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A socio-technical approach to improving retail energy efficiency behaviours

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ABSTRACT

In recent years, the UK retail sector has made a significant contribution to societal responses on carbon reduction. We provide a novel and timely examination of environmental sustainability from a systems perspective, exploring how energy-related technologies and strategies are incorporated into organisational life. We use a longitudinal case study approach, looking at behavioural energy efficiency from within one of the UK's leading retailers. Our data covers a two-year period, with qualitative data from a total of 131 participants gathered using phased interviews and focus groups. We introduce an adapted socio-technical framework approach in order to describe an existing organisational behavioural strategy to support retail energy efficiency. Our findings point to crucial socio-technical and goal-setting factors which both impede and/or enable energy efficient behaviours, these include: tensions linked to store level perception of energy management goals; an emphasis on the importance of technology for underpinning change processes; and, the need for feedback and incentives to support the completion of energy-related tasks. We also describe the evolution of a practical operational intervention designed to address issues raised in our findings. Our study provides fresh insights into how sustainable workplace behaviours can be achieved and sustained over time. Secondly, we discuss in detail a set of issues arising from goal conflict in the workplace; these include the development of a practical energy management strategy to facilitate secondary organisational goals through job redesign.

1. Introduction

Energy management has become a key part of organisational life across all industries and is proving an area of increasing interest as a response to carbon reduction targets (DEFRA, 2006). This interest is also reflected in the increase in Corporate Responsibility carbon commitments amongst UK retailers which detail far-reaching carbon reduction targets and strategies (Gouldson and Sullivan, 2012). Running alongside important ethical considerations associated with climate change action are gradual, long-term pressures such as rising energy prices and increasing fuel poverty (Rosenow, 2012).

In this paper we describe a qualitative two-year case study (2011–2013) carried out in a large UK retail organisation. The study explores energy management from a socio-technical perspective, and considers inter-relationships that have rarely been discussed together in a workplace environmental study. The study not only shares exploratory data around the interaction of energy efficiency tasks with wider organisational strategy, but also describes the subsequent formulation of an intervention strategy to improve energy efficiency based on the initial qualitative data. Further data are also provided to assess the initial impact of the change. In what follows, we review previous work on goal setting, work design and socio-technical systems thinking, followed by research which has looked at environmental behaviour, as a prelude to introducing the empirical study. In this study 'energy' refers to water and utilities, but predominately electricity.

1.1. Goal-setting theory and socio-technical systems

Goal-setting theory uses a range of moderators and mechanisms to explain levels of performance against a core goal, when that goal is difficult and specific (Locke and Latham, 2002). Example moderators include individual ability and commitment to the goal, the complexity of the task and the degree of feedback given (Smith,

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2006; Klein et al., 1999; DeShon et al., 2004). The mechanisms to drive goal performance are both individually-driven, such as effort and persistence, and organisationally-driven, with task strategy clarifying how the end goal should be achieved, for example through training and tools. Most working individuals have more than one goal, but performance problems have been identified when multiple goals are in perceived to be in conflict (Austin and Bobko, 1985; Locke et al., 1994; Slocum et al., 2002). Goal-setting and environmental behaviours are frequently discussed in the domestic context (Rabinovich et al., 2009), particularly in the area of energy efficiency, with strong emphasis on the role of the feedback mechanism through home energy monitoring systems (Abrahamse et al., 2007; Hargreaves et al., 2010). There are only a handful of papers that discuss the implications of environmental work behaviours and goal setting in the workplace (Carrico and Riemer, 2011; Unsworth et al., 2013), but as yet practical case studies are relatively scarce.

The adoption of a socio-technical systems approach involves understanding the interdependencies and interconnections between technology (e.g., tools and equipment), work tasks and processes, and organisational culture (Cherns, 1976, 1987; Clegg, 2000). An important implication of this approach to work systems and environments is that changes to one part of the system will impact another (Challenger and Clegg, 2011). A series of guiding socio-technical principles includes: simple design informed by the end-user, congruence between all parts of the system and with organisational goals, integrated task perspectives and the enabling of local experts to problem-solve and adapt systems appropriately (Clegg, 2000). Most organisations begin looking at energy management from either efficiency (technology) or maintenance perspectives (Sweeney et al., 2013) and energy management is traditionally placed within an engineering/maintenance function in most organisations. This technical focus can downplay the behavioural elements around energy management, leaving them to be designed around the system without necessarily being considered as part of the primary design. Using a socio-technical systems approach research to challenge existing systems in the energy space helps to identify disconnects between technology and behaviours that are systemically supported by the organisational design.

In this paper, we adapted a socio-technical framework (Davis et al., 2013) to probe deeper into the interaction between environmental behaviour, goals and buildings and infrastructure. The framework uses similar themes, but is developed to fit the nature of the organisation, the research question and the novel use of using a socio-technical framework approach to address goal-setting issues. The framework is designed to generate observations which in turn contribute to the exploration of multiple goal conflict, the design of an intervention, the identification of existing conflicts or gaps (Davis et al., 2013) and to contribute to the development of theory and practice (Challenger and Clegg, 2011).

1.2. The role of behaviour in energy reduction

Environmental behaviour research has historically largely focused on domestic energy use (Greaves et al., 2013; Carrico and Riemer, 2011), with little examination of the role of environmental behaviour and energy reduction within a larger organisational context. Within the domestic (home) environment, a wide range of issues has been explored to explain energy behaviours, including: financial motivations (Abrahamse et al., 2005); goal setting (Abrahamse et al., 2007), information and knowledge building (Jackson, 2005; Lorenzoni et al., 2007); intrinsic motivations (Osbaldiston et al., 2003), and embedding environmental behaviours into everyday habits and routines (Warde, 2005). Whereas pro-environmental attitude was once viewed as a primary means to effect behaviour change (Guagnano et al., 1995), research is beginning to challenge the need for a pro-environmental attitude as a pre-requisite for pro-environmental behaviour (Young et al., 2013; Owens and Driffill, 2008). The much discussed 'Value-Action' gap additionally reveals that even where pro-environmental attitudes are present, appropriate energy-related behaviours are not guaranteed, as knowledge or belief is not always a predictor of action (Kollmuss and Agyeman, 2002). Research has therefore identified the need to expand existing behavioural frameworks for application in large organisations (Tudor et al., 2007), and moved to consider alternative factors that can act as barriers or enablers to pro-environmental behaviours amongst the general public, either in addition to, or despite the individual's personal environmental commitment (Lorenzoni et al., 2007). Little work of this nature, however, has been conducted in a workplace context, therefore in this paper we attempt to identify specific organisational barriers and enablers to energy efficiency behaviours.

