results in a work environment, and so proceeded to focus on domestic scenarios. Their anecdotal findings saw consumption *increase – double* in fact.

One of our recent studies in Swansea University, UK, focused directly on this surprising issue. We created a series of feedback installations, and installed them in a shared work-place kitchen. Like the work by Kuznetsov and Paulos, the installations used a Phidget microphone to track water flow through the pipes. The installations were supported by informational posters, which included a link to a website to provide feedback. Otherwise, we remained as un-intrusive as possible in order to record normal usage as closely as possible. After recording baseline average readings, we first recreated the ambient light display provided used by Kuznetsov and Paulos, which: glowed green with less-than-average consumption; glowed yellow 10% either side of the mean; and glowed red thereafter.

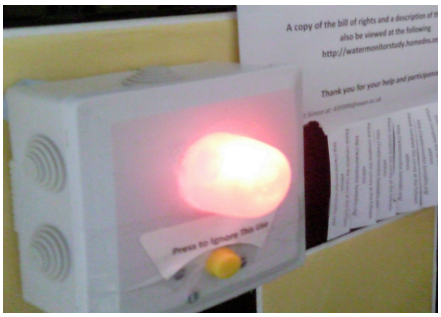

Figure 2: Our ambient-light installation

Three further displays were installed in subsequent weeks. The first used similar measures, in respect to average consumption, to create competitive gaming-style text-oriented messages on an LED display, such as: "You're beating most people" and "Sorry, you lost". The second display converted the light system into a series of audible beeps. The final display tried a different tack altogether, by simply providing environmental information relating to their water consumption, such as the average amount of water available to people in the third world on a daily basis.

Initially, as per the prior anecdotal evidence, the ambient light display did double the average consumption of water during the 2 weeks it was displayed. In comparing studying the additional displays, we saw all but the audio condition increase the consumption. While the increase shown by these alternatives was significantly less than the ambient light display in particular, none were significant. Although the audio feedback did marginally reduce consumption, we also recorded a significant number of opt-out button presses in the audio condition, indicating that people disliked this particular installation. Qualitative comments from an optional online survey confirmed this. Given the surprising increase created by the ambient light display, we concluded the study by reinstalling the ambient light display for a final week. Although not quite double the average consumption, we again saw a significant increase in energy consumption.

In the end, none of the displays managed to significantly decrease consumption of water. It is promising, however, that not all the displays increased consumption significantly. This means that such displays do not simply have the opposite effect in work environments. Instead, the results suggest that people simply do not care for the consumption of the company as a whole, and potentially do not mind entertaining themselves with the resources of the company by using additional resources. The fact that significantly more users opted out of the audio display, which was the only one to reduce average consumption, further indicates that people do not mind avoiding resources in this area; that they do not feel personally motivated to accept the nudging technology.

Study 2 – Energy Consumption in the Work Place

Our recently commenced Electro-Magnates study [6] aims to reduce energy usage in the workplace by utilising a suite of social persuasive applications to encourage pro-environmental behaviours. Personal desktop applications (social widgets) and situated displays will be used to deliver energy feedback to individuals, groups and communities about their own – and others' – energy usage to foster exchange of performance and to support constructive competition to reduce consumption. The workplace in the context of this study is educational and public sector work-place environments in the county of Lincolnshire, UK.

In previous work [5], we reduced domestic energy consumption through social norms and social technology. However, designing a similar system for the workplace presents greater challenges across a range of design, ethical and technical issues. From our study focus groups in the domestic environment we discovered that for some people *cost* was the primary motivating reason to reduce their energy use. In the workplace employees are not typically responsible for paying energy costs, neither are they directly responsible for meeting any governmental carbon policies in place that could lead to institutional 'carbon' fines.

To mitigate the absence of financial motivation in employees and to develop workplace energy metaphors, we intend to run a series of focus groups and participatory design workshops to engage and empower the employee in developing an understanding of both the economic and environmental impact of their working practices. The participatory design workshops will provide an opportunity for employees to be directly involved in designing the UX element of Electro-Magnates therefore helping to address ethical concerns over privacy and appropriate disclosure of energy data.

