Behaviour Change at Work: empowering energy efficiency in the workplace through user-centred design

Dan Lockton[1,2*], Rebecca Cain[1], David Harrison[2], Sebastiano Giudice[1], Luke Nicholson[3], Paul Jennings[1]

[1]Experiential Engineering, WMG, University of Warwick, Coventry, Warks., CV4 7AL, UK
[2]Cleaner Electronics, Brunel Design, Brunel University, Uxbridge, Middx., UB8 3PH, UK
[3]More Associates, The Hub, 5 Torrens Street, London, EC1V 1NQ, UK
* *Corresponding author: dan@danlockton.co.uk*

Abstract

CO_2 emissions from non-domestic buildings—primarily workplaces—make up 18% of the UK's carbon footprint. A combination of technology advances and behavioural changes have the potential to make significant impact, but interventions have often been planned in ways which do not take into account the needs, levels of understanding and everyday behavioural contexts of building users—and hence do not achieve the hoped-for success.

This paper provides a brief introduction to the Empower project, a current industrial-academic collaboration in the UK which is applying methods from user-centred design practice to understand diverse users' needs, priorities, mental models of energy and decision-making heuristics—as well as the affordances available to them—in a number of office buildings. We are developing and trialling a set of low-cost, simple software interventions tailored to multiple user groups with different degrees of agency over their energy use, which seek to influence more energy efficient behaviour at work in areas such as HVAC, lighting and equipment use. The project comprises an ethnographic research phase, a participatory design programme involving building users in the design of interventions, and iterative trials in a large office building in central London.

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1 Background

In the UK, CO_2 emissions arising from non-domestic buildings—primarily workplaces—make up 18% of the country's carbon footprint (Technology Strategy Board, 2009). While technological advances can lead to major improvements in efficiency, it is recognized that occupant behaviour is also "a key determinant of energy consumption" in the workplace (Hadi & Halfhide, 2009), and so interventions to address occupant behaviour, in both new and existing buildings, are increasingly common in tandem with changes to building systems and operating policies.

Often these are communication-based programmes within organisations, drawing on techniques from social marketing (e.g. McKenzie-Mohr & Smith, 1999), but some approaches are making use of developments within the fields of persuasive technology (Fogg, 2003) and design for behaviour change, which aim to understand and influence human behaviour via the design of the products, services and environments with which people interact.

Aside from potential benefits from more engaged staff, the financial benefits for organisations can involve both cutting energy bills and, for larger bodies, reducing the payments mandated under the Department of Energy and Climate Change's CRC Energy Efficiency Scheme[1], a cap-and-trade

[1]Formerly the 'Carbon Reduction Commitment'.

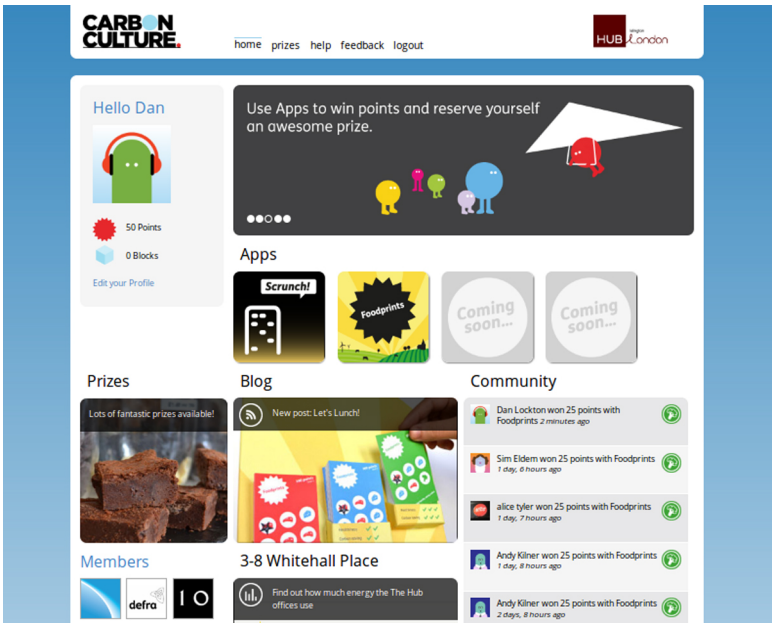

Figure 1: The CarbonCulture home page once a user is logged in

scheme introduced under the 2008 Climate Change Act, in which both a financial and a 'reputation' price are attached to CO_2 emissions.[2]