The design of our research and subsequent intervention is derived from an existing socio-technical model (Davis et al., 2013 – Fig. 1). We also draw from previous environmental research that emphasises a systematic approach to promoting behaviour change through identifying key behavioural tasks and associated barriers and enablers and then using these to build an appropriate intervention, rather than applying a generalised approach potentially derived from dissimilar contexts (Steg and Vlek, 2009; Geller, 2002). Our interest in socio-technical systems in workplace energy usage also has resonance with the worldview of 'Practice Theory', which also has a strong theoretical emphasis on context (Cetina et al., 2005). Practice Theory has gained in popularity in sustainability research over recent years primarily in domestic energy usage (Sweeney et al., 2013). This perspective discusses the systemic feasibility of sustaining infrastructures required by our ingrained routines and technologies, despite the ecological damage that is being caused (Gram-Hanssen, 2009). Work in this area is exemplified by analysis of ingrained everyday practices, and the challenges inherent in transitioning into a more pro-environmental practice regime (Shove and Walker, 2010).

1.3. Study objectives

Our overall aim is to describe a case study involving a large UK retail organisation's work to build on energy efficiency improvements through job redesign. We focus specifically on three main objectives in the paper:

1. To describe a case study involving behavioural energy use in non-domestic environments through a socio-technical lens;
2. To explore specific socio-technical challenges, enablers and barriers involved in implementing an energy efficiency strategy within the retail organisation, currently under-researched in the socio-technical field;

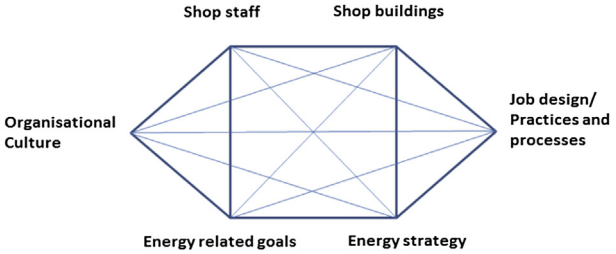

Fig. 1. Retail energy management adapted socio-technical model (adapted from Davis et al., 2013).

3. To identify novel key inter-relationships between factors that directly lead to practical strategies for managing energy efficiency;
4. To describe how this socio-technical approach has directly led to an original intervention for managing energy efficiency as a secondary goal through job redesign.

2. Method

2.1. Background and setting

The organisation is an important retailer in terms of size and turnover both in the UK and abroad. It has clear published carbon targets, aiming to halve emissions from a 2006/2007 baseline by 2020 and become a zero carbon business by 2050. The organisation has received acclaim for innovative approaches to reconcile behavioural and technical developments. Consistent reduction in energy consumption has been observed as a result of the existing behavioural strategy; however, in order to further improve, it is recognised that some review and change could enhance existing practices. Several years prior to this study, an 'Energy Champion' system was implemented in stores, This was a network of volunteer staff nominated to undertake additional training in energy efficiency in order to influence their store peers a popular and frequently successful approach to behavioural energy management (Davis and Coan, 2014; Heijden et al., 2012). This system was still in place during the initial research and was changed as part of the subsequent intervention.

2.2. Data collection: participants and timeline

Our data collection was carried out using the socio-technical meta-principles that design is systemic, that all parts of a system are inter-connected, and that values and mind-sets are integral to design (Clegg, 2000). These socio-technical principles are reflected in the depth of our research over time and the spread of our enquiry (e.g., across hierarchical levels of the organisation, examining both store and office-based staff perspectives). A total of 131 participants took part in either semi-structured interviews or focus groups during the period 2011–2013. The longitudinal approach was designed in order to observe how attitudes and understandings altered over this period, particularly prior to and following a behavioural intervention in 2012.

Twenty focus groups were carried out in two phases, the first in 2011, and the second in 2013. There was an average of 5–6 participants in each group. We included a wide variety of staff in these focus groups, from shop floor staff, departmental managers, and team leaders in stores, drawn from across the UK store network. We carried out four interview phases. The first three phases focused on 22 Store Managers, and were conducted in 2011–2013. Twenty-two Store Managers were interviewed across the three phases. Finally, in 2013, we interviewed three members of a central energy team who implement the centralised technology energy strategy for stores (Table 1).

Each set of phased focus groups and Store Manager interviews was conducted in 29 different stores. Table 2 describes the various data collection stages alongside a description of the job and work design interventions which were put in place during the period 2011–2013. During this time of qualitative research and intervention development, the lead author was embedded within the organisation, and tasked with contributing towards resolving issues around non-performance of energy-related tasks in stores. The research was carried out independently and reported back to the organisation with recommendations for change. The subsequent job-redesign intervention was built around the response to the findings, but implemented by the organisation.

The core job-redesign intervention was to incorporate existing energy tasks into appropriate departmental management roles. These tasks were previously managed through the Energy Champions network. The tasks were re-evaluated and appropriated to job roles that already had responsibility for the relevant equipment or areas. As part of this job-redesign intervention, a performance management measure for energy task completion was introduced. This transformed the goal from a distal objective to comply with direct energy consumption targets, to a proximal goal around specific energy task completion. Following the job redesign, the energy tasks became subject to regular mandatory performance management and training built around job roles. Changes to job roles and responsibilities were designed as much as possible to be delivered through already existing channels. This was intended to facilitate 'support congruence', as the task delivery forms part of the existing mainstream system (Clegg, 2000). Specific energy tasks were delivered on a quarterly basis through an existing communications system. Clearly disseminated communication was recognised as being crucial to a successful environmental change process (Davis

Table 1
Study participants.