Early work to date includes prototyping a high-impact energy interface for overall energy usage in Figure 3, page viewed on 09/01/2011, as well as a competitive league table for buildings. Both prototypes are designed for large situated displays and are abstracted presentations of what is possible with raw energy sensor data which in itself is intangible and difficult to interpret.

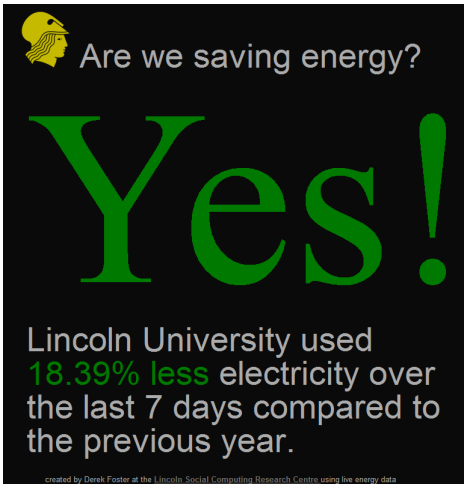

Figure 3 High-impact visualisation of overall energy usage

DISCUSSION

The workplace, as an example of a non-domestic, non-personal environment, creates many unique issues for the ideas behind nudging behaviour. Consequently, we have identified three initial dimensions that differentiate domestic and workplace environments that might be used as a formative framework for thinking about applying nudging technology in different environments:-

Expression of Self. First, the workplace may be termed a special environment in that there are usually constraints and rules in how employees can interact and carry out activities in the workplace compared to their less inhibited personal life. This is particularly important when considering employee consumption of resources with emphasis on ownership, freedom of choice and sustainable behaviour. Ironically, an individual may be committed to pro-environmental behaviour when at home but is forced to

engage in negative practices at work such as using inefficient energy-intensive equipment or sitting in an over-heated environment.

Sense of Responsibility. Second, prior research typically assumes that individuals are trying to change their behaviour, or reduce their consumption, but for many the workplace is not their own and not their responsibility. Consequently, not only is the environment and technology controlled for them, people have a diminished sense of responsibility for the energy costs and environmental impact.

External Constraints. Third, the workplace or type of work has its own requirements – they may need to maintain 24-7-365 server support. It may be normal for some businesses to have 3 or more machines running per individual, but unusual for others to have a computer at all. This kind of top-down requirement might make individuals feel out of control of the environment and its consumption, leading to lack of motivation.

Given these limiting and influential factors, it is hard to consider how we can utilise the same nudging technology that we typically apply in domestic contexts. The few successful workplace nudging installations have typically been dependent on a driven community. The CleanSink project [2] saw some positive influence in hospitals, where cleanliness is both required and important for care. Our on-going study on energy consumption in Lincoln, is focusing on driving community motivation, which may encourage expression of self and increase sense of ownership, whilst working within the external constraints of the workplace.

CONCLUSIONS AND FUTURE WORK

Much of the prior research on Nudge, and other PINC issues, has assumed that individuals are focusing on their environments, behaviours, consumption, and other things that they are in some control over. How does Nudge fare in environments, like the workplace, that are typically outside of an individual's control? Such questions are important for larger organisations who want to improve their collective behaviour, whether it is a business trying to reduce its own consumption or meet it's quota of carbon credits, or a government trying to reduce the nation's consumption.

In our future work, we are focusing on this issue in two ways. First, our funded research is focusing further on encouraging community-driven nudges for reducing business and employee consumption. Second, we are planning future studies that specifically investigate the nudge of groups and communities rather than of individuals, as to meet the UN's Millennium Goals[1], we need to nudge the behaviour of the global community and not just that of individuals.

[1] http://www.un.org/millenniumgoals/

ACKNOWLEDGMENTS

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