During 2010, the Technology Strategy Board, the UK's 'national innovation agency', funded a number of projects under the banner of 'User-centred design for energy efficiency in buildings', involving collaborations between academic and commercial partners, and specifically focused on non-domestic buildings (since a number of other programmes are already covering domestic energy use behaviour change). The Empower project (2010-12), described in this paper, is a collaboration between More Associates, a London-based sustainable design consultancy, and research groups at the University of Warwick and Brunel University, which aims to develop a set of low-cost software interventions, tailored to multiple user groups, to influence more energy efficient behaviour in the workplace, focusing on offices.

1.1 CarbonCulture

More Associates have developed CarbonCulture[3], an online community platform for deployment within an organisation, using a range of game mechanics, forms of feedback (including real-time electricity and gas use monitoring) and social proof indicators with the aim of engaging employees in energy saving and other areas of reducing resource use (such as transportation and food choices). The aim is to help employees—CarbonCulture members—find the best 'moves' they can make to save energy and carbon in their workplace, and help spread that knowledge amongst the membership. The Empower project adds an academic research element to the platform, both using CarbonCulture as a research tool to uncover insights around building occupant behaviour, and feeding back

[2]Organizations must not only monitor their CO_2 emissions, but also purchase (tradeable) allowances equivalent to their project emissions each year, with the initial price at £12 per metric ton of CO_2—effectively making this a 'carbon tax'. Since the allowances are per t CO_2, they are not proportional to the energy purchasing costs: fossil-fuel-generated electricity ends up being more expensive in allowance terms per MWh than gas, since in the UK it has a greater carbon footprint.

[3]See *www.carbonculture.net*

relevant insights to the development process so that the product can be improved in scope, focus and ultimately, effectiveness. Figure 1 shows the CarbonCulture home page for an example user.

Organisations among CarbonCulture's early adopters include seven UK government departments, with the Department of Energy and Climate Change (DECC) being the pilot for most trials and engagement during 2010-11.

1.2 Design approaches to behaviour change

Design-based approaches to influencing behaviour offer some advantages over purely communication-based interventions. In particular, they recognize the importance of *context* in determining behaviour in addition to attitudes and cognitive processes, something underemphasized by models such as Ajzen's Theory of Planned behaviour (1985), as Jackson (2005) notes. [4] In terms of the controls, equipment interfaces, information displays and room layouts which employees experience in their everyday working lives, contexts are something which are *designed*. The seats around a table, the availability of a recycling bin, the order of the options in a list, the color of a warning sign and the markings on a thermostat all affect the decisions we make and the actions we take. Stanton and Baber (1998, p.1-3) make the point that "[i]n designing products, designers are also designing user activity, which does not occur independently of the product... consumer behaviour is shaped by products as much as products are shaped by consumer behaviour." And that behaviour can have wider consequences, for the environment, for society, for ourselves and for others.

Sunstein and Thaler (2003, p.1,164) have argued—using the example of a cafeteria director choosing how to lay out the items presented to customers—that since in any planning process some decisions will be made which affect behaviour, it is incumbent on us to consider the impact of these decisions, and try to achieve a desirable behavioural outcome (an approach they term *libertarian paternalism*). By this argument, choosing not to think about how design influences behaviour is still a decision about influencing behaviour: everything that is designed affects how we act, whether it is intended to do so or not. Thus, while behaviour may naïvely be seen as out of the hands of the architect or designer, it can equally be seen as a design problem, concerned with how and why people interact with the products and systems around them, and how designed interventions might change this.