Time period	Data ID	Data collection activities	Participants
2011	Focus group Phase One	10 Focus Groups in stores to review problems in completing energy tasks	Total 51 participants aged between 19 and 73 across 10 UK locations 55% General Assistants to 45% Line Manager/Team Leaders.
2011	Store Manager interviews Phase One	Interviews with UK store managers	Five participating Store Managers from the same stores as Focus Group Phase One. Interviewed separately from Focus Group participants
October 2012	Store Manager interviews Phase Two	Interviews with UK store managers to assess initial impact of interventions	Nine participants from UK locations. Selected from outlier stores that were both performing well (four), and performing badly (five) with energy task completion. No replication of stores in Focus Group Phase One or Two.
June 2013	Store Manager interviews Phase Two	10 Focus Groups in stores to assess impact of interventions	Total 54 participants aged between 20 and 64 from 10 UK locations (different from Focus Group Phase One). 60% General Assistants to 40% Line Manager/Team Leaders.
June 2013	Store Manager interviews Phase Three	Follow-up interviews with UK store managers	Eight participating Store Managers from the same stores as Store Managers interviews Phase Two. Interviewed separately from Focus Group participants
August 2013	Interviews with Energy Team	Interviews with Energy team involved with the centralised energy strategy	Three participants from Head Office central energy team.

Table 2
Data collection and intervention timescale.

Time period	Data ID	Data collection activities	Job-redesign interventions
2011	Focus Group Phase One	10 Focus Groups in stores to review problems in completing energy tasks	
2011	Store Manager interviews Phase One	Interviews with UK store managers	
April 2012			Job redesign. Change from Energy Champion system to instead incorporate energy tasks into core Departmental Management responsibilities. Redesign of energy performance goals as proximal task goals rather than distal electrical consumption goals.
October 2012	Store Manager interviews Phase Two	Interviews with UK store managers to assess initial impact of interventions	
June 2013	Store Manager interviews phase 3	Follow-up interviews with UK store managers	
June 2013	Focus Groups Phase Two	10 Focus Groups in stores to assess impact of interventions	
August 2013	Interviews with Energy team	Interviews with Energy team involved with centralised energy strategy.	

and Coan, 2014) so we worked to ensure that communication was as consistent as possible to avoid any impact on results.

2.3. Data analysis procedure

We adopted an abductive approach towards data analysis, that is, building our theories as our data were gathered (Dubois and Gadde, 2002). Each data set was analysed separately, and the insights informed further research. Along the course of the timeframe, we examined several themes that were later abandoned as our understanding grew; the presence of the themes that remain is therefore reflective of their relevance (Dubois and Gadde, 2014). All interviews and focus groups were semi-structured in order to generate data that were not tied to existing hypotheses or theory (Cresswell, 2009; Yin, 2009). We recorded and transcribed all interviews, and then analysed them with reference to a set of initial *a priori* themes that we developed over time.

Data were organised and reduced using template analysis, where our data was sorted into themes (King, 2004). These themes were generated and adapted across all the discrete data sets created through sessions with different participants and different collection dates across the length of the study. Over the course of the 2 year study each new data set was analysed independently, with themes being matched or discarded as appropriate. This enabled the comparison of perspectives on behaviourally-related barriers and enablers around the energy agenda across the different participant groups and over time. The integration of data from varied sources around themes is reflective of the socio-technical worldview of systemic interconnectivity. This approach enabled us to build an integrated themed data set that was reflective of different parts of the organisation at different points in time. Repetition of themes within the range of indicated areas of interest for us, as did changes in themes over time and data that indicated opposing opinion around themes. Our analysis emulates the socio-technical content principle that design should reflect the needs of the business, its users and their managers (Waterson, 2005; Carayon et al., 2006) and emerging themes in our research tended to echo areas of interest around these concerns.

3. Findings

In this section we describe the data generated from the phased focus groups and interviews. The findings are summarised in Table 3 below. We begin with discussions that preceded the job design intervention. These initial findings are organised to outline the socio-technical framework from which they were generated (Fig. 1). The findings demonstrate divergent perceptions of energy management in the organisation and highlight misconceptions around energy strategies, building management and goals that can be systemically linked to issues around practices and processes. Taking a socio-technical approach led to discussion around factors that are interlinked but rarely considered in the same study and thus provides fresh insights. Following the initial findings, we discuss interviews and focus groups that followed the intervention in order to assess the perception of change. We consider two aspects of change, firstly the job redesign itself and secondly the concurrent restructuring of the performance measure. Our initial qualitative feedback following the intervention found that generally the changes were considered as helpful.

Table 3
Socio-technical aspects of the findings.

Key socio-technical factors	Summary of findings
Organisational Culture	Limited pro-environmental concern Enabling organisational motivators – feedback and competition and leadership support Problems of secondary goals competing in a multiple goal environment
Energy Goals	'Energy Champion' job design misalignment Measured by complex distal goals that confused some staff Energy needs to be designed as a secondary goal Performance management processes are informally prioritised, extra incentives are required to keep energy goals in frame
Shop Buildings	Perception of delayed response on maintenance problems exacerbates multiple goal Need for a better support/response system for reporting faults and problems
Energy strategy	Emphasis on technology-led solutions Controlled environment Potential for lack of trust between stores and technology Limited consultation with staff over 'silent' interventions
Processes/procedures	Lack of alignment of energy to existing processes and practices Departmental jobs redesign to include energy tasks
Store staff	Low priority of energy task completion Problems with champion culture – additional tasks Avoidance of non-primary tasks if they are difficult and complex

3.1. Organisational culture

Corporate culture within this retail organisation is very oriented towards pro-energy efficiency with strong public carbon commitments, high investment in energy efficiency technology, and a team of technical experts working to reduce carbon/energy spend. Building staff engagement has been a core part of the organisational energy strategy over recent years. Our data show that most staff agreed that energy efficiency is important for the organisation, and that certain individuals in stores show high levels of motivation to comply with energy efficiency tasks. However, across the 29 stores visited, focus group participants exhibited little personal intrinsic interest in carbon reduction either in or outside of the organisation. A typical statement from a focus group participant attests to this:

> "you think about what's affecting you there and then, not what's going to affect the planet in years to come"
> (Focus Group Phase 1)

Previous research has suggested that pro-environmental concern or self-concordance with environmental concern is a determinant of engagement (Stern, 2000; Unsworth et al., 2013). Interestingly, our data imply that this is an organisation where staff do understand and support the organisation's commitment to energy efficiency. Our insights into perceptions of energy efficiency suggest a lack of self-concordance with energy efficiency on the part of some employees, despite the fact the organisation itself has a strong and overt strategic commitment to energy savings.

The strongest motive for household energy efficiency is reducing personal financial costs (Abrahamse et al., 2005). Our data concurred with this, with people in stores telling us that they are personally very much motivated by financial concern around paying their bills at home. In this setting we found that the impetus of financial motivation does in part translate to the workplace, with management staff frequently demonstrating an interest in the equation between energy loss and operational profit:

> "Empty shelf, dirty shelf, queue, energy, just in your psyche just to say, chiller door is open today, why is it open? That is costing money for the company."
> (Store Manager interviews phase 2)

However, the relationship between energy task performance and personal financial impact was found to be too distant to be particularly motivating at a junior staff level:

> "any ordinary General Assistant isn't going to care that they are saving money for (the company)"
> (Focus Group phase 1)

Similarly, although an appreciation of the contribution of energy efficiency to organisational profitability may be motivating at certain management levels it is unlikely to extend to all staff. Previous research has shown that in domestic settings where individuals do not pay the bill, the financial incentive tends to be very much diminished and other more altruistic incentives come into play (McMakin et al., 2002). The less favourable response from non-bill payers to financial incentive plays similarly here in the work-setting. However, whereas in the domestic study altruistic motivations were observed to support energy efficiency behaviours (McMakin et al., 2002); in this setting our data suggest that motivation based on intrinsic sympathy for energy efficiency is also unlikely to be universally successful. This combination of data reveals a gap in motivation when primary communication is based on altruistic or financial motivation.

3.2. Energy goals

3.2.1. Conflicting goals: energy reduction vs. other operational priorities

Our data across 29 stores consistently highlight a sense of competing priorities and multiple goal conflict around energy. People in stores are clearly busy, often in stores that open to customers day and night. We were repeatedly told that a core skill for any store manager is being able to act on priorities and that quick turnaround and responses can make a difference to the store performance. Thus, time spent on energy management is sometimes seen as essentially time spent away from other store needs that are perceived as being more pressing:

> "we get so many instructions, so many agendas, and to be honest energy's not high on my to-do list"
> (Store Manager interviews phase 1)

Energy management is not only often a lower priority than other store tasks; our research also reveals that it can be perceived of as in conflict with other goals in stores. Key organisational objectives and focal goals such as sales or customer service were cited by some staff as a better use of their time than calling attention to energy efficiency issues;

> "If I walked past and said 'look how much electricity we use for lights, ooh let me go and bring that to someone's attention', they would say,' Oh go and do something useful'. That's just the way it is!"
> (Focus Groups phase 1)

This perception of tension between energy goals and commercial priorities is potentially a barrier for staff engagement. Multiple goal conflict is counterproductive to performance (Cheng et al., 2007), so finding that energy can be regarded in this way provides some insight into why tasks may not being consistently performed. This is important to consider as a contextual background for introducing energy tasks to stores.

3.2.2. The role of 'Energy Champion'

During the initial research an 'Energy Champion' system was in place in stores. Stores were instructed through the central energy behavioural strategy to nominate their own Energy Champions to be trained on energy issues and to influence their peers to complete energy saving tasks. This was not incorporated as part of a job per se, but seen as add-on task to an existing job role. Motivation for these Champions was largely constructed around personal commitment to carbon reduction and financial savings for the organisation. Our data have already indicated that neither of these motivations was likely to be universally appealing in the wide organisation, so although individual Energy Champions were very successful, particularly at the outset, the network was unlikely to sustain on-going impact. Additionally, the approach did not reflect potential for multiple goal conflict, and that the additional responsibility might be resented by some Champions. Although some Champions relished their position, and used it effectively to encourage other people to take behavioural action, others expressed frustration with being given additional tasks to perform:

> "[The] Energy champion role was foisted on me… you haven't got time to do your own job without taking on extra responsibilities"
> (Focus Group phase 1)

The nature of the role was to encourage colleagues to conform to energy tasks, but staff reported that this was often difficult:

> "As an energy champion it was hard to get people to do things that they were supposed to, especially when they are busy working"
> (Focus Group phase 1)

It seems perhaps logical that, as a collective organisational goal, that everyone has a duty or perhaps a desire to get involved with energy efficiency. We found that in this context pro-environmental and pro-organisational concerns will only motivate a certain population, and not necessarily engage a broad staff base. Despite raising awareness across a large estate, and strongly developing certain individuals in energy efficiency, our assertion is that the Energy Champion role did not tap into the existing organisational culture or structures sufficiently to be sustainable on a long-term basis.