1.2.1 Design for sustainable behaviour

Design for behaviour change is growing as a research area in fields such as healthcare, but also in sustainability, applying insights from multiple disciplines to the problems of influencing more environmentally friendly use of products, services and environments (e.g. Lilley et al, 2005; Rodriguez & Boks 2005; Elias et al, 2007; Lockton et al, 2008; Bhamra et al, 2008; Wever et al, 2008; Pettersen & Boks, 2008; Froehlich et al, 2010).

However, as Blevis (2007) puts it, "[i]t is easier to state the kinds of behaviours we would like to achieve from the perspective of sustainability than it is to account for how such behaviours may be adequately motivated." It is evident that designers need to be able to draw on—and understand the applicability of—concepts from other disciplines, mainly a number of different areas of psychology; despite design's growing role, there is not much guidance for designers facing 'behavioural' briefs—guidance which can be applied during the early stages of a project where discussions with clients and other stakeholders are likely to determine the approach taken. This is not simply to avoid 're-inventing the wheel', but also to make use of knowledge and insights developed in other contexts which could influence behaviour more effectively. Lockton et al (2010a, 2010b) have developed the *Design with Intent toolkit* (Figure 2) a collection of 'design patterns' for influencing behaviour,

[4] Simon (1990) used the metaphor of a pair of scissors to recognize that behaviour necessarily involves context alongside cognition: "Human rational behaviour is shaped by a scissors whose blades are the structure of task environments and the computational capabilities of the actor".

Figure 2: The Design with Intent toolkit in card form

bringing together techniques from a range of psychological and technical disciplines, illustrated with examples, with the aim of enabling designers to explore and apply relevant strategies to problems; the toolkit has been employed a number of times during the Empower project to explore possible directions for interventions and structure the concepts under consideration.

1.2.2 User-centred and participatory design

A user-centred process was considered important to the workplace energy context primarily because existing post-occupancy evaluation and ethnographic inquiries (e.g. Leaman and Bordass, 2001; Chappells and Shove, 2005; Hadi and Halfhide, 2009) have highlighted many occupant behaviours—relevant to energy use—which do not necessarily accord with those assumed by architects and planners. The Technology Strategy Board (2009) notes phenomena including: occupant interventions to bypass or defeat automated systems (e.g. propping open fire doors to increase ventilation); frequent alteration of heating or air conditioning thermostats, never allowing the system to reach a stable condition; and reversion to *ad hoc* stand-alone heaters and air conditioning units due to usability problems with the complex installed building systems.

A key part of a user-centred design approach to influencing behaviour is the use of *participatory design* techniques (e.g. Luck, 2003; Carroll and Rosson, 2007), and this approach has been adopted for the Empower project. This means involving stakeholders throughout the design and development process—in the case of workplace interventions, this includes the whole range of building occupants and users, including facilities managers (building operators) alongside staff members from different departments, job functions and levels of seniority. The involvement is not simply on the level of focus groups, but involves a degree of ethnographic 'embeddedness', with designers spending time working in the same environment as the stakeholders, interacting with users and observing behaviour from within rather than solely externally. Typically, engaging stakeholders directly in the design process will involve workshops (often on-site at the workplace), co-design sessions, and iterative trialing of early prototypes with users, and these were all considered relevant to the Empower project.

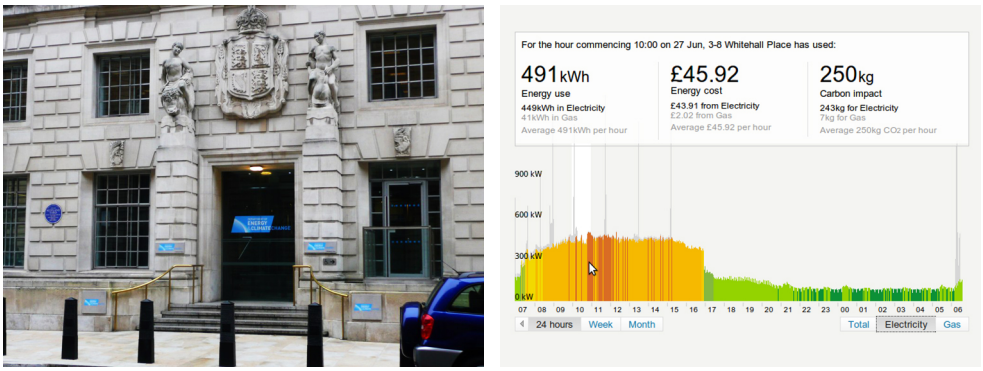

Figure 3: (a) Entrance to the DECC building, 3-8 Whitehall Place, London; (b) an example of the interactive energy graphs for the building, made available on a public-facing part of the CarbonCulture website

2 Initial investigations

The majority of on-site research work during the Empower project has taken place at DECC's main building, at 3-8 Whitehall Place in central London (Figure 3a), with over 900 employees on site. Built by the Ministry of Works in 1951-2, the building was originally five stories high with a set-back attic story, but a 2003-4 reconstruction added new sixth and seventh floors behind the original parapet, placed air-handling equipment on the roof, inserted a central atrium and restored the original façade in line with the building's Grade II historic building listing.

DECC has a comprehensive carbon management plan (DECC, 2011) which commits it to a 25% reduction in CO_2 emissions between 2010 and 2014-5, in addition to substantial reductions already made; behavioural changes are an important component of that plan alongside changes to equipment and infrastructure. As part of DECC's engagement with CarbonCulture, both real-time and interactive summary electricity and gas data have been made publicly available online (Figure 3b).

Other research has taken place with occupants at a variety of research and teaching buildings at Brunel and Warwick, and at the premises of a medical device R&D company in Hertfordshire, north of London.

2.1 Annotation exercise

As part of the CarbonCulture development process, alongside workshops establishing engagement for interested members of staff and interviews with facilities management, an 'annotation' exercise was carried out at DECC in late 2010 to help establish both opportunities for energy saving and carbon reduction and uncover aspects of occupants' understanding of carbon and energy and the part their behaviour plays in it.

Building occupants were given printed red 'arrows' and asked to annotate their working environment with questions. comments and suggestions concerning how energy or resources could be saved—for example, lights which are often left switched on, queries about how much energy is used by some equipment compared to others, and so on (Figure 4a). 183 arrows were placed and filled in, with 25 leading to 'discussions' where others answered or further annotated the original arrow. A similar exercise was carried out at Brunel with design undergraduates annotating a lecture theatre using Post-It notes (Figure 4b).

The exercise helped to uncover specific issues which could be addressed—for example, a number of occupants at DECC questioned how much electricity the lifts (elevators) used, and whether it

Figure 4: (a) Arrow annotation at DECC, suggesting that recycling information signs similar to those present be displayed adjacent to recycling bins on other floors; (b) a student's annotation of an unknown control at the back of a lecture theatre

would lead to significant energy savings to use them less. Making the figures (around 30 kWh per day total for passenger lifts) available to employees via the intranet, and putting them in perspective compared with other energy use in the building (e.g. between 2,000 and 6,000 kWh per day total energy use depending on time of year), was an easy piece of communication, but also highlighted the different levels of literacy around units, and the difference between power and energy, within the same workplace.

It also revealed general areas of concern and interest among staff, many relating to HVAC issues—the largest single area identified for possible intervention, with issues such as temperature variability throughout the day and in different parts of the building being frequently commented upon. 'Coping' strategies such as staff deliberately sitting near draughty windows to cool down or get fresh air, wearing multiple layers of clothing that can be put on or taken off, and even leaving the building to get fresh air, cool down, or warm up (at different times of year) were noted. Discussions with the building's facilities management confirmed that complaints over temperatures (both too hot and too cold) are frequent.