Partly in response to these issues, the data showed that in some stores the role of Energy Champion simply disappeared from focus, and was not replaced if nominated staff left the organisation. In tracking down the Energy Champion in stores our researchers frequently heard that one was no longer in place:

> "We did have an energy champion, in inverted commas, but nobody wants that monkey."
> (Focus Group phase 2)

3.3. Store staff

Motivation was discussed in all interviews and focus groups, and some common themes were identified that characterised the existing organisational culture across levels, locations and departments. The strongest themes were around feedback results and competition. Strong similarities were observed between the stores across these themes. The following quote exemplifies how a member of staff discusses a preference for feedback, drawing comparisons with how other organisational goals are motivated:

> "if we go out and product-protect wines and spirits today, we would see (loss) come down on wines and spirits, if we do energy checks and next period we do all our energy checks, and the next period we do all our energy checks, what have we achieved?"
> (Focus Groups phase 2)

Store managers told us that general feedback around how energy efficiency saved money for the company was not enough – they would want to know how much over a specific period, and to see for themselves that it was making a difference. This relates strongly to their existing goals and practices and processes around goal motivation. In this cultural context, feedback needs to be carefully crafted to conform to deeply engrained expectations around how goals and results are presented in order to be taken seriously.

Competition is an inter-connected common theme, with much animated discussion around how local store formats compete around other productivity objectives.

> "You see those girls and guys coming in in the morning and getting their waste figures and they want to know are we at the bottom of the list? It's very competitive, very driven"
> (Store Manager interviews phase 3)

Finally, our research highlighted the crucial importance of supervisors at all levels to how duties are activated and prioritised on a daily basis. This responsive leadership trait is very typical of a retail environment and a strong cultural characteristic across this organisation:

> "Without sounding like a bunch of robots, we will deliver what our work levels above us push us to deliver. Because we have our own priorities in shops, but what our boss talks to us about is really key."
> (Store Manager interviews phase 2)

3.4. Energy strategy

Energy strategy and accountability in this organisation is located within an engineering function. The technology is well invested and highly researched and the technology function is very much aligned with operations and collective organisational goals, reflecting customer service as a key strategic aim. However, in line with much socio-technical research (Clegg, 2000; Cherns, 1976, 1987), our research demonstrates how a heavily technology-led energy strategy can compromise energy efficiency if end-users are not sufficiently integrated with the system.

The early focus group data highlighted the complexity associated with a technology-led approach to managing energy management performance in stores. Energy use data focused on kilowatt hour and carbon weight spend which were translated directly into target measures amongst stores. However, these technically-focused criteria did not always sit comfortably. Some managers confided that they did not understand the technical spread-sheets that were distributed to them by energy managers as a means to manage their stores energy, and were confused on what actions they could take to reduce their kilowatt or carbon spend:

> "when we talk about 200,000 kilos of CO_2 more than this time last year, …(sigh)….how I engage the team to make that less (was) quite a trick…"
> (Store Manager interviews phase 2)

There is a real danger that in a strongly goal-driven environment leaders will simply ignore tasks if they appear too difficult or indeed unachievable (Locke and Latham, 2002). Store managers and senior staff play a key role in directing staff how to respond to instruction from head office. Our data show that managers can influence their staff on how seriously to prioritise energy tasks:

> "When I was being trained as a manager this Energy Check thing came up, and the senior staff who was training me just said, 'oh we never do that, just mark it as done'."
> (Focus Groups phase 2)

Additionally, as overall consumption was affected by many factors that were out of the control of store personnel, such as weather conditions, some managers reported feeling that the measure did not always feel controllable, and risked resulting in counter-productive behaviours when managers did not understand how they were expected to deliver to a target:

> "I can talk to you about a store I was in three years ago about a deputy manager going out and taking out a light bulb thinking it's going to help to deliver the measure!"
> (Store Manager interviews phase 1)

Thus, the data indicate that in order to have the full support of managers and staff energy directives need to be simple and task orientated, presenting no ambiguity on how they fit with other organisational priorities.

3.5. Shop buildings

The size of the retail estate drives a strategy for uniformity in energy approaches in stores, rather than tailoring technology to individual needs, as this Energy team member expresses:

> "to have the biggest impact we have to do what is right for a majority of the estate…… but looking at an entire estate the mould is not always going to fit."
> (Interviews with Energy Team)

The behavioural strategy is very much driven from the necessity of managing energy use across a wide estate. The organisation centrally manages an operating standard that maintains control over operational assets, while delivering optimal energy usage for staff as well as customer comfort and convenience.

Centralised control mechanisms were found to be a source of tension between energy management and store staff in some cases, such as when standardised estate-wide lighting schedules are perceived to clash with staff routines. In a large and busy retail estate controlled systems are undoubtedly the best solution for the greatest energy efficiencies. The standard operating system in this organisation guarantees that lighting and heating controls minimise waste by ensuring the efficient use of equipment, whilst maintaining full provision for store activities. Despite this, our research shows that energy savings are frequently referenced in store when problems are observed:

> "they do it for energy savings, I get that, but they forget about the people filling the shelves. They need to be able to see what they are filling."
> (Store Manager interviews phase 3)

The above quotation describes a situation which is unlikely to be related to action by the energy team, as this would be out of line with the standard operating system that is consistent across the estate. However, we observed the use of the term 'energy savings' being referenced as a wrongful explanation for things going wrong with timings or equipment that has failed. As this energy team member describes, energy-savings innovations are also sometimes viewed with some concern, as they can be misguidedly held responsible for other things going wrong in the stores:

> "in their world, 'everything was alright until he came along, and then he did something and now it's not, so I'm going to blame him'"
> (Interviews with Energy team)

3.6. Processes and practices

We observed a sense of distance in the relationship between store staff and energy strategy staff that can additionally impact response to energy efficient technology. This underlying question of trust amongst some staff, could risk the successful roll out of future behavioural strategy. Our data suggests that the issues are largely due to assumptions or misinformation, and are likely to reflect problems with practices and processes around defining accountabilities, delivering training and communication, rather than any conflicts within the energy strategy itself. These examples also illustrate the risk of backlash on the effectiveness of the technical solution in place if new equipment is misguidedly blamed for problems and switched off.