2.2 Issues to investigate

A number of issues arising from the initial engagement were considered worth addressing via more academically-oriented research which could lead to further developments with CarbonCulture.

These included: understanding building occupants' *mental models* of energy use, and how their behaviour affects it (in particular, HVAC, lighting and equipment use); what factors influence perceptions of thermal comfort, and 'acceptable' temperature ranges, and how might these be influenced through features of the CarbonCulture interface?; and what graphical formats (units, style, detail) are most suitable for presenting energy data and feedback on behaviour to diverse stakeholder groups within an organisation, and how can the information be tailored to match the understanding of different groups?

A programme of work has been initiated to investigate these issues, including:

- investigating building occupants' mental models and understanding of the energy-using systems around them, and how their behaviour fits in, using structured interviews in the workplace. Participants—at DECC, Brunel and Warwick—were asked to 'construct' system diagrams using Post-It notes, drawing arrows to connect items and attributing responsibility for energy use to different people and groups, and questions helped explore the degree of perceived 'control' over energy use available to participants in their working environments.

- developing, via a participatory design process, a range of novel representations of building energy use for the workplace, designed to be tailored to the understanding of different groups of employees, and testing the levels of engagement obtained through field trials using real data. An opportunity identified, linking this piece of work to the one above was the potential for better feedback and presentations of energy data to help building occupants develop more accurate mental models of energy use and the impact of their behaviour (similarly to the approach proposed by Burns & Hajdukiewicz, 2004, in relation to *ecological interface design*).

The above two investigations are ongoing and will be reported in detail in a future article, along with the incorporation of the insights uncovered into the CarbonCulture platform.

Aside from these issues, thermal comfort was identified as a priority for focused investigation, since HVAC represents such a major proportion of energy use. In the DECC context, the specific brief of 'encouraging office building users to be comfortable with a wider range of temperatures' was deemed worth addressing, since a wider range than the 20-24 °C within which DECC's facilities management currently aim to maintain temperatures would allow heating to be used for less time in the winter and air conditioning for less time in the summer.

Fieldwork is ongoing investigating the factors which influence perceptions of thermal comfort and 'acceptable' temperature ranges, including social feedback, perceived control and office layout, and will be reported in a future article, but the opportunity was taken, via a workshop, to solicit the ideas of a group of designers and students making use of the Design with Intent toolkit to generate possible directions for addressing the brief of encouraging occupants to be comfortable with a wider temperature range.

The remainder of this paper outlines this workshop as an example of a how a 'design for behaviour change' approach can be applied to this particular aspect of workplace energy use.

3 Thermal comfort design workshop

In November 2010, an opportunity arose to run a workshop at the University of Twente in Enschede, Netherlands; the invitation came from organisers of the Design for Usability project, a collaboration between the three Technical Universities of The Netherlands (Delft, Eindhoven and Twente) and companies including Philips, Océ, T-Xchange and Indes. Each year on the Usability Professionals' Association's World Usability Day, the DfU project runs a symposium, with workshops, on specific emerging areas of theory and practice relating to design and usability. 2010's focus was on 'product impact'—effectively, how design can be used for social benefit through behaviour change, and the possibilities and implications for users, designers, industry and society.

It seemed opportune to use the workshop (Figure 5) to apply the toolkit to address a behavioural issue that the early stages of the Empower project were investigating, and capture some of the ideas generated informally by an 'outside' group of designers and researchers.

3.1 Procedure

Twenty-eight participants took part—a mixture of industrial designers, interaction designers, user experience and web designers from industry (including Brabantia and ING Bank), strategy and consulting staff from industry (including a former senior manager at Philips) and current design, psychology and computer science students and researchers from Delft, Eindhoven and Twente.

The lead author introduced some of the insights around heating, cooling and a comfortable work environment that had emerged from the early stages of ethnographic work on Empower, and (following More Associates' recommendation) framed a number of these into a single challenge: "Getting people to feel happy in a building with more variations in temperature".

Example approaches given were "wearing different clothes", "sitting in different places" and "being more tolerant of other people's feelings". Participants organised themselves into four groups, each

Figure 5: The University of Twente workshop.

with a mix of academics and industry staff. Each group received copies of the eight Design with Intent worksheets as inspiration material, and over 30 minutes, they discussed both the challenge and generated concept solutions to address it, sketching and noting them down. The suggested procedure was for the groups to talk briefly about the brief itself, and their own experiences in workplaces around heating, cooling and comfort, then for each person in the group to take one worksheet, become 'familiar' with the patterns and ideas for a few minutes, and then talking back to the rest of the group, running through the possibilities of applying the patterns to the brief. Radical ideas were encouraged, but so were more realistic interventions. After this brainstorming, representatives from each group presented some of their ideas to the room and there was a brief discussion about the merits (and in some cases, the ethics) of the concepts.

3.2 Results

Approximately 38 separate ideas were generated by the four groups, with some duplicates or very similar concepts[5]. Tables 1, 2 and 3 provide a categorisation of the ideas, and Figure 6 is a montage of some participants' sketches. The concepts roughly resolved into:

- Allowing staff to adjust or affect the temperature in different ways
- Keeping people informed about the temperature
- Different temperatures in different parts of the building
- Provoking empathy / peer awareness
- New working practices / organisational initiatives
- Heating and cooling the immediate workspace

[5]Not all of the concepts were explicitly noted as inspired by the Design with Intent patterns, but the majority were, sometimes 'postrationalised' by participants explaining them, as being "inspired by that pattern when we came up with it, but actually it fits this one too".

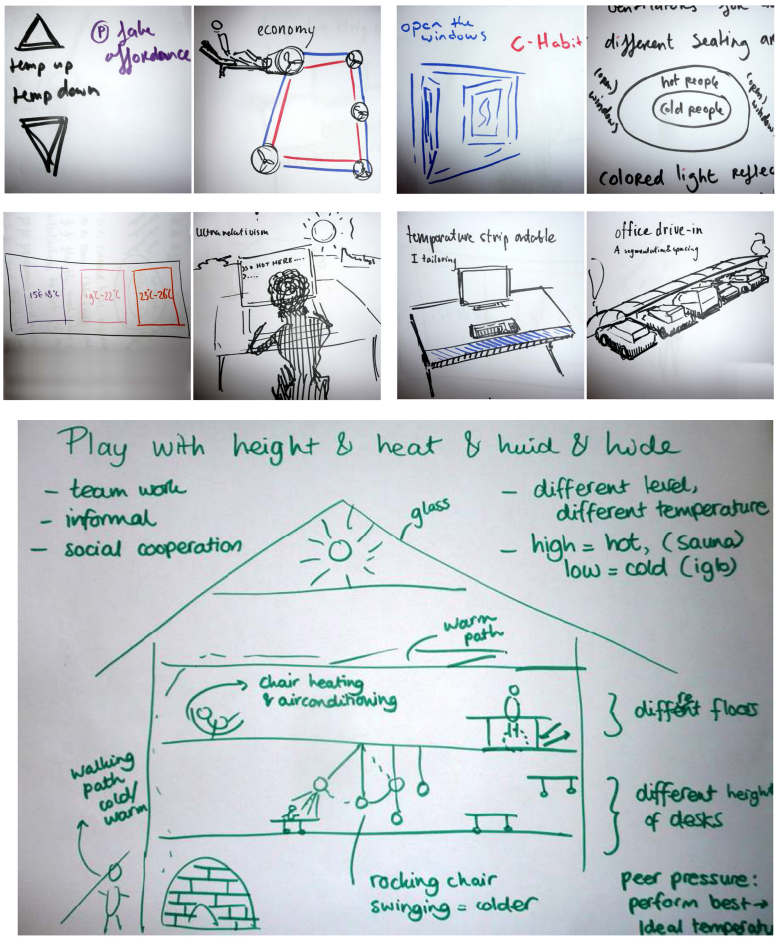

Figure 6: A selection of participants' sketches from the University of Twente workshop

Some of the concepts included are only indirectly about behaviour change—dealing with changes to building layout or working practices which would have a behavioural effect, but not at the level of designing interfaces or product features. Perhaps surprisingly, none of the participants emphasised the environmental angle on reducing energy use—there were concepts about attitude change around empathy, but nothing about engendering pro-environmental attitudes in order to cause behaviour change, which is a common approach in UK discussions of encouraging more sustainable behaviour.