While some staff are concerned with how the system is set up and how they identify problems, the key issue for some others is the perception that energy-related issues can be slow to fix, and that support is not always immediately available:

> "There shouldn't be these extra lights switched on, so I speak to the store technician, can you switch those off, he says, don't know how to and that's the end of it"
> (Focus Groups phase 1)

A perceived lack of responsiveness appears again to influence the attitude in which people interact with the energy agenda (Herring and Roy, 2007):

> "Like on the back door, they keep telling me to shut it all the time, but then when it's broken and they don't fix it then, then what am I meant to do? … "
> (Store Manager interview phase 1)

In one specific case a perceived lack of response to problems was observed to result in a worrying statement that energy issues would be deliberately ignored in stores:

> "when summer comes and the heating's still on no-one is going to say nothing, because if they don't fix it for us – what's the point?"
> (Focus Groups phase 1)

In the majority of cases, there is a good explanation for the perceived lack of response, such as a more deep-seated problem than is immediately apparent that requires a more complex fix. The energy efficiency strategy relies in part on staff quickly reporting faults to ensure energy waste due to equipment malfunction is limited. If staff are disengaged due to previous perceptions of lack of response, and not responsive to these equipment fail cues, then there is potential for a negative impact on energy efficiency.

The data suggest disengagement and lack of trust amongst some members of staff in terms of how the energy strategy supports their work in stores. This lack of connection is largely based on misconception, but is nevertheless potentially damaging to the trust and cooperation between the centralised energy team and store staff.

3.7. Organisational intervention

Following the identification of issues, our initial data inspired two job design interventions that were implemented in over 1000 stores, focussing on energy management accountability and performance management. Using the socio-technical model to achieve a systemic view of energy within the organisation enabled us to gain the perspective of considering energy as a secondary goal operating within a primary retail context. This concept became a central plank of our intervention design. We set out to improve performance against energy goals by increasing the chances of the energy task being completed in a multiple goal environment through alignment, rather than trying to raise the relative importance of the energy goal against other store goals. The emphasis on aligning with existing practices and goals is drawn from multiple goal theory, where alignment with an organisational goal is proposed to improve performance in a multiple goal environment (Locke and Latham, 2002; Cheng et al., 2007). Our initial longitudinal data collection and analysis phases, as described above, reflect the socio-technical meta-principles of a systemic approach, where job design considers values, mind-sets and the needs of the wider business as integral to design (Cherns, 1976, 1987). Our subsequent job design intervention as described below is crafted from the pre-

intervention data, and continues to follow socio-technical principles. Most critical to the intervention were the over-riding principles of simple congruent design and user ownership of systems and their design. The principles of integrating core processes, support congruence and control of variance at source (Clegg, 2000) are referenced below as critical to the thinking behind the job design interventions.

3.7.1. Energy management and aligned job design

The initial data analysis indicated that while the Energy Champion system had successfully engaged key members of staff to perform energy-related tasks, the voluntary nature of the job, and the lack of universally-appealing motivation limited the potential for the initiative to sustain success. We hypothesised that this was associated with observed conflict with core store objectives. We further theorised that it was therefore counterproductive to see energy as a primary organisational goal in this context, as it risked the perception of opposition to primary sales goals in terms of staff time and effort. We therefore began to specifically design energy management as a secondary goal in the organisation to be aligned with existing cultural characteristics through job design, practices and processes. This is consistent with existing theory on managing multiple goal conflict through simplification brought about through alignment with existing goals (Locke and Latham, 2002).

An important norm in this company context is to work and organise within line departments. Our job redesign therefore saw energy-related tasks mainstreamed into departmental structures, with departmental managers carrying out prescribed energy tasks as part of their job design. Socio-technical design principles were important to our job redesign in three ways: Firstly, the socio-technical principle of integrating core processes (Clegg, 2000) is strongly reflected. The kind of artificial organisational demarcations that are used to organise any organisation mean that a whole task, such as managing a department, can be split into different processes to account for different specialisms. The principle of integrating core processes advocates that the individual maintains as much ownership of the whole task as possible (Clegg, 2000). In this situation the processes for managing the department should be integrated, whether looking through a sales or energy management lens. Here, as energy responsibility is transferred to the appropriate department manager the process structure becomes better integrated with the existing processes around the whole task of managing the department. Secondly, a crucial advantage of the job-redesign intervention is that it aligns and normalises energy management with existing staff training and performance systems. While energy tasks were carried out by Energy Champions they were perceived as an "add-on", to their regular job role. Giving energy task responsibilities instead to an existing job role automatically facilitates access to the system built up around that existing job. In socio-technical terms this enables energy tasks to participate in a 'support congruence', as they join a mainstream system that is already set up to support the job task, through aligned tools such as communications, training and performance management (Clegg, 2000). Lastly, making energy part of the job-holder's core responsibility enabled the provision of solutions to common problems that could be implemented at source. This plays on the socio-technical design principle of 'control of variance at source', where workers are trained and entrusted to deal with arising problems in their own areas (Clegg, 2000).

The job-redesign changes energy task completion in stores from being a discretionary task, performed by volunteer Energy Champions, to a prescribed task that is performed as part of the role of a specific job-holder. Whereas the previous system had engaged certain committed individuals in stores, this intervention was theorised to engage a wider population. The energy behaviours, newly incorporated into the job design, will benefit from being enforced by existing performance management systems around the original job, facilitating support congruence, integrating core processes and enabling improved 'control of variance at source'. Aligning with existing goals is also a means of simplifying the process, particularly in multiple goal environments (Locke and Latham, 2002).