3.3 Impact

Some of the concepts are impractical, and some relate to building fabric changes rather than influencing behaviour, but overall the exercise was useful in increasing the 'idea pool' for this aspect of the Empower project at a relatively early stage. For example, in interviews with building occupants, elements of some of the concepts have been suggested as provocations to help spur discussion around behaviour.

Aspects of some of the concepts around temperature voting have been taken forward and developed further as part of the project, although only to paper prototype stage, but the main impact has been the adoption of elements of a number of the 'keeping people informed' and 'peer awareness' ideas in the ongoing studies of thermal comfort mentioned in section 2.2. At time of writing, two studies at DECC and Warwick as part of Empower are employing these ideas via a web-based research tool, incorporated into the CarbonCulture platform, which allows users to record their comfort levels throughout the day and also to see how their colleagues are feeling. This work will be reported in a future article.

4 Conclusion

This paper only gives a brief, informal introduction to the Empower project and some of the directions it has taken; the project is ongoing and, being a commercial collaboration, with a 'live' client organisation in the form of DECC, the approach has been largely exploratory and empirically driven, with the research undertaken evolving according to need rather than being fully determined in advance.

Nevertheless, it is hoped that the insights provided are of interest to the BECC community, particularly around the potential offered by design approaches to behaviour change. As the project progresses, formal publication of the studies introduced here on mental models of energy, different forms of energy data visualisation, and perceptions of thermal comfort will follow. In the meantime, the CarbonCulture website, *www.carbonculture.net*, will be updated as the platform is further developed.

Table 1: Concepts generated by participants, roughly categorised

CONCEPTS	DESIGN WITH INTENT PATTERNS
Allowing staff to adjust or affect the temperature in different ways	
Voting scheme on temperature for each floor or area: everyone gets votes for hotter, colder or OK throughout the day and a democratic compromise results	PEER FEEDBACK; RECIPROCATION
Rolling voting scheme where 10 people must vote the same way before temperature changes	PEER FEEDBACK
Placebo button allowing people to 'increase' or 'decrease' the temperature (that actually does nothing)	FAKE AFFORDANCES
Allow people to adjust the thermostat, but only by ± 1 °C or only every 30 minutes, so that 'thermostat wars' do not develop	PORTIONS; SLOW/NO RESPONSE
Use peer pressure – the most productive employee or team gets to choose the temperature setting for the day or week	SOCIAL PROOF; PEER FEEDBACK
Keeping people informed about the temperature	
Progress bars on thermometers / thermostats so people can see the trend of temperature in the building, and how long it will take to reach the setpoint (to avoid constant changes or unachievable settings)	PROGRESS BAR; REAL-TIME FEEDBACK
'Temperature forecasts' for the next day for different areas of the building, so people can plan to wear appropriate clothes ("Tomorrow is t-shirt weather!")	SIMULATION & FEEDFORWARD; TAILORING
Intranet should show current temperature for every area of the building so people can know exactly where to go and work if they're currently uncomfortable	REAL-TIME FEEDBACK
Visualisation in each room showing how hard the heating or air conditioning system is working to maintain the current temperature (so people realise how much energy it uses)	REAL-TIME FEEDBACK
Coloured lighting in different areas of the building signalling the temperature of that area, with flexible workspaces so people can choose to work where they are most comfortable	COLOUR ASSOCIATIONS
Inform people in advance of temperature trends in the building, so they can adjust clothes or move to a different place to work	SIMULATION & FEEDFORWARD

Table 2: Concepts generated by participants, roughly categorised

CONCEPTS	DESIGN WITH INTENT PATTERNS
Different temperatures in different parts of the building	
Have cold and hot areas, entered through different doors. Even areas with a breeze from open windows, insulated from areas where people don't want it	SEGMENTATION & SPACING
Chart exactly where the hot and cold spots are in the building, and devise a seat-shifting game visualized through a 'sliding square' grid	PEER FEEDBACK
Allow people to book or subscribe to particular workspaces in advance with the temperature they prefer	TAILORING
Interior atmosphere could be changed somehow to better match the outside, so people feel less disconnected from the weather (managing expectations)	TRANSPARENCY
Different (concentric) seating areas for 'hot people' (nearer windows – that can be opened) and 'cold people' (nearer the centre of the building)	TAILORING; POSITIONING
Allow people on other floors to 'request' heat or cooling, and move the air around the building	
Exercise bikes which can warm up the people pedalling, while driving fans to cool people elsewhere who are too hot	
A 'cool path' through the building that takes people into unheated areas to allow them to cool down, feel refreshed and get some exercise before returning to their desks (or alternatively, a 'warm path')	MAZES; IMPLIED SEQUENCES
Give people points for sitting in hot spots or unpopular places that they can trade for sitting in a comfortable spot later – could have 'hot' and 'cold' points	SCORES; REWARDS
Flexible workspaces clearly labelled with the temperature, so over time it will be possible to see which areas are unpopular due to their temperature	SUMMARY FEEDBACK
Have 'social corners' with water coolers or coffee machines which encourage people to get up and move around (warming themselves up)	
Provoking empathy / peer awareness	
Out of office notification – "I am going outside for some fresh air" – to provoke empathy	PROVOKE EMPATHY
Avatars or puppets sitting on desk for every member of staff representing how happy / hot / cold / satisfied everyone is (raising empathy)	PERSONALITY; PEER FEEDBACK
'Ultrarelativism' concept – if you're too hot, you can video chat with someone who's much too hot (perhaps even in another country)	PROVOKE EMPATHY; EMOTIONAL ENGAGEMENT
'Chatboxes' where people can discuss the temperature, etc	
A t-shirt or badge that changes colour with people's body temperature, to drive empathy and show others that people do have different comfort levels	FEEDBACK THROUGH FORM; PROVOKE EMPATHY
Animated display showing employee satisfaction and happiness each week	SUMMARY FEEDBACK

Table 3: Concepts generated by participants, roughly categorised

CONCEPTS	DESIGN WITH INTENT PATTERNS
New working practices / organisational initiatives	
Rota of working at home, so that on any one day fewer people are present and fewer computers switched on	
Encourage people to work in their cars instead, where they can control the temperature personally (the 'office drive-in') – or achieve the same effect with personal booths in the office	
Somehow make it fun or pleasant to experience a wider temperature range, e.g. themed days where people can dress up to match different climates, maybe with appropriate food and drink in the canteen	PLAYFULNESS
Simply encourage people to work from home at times of extreme temperature when the energy demand on heating or cooling the office will be too high	
Heating and cooling the immediate workspace	
Heated (or cooled) wrist rests on desks, to allow a 'point source' of heat or cold in people's immediate workspace	
Allow desk and chair height to be changed to raise people who are cold up into the warmer air towards the ceiling – or have it happen automatically to maintain a constant temperature in airspace around the person	TAILORING
Establish a habit of people opening the windows for a few minutes every hour in colder weather, to get fresh air and feel refreshed without letting too much heat out – could be a beep or flashing light to remind people to close them again	HABITS; CONDITIONAL WARNINGS
Remove handles entirely from all windows so people sitting next to them aren't tantalized by feeling they could have control but don't	FEATURE DELETION
Have rocking chairs or desks which both warm up the person doing the rocking, and create a draught to cool others and improve air circulation in general	
Heated (or cooled) chairs and footrests to allow localized temperature control in people's workspaces	

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