3.7.2. Impacts of job redesign

Following the job-redesign roll out we were able to conduct further interviews and focus group in order to gain some primary evidence regarding the impact. Our data have shown some positive results from managers who are seeing a difference in accountability when the energy task is specifically assigned to a departmental manager:

> "it's your own area, you look after your staff, you manage it, giving it to the manager made them look at the stuff they need to look at"
> (Store Manager interviews phase 3)

By dividing it up by department the checks were spread more thinly rather than having one or two people with energy responsibilities in each store. This was positive from a logistical perspective

> "the head count in here is 490, … imagine 2 people trying to tell people to close the freezer door, you probably have 100 people going in that freezer every day."
> (Store Manager interviews phase 3)

The changes to better align energy management processes with the organisation is observed to benefit the perception of energy management performance by reducing the sense of goal conflict and difficulty that had been observed to impede performance (Cheng et al., 2007). Being aligned with everyday store practice has also made it easier for store managers to manage the completion of routine energy tasks:

> "I can tell you who missed it last period, it was my warehouse manager that missed it, it was my bakery that missed it….but I know that backdoor man is off sick, so I've given it to the ambient manager to look after"
> (Store Manager interviews phase 3)

This incorporation into the way the organisation works is theorised to build stronger job norms for energy management. Our second set of focus group data indicates that the energy tasks (checks) are becoming an accepted norm for more people across more stores. This is a typical comment from a Compliance Manager:

> "I get energy checks, they come down once a period to each manager for each department and then I have a check to make sure they've done their checks, in the last year certainly."
> (Store Manager interviews phase 2)

3.7.3. Redesign of performance measure

Prior to the intervention, the key indicator for success in store energy efficiency was performance against periodic electrical consumption store targets. However, as that overall consumption was affected by non-operational factors, such as weather conditions, the measure was not always perceived to be controllable, and had the underlying risk of resulting in counter-productive behaviours. Performance managing energy usage in store on

electrical consumption figures alone therefore did not fully promote support congruence for the energy check task behaviour. As part of the job redesign, the energy management performance measure was refocused as being task orientated, rather than working to achieve a complex distal kilowatt or carbon goal. This simplified the goal, in a bid to lower risk for multiple goal conflict. Goal-setting theory indicates that task strategy and proximal goals are important for success (Locke and Latham, 2002). This is particularly relevant in a multiple goal environment where managers have limited time for complex energy management. We hypothesised that the simplification of energy performance management would reduce the sense of goal conflict and difficulty revealed in our data (Cheng et al., 2007). The measure changed from being a distal measure of energy usage data to become a proximal goal of energy task completion, making the action more simple and directed.

3.7.4. Impact of simplified performance measure

Changing from a distal measure around kilowatt budgets to a proximal goal around set tasks (energy checks) meant that some frustration was taken out of the energy agenda in stores;

> "The word simpler is key to it, so what I found before when we did energy is that we had all these reports come down, kilowatt hours this, and I've got to say I'm not an electrician, I get paid to run a shop."
> (Store Manager interviews phase 2)

The new proximal goal was observed to increase confidence for managers:

> "The problem with the old measure you felt it was out of your control, you had 21 a week, I was always hitting 23, and it was like, well what can I do??
> (Store Manager interviews phase 2)

The combined changes to job design and performance management measures are observed to have made a difference to the perception of difficulty of energy management for most of the participants that we spoke to. The managers appeared to feel more comfortable with a directive performance indicator than with the idea of controlling energy budgets, as it gives managers direct actions to take to achieve a goal. Again, this fits into the culture of the stores; they feel comfortable talking about how they get specific tasks completed:

> "you know what it's like – you have to talk to your managers – 'done your energy checks? Yeah? Any issues? No all fine?' Well, 'what was on the check?' Then you know don't you? Basic management isn't it?"
> (Store Manager interviews phase 3)

3.8. Further challenges

Despite the advantages of introducing a more aligned job structure, and more proximal, simpler goals, our later qualitative data showed some continued challenges, and indicated some clear next steps for the organisation to take. Despite a performance management system being in place to assess task performance, we were told that in this multiple goal environment, not hitting energy consumption targets can potentially be justified:

> "if you fail on energy it would just be like, well we've got to have lights on,"
> (Focus Group phase 2)

These data demonstrate that, despite incorporation into a job design and performance management system, the energy task goal needs increased informal management in order to be supported in stores. We suggest that some motivators (leadership support, feedback and competition) could act as moderators to task achievement in this context to determine whether the job design intervention will effectively impact the performance goal.

4. Discussion

4.1. Summary of findings

Our findings are summarised in Table 3 (below). Using a socio-technical model as a research and analysis tool enabled us to connect previously somewhat disparate factors within the energy management system in order to develop our intervention. The model enabled us to identify key relationships between various factors within the systems model. Below we illustrate those inter-relationships and describe how the insights they provide can be utilised to design a solution for managing energy as a secondary goal through job redesign.

4.2. Socio-technical inter-relationships

Our findings highlight three distinct inter-relationships that are important to energy task performance in this retail organisation. Previous work has highlighted the importance of considering environmental initiatives through a systems framework (Davis et al., 2013) and this is played out in our research. The insights have been gained by looking beyond the obvious relationship between energy goals and store staff, and looking at more systemic relationships between other organisational areas.

4.2.1. Technology – goal – organisational culture

Our systems research has highlighted the perceived problem of multiple goal conflict in reconciling energy and customer goals. Building energy efficiency strategy is generally concerned with adherence to set lighting times and heating/cooling set-points, and ensuring that staff take responsibility for energy-savings actions. In any organisation these priorities have the potential to overlap with retail concerns over customer comfort in shops and staff availability to serve customers. In this organisation, an agreed operating standard maintains a balance between energy consumption and optimal energy usage. Despite this, our findings suggest that the perception of disconnection between the two is a fundamental socio-technical issue to address.

Prior research on multiple goal conflict has looked at aligning organisational objectives in order to simplify tasks and counter multiple goal conflict (Locke and Latham, 2002; Cheng et al., 2007). The idea that work should be organised in a way that is compatible with the organisation's objectives is also crucial to socio-technical systems (Cherns, 1987; Clegg, 2000). This was a key starting point for developing our intervention, using our data to understand how we could better align our energy efficiency goals with other store goals and priorities. Using job design with clear task strategy to outline how and where busy staff should take action, and replacing distal kilo-wattage performance goals with proximal task-orientated measures were hypothesised to reduce perceptions of complexity and thus reduce any potential for confusion in store energy management. Our follow-up data suggest that these measures to simplify goals and make them more appropriate to the existing culture resulted in them being seen as less time-consuming, and consequently perceived to be less in conflict with primary sales goals.

4.2.2. Energy goals – shop buildings – energy strategy

Just as sales and energy goals have the potential to generate tension, the use of heating and cooling to provide user comfort has been identified in the literature as being often at odds with the energy agenda in both domestic and organisational usage (Nisiforou et al., 2012). Most energy technology strategies can accurately predict energy usage in buildings, based on typical or automated usage. However, system overrides or additional power usages are commonplace, and often attributed to misunderstanding behavioural considerations such as user preferences in the design (Bordass et al., 2001).

The findings also indicate that although a controlled environment is sometimes frustrating, staffs generally accept the need to operate in this way across the estate, and few comfort issues were noted. However, our findings suggest that multiple goal conflict can be exacerbated by the perceptions of limited problem response and inevitable lack of variance in the technical strategy. Automation of temperature and lighting equipment is crucial to an energy efficiency strategy, but perception of lack of support in cases when staff are trying to highlight a problem is counterproductive (Unsworth et al., 2013). Our data show that there is a risk of reducing likelihood to cooperate with a central energy team if problems in store are not perceived to be responded to appropriately.

This observation corresponds to the various literatures we described earlier in this paper (Section 1). Job design research indicates that a lack of autonomy in the role has a potential negative performance impact on motivation (Morgeson and Humphrey, 2006). Autonomy is also important to the control of variance at source principle in the socio-technical literature (Clegg, 2000), which advocates giving workers freedom to spot and rectify problems. Again, in goal-setting theory, task strategy (Locke and Latham, 2002) is a mechanism through which workers are prepared to deal with arising issues through training and tools. Staff need not be equipped to physically fix energy-related problems, but to have a responsive system in place where trained staff can appropriately report concerns. Our data emphasise the need for the kind of operating standard that is already successfully maintaining manageable consistency across this large estate. The literature also reiterates the need for fast response to any issues (Leaman and Bordass, 2007) if a one size fits all solution is used, otherwise any backlash can be potentially counterproductive, particularly if primary comforts such as heat or cooling are impacted (Bordass et al., 2001).

Our socio-technical approach suggests the technology perspective would benefit from further reflection on existing organisational and cultural norms in the business to better understand and anticipate other agendas that may be perceived to be in conflict with energy management. These observations are by no means suggesting a deep disconnect between the two, but instead highlighting how even subtle misalignments can impact a successful programme of works.

4.2.3. Energy strategy – shop staff – practices and processes

Our findings showed a misalignment in the job design used through the Energy Champion approach to embed energy-related tasks into the store operation.

A central theme in our research was to question the motivating power of pro-environmental attitudes, as used in existing scales (Stern, 2000). Job design research has previously shown employees to be intrinsically motivated to make a pro-social difference (Grant, 2012), and meaningfulness is a commonly used mediator between motivational characteristics and work outcomes (Morgeson and Humphrey, 2006). Despite the value-action gap between attitude and behaviours (Kollmuss and Agyeman, 2002), a pro-environmental attitude can determine behavioural outcomes, with ambivalence towards the environment negatively correlating with pro-environmental behaviours (Costarelli and Colloca, 2004). Similarly, self-concordance with pro-environmental behaviour is identified as a determinant of the extent to which employees support an intervention (Unsworth et al., 2013; Bissing-Olsen et al., 2013). However, our study is part of a growing body of research to suggest that motivation through pro-environmental/ pro-social commitment is not always sufficient, as the threat of climate change is not consistently strong enough to impact everyday behaviours (Einsiedel et al., 2013). Our in-depth discussions with store staff and managers revealed limited interest in their role as being pro-social in an environmental sense, or indeed in combating climate change as a social objective either at home or at work. With a limited sense of pro-environmental motivation, some Energy Champions perceived the energy tasks as an additional task which could be resented as extra work which could interfere with the successful completion of their daily goals.

Designed through the energy strategy team, with little input from store staff, the second problem with the Champion role was that it existed essentially as a new process that was not fully aligned with existing job and performance structures. We suggest that alignment with organisational processes and practices are important in a multiple goal environment, as a part of the simplification intention (Cheng et al., 2007). Taking a lead from these two key findings, our intervention uses job redesign as a means to integrate energy management into everyday job roles. By adopting the existing departmental structure, common to most organisational performance tasks, we were able to integrate energy management into appropriate jobs, and replicate existing systems to manage energy tasks. This approach simplified energy management by breaking down the additional processes and practices, and gave it an equal status to other secondary goals within the appropriate job roles, rather than being considered as an additional task. The integration of energy tasks into existing job design is theorised to respond to the idea of pro-environmental motivation as a determinant for action. By imposing an energy component onto appropriate job roles, the action will be motivated by external performance factors.

The intervention now sees energy efficiency goals as motivated through the organisational performance management system, and through the motivating function of the energy tasks (Hargreaves, 2011). However our data suggest that in a multiple goal environment energy goals risk being overlooked because of other priorities over time, so additional incentive and motivation is important (Lindenberg and Steg, 2007; Schmidt and DeShon, 2007). Through our systems framework we have identified factors with the potential to be incorporated into further interventions that we consider to be more motivating in this organisation than pro-environmental concern.

Our data indicates that feedback on inter-group performance against colleagues is more meaningful here than intrinsic pro-environmental concern. Feedback is a well-established element of both socio-technical systems thinking (Einsiedel et al., 2013) and the goal-setting model (Locke and Latham, 2002; McCalley and Midden, 2002), and can help to promote the allocation of resources for the goal where feedback is present (DeShon et al., 2004). Seeking feedback is typically found in situations where there is perceived task difficulty (Millward et al., 2010). Comparative feedback is also found to be efficacious, with peer to peer knowledge of results proving to be motivating even in situations where no change of attitude or information level was observed (Siero et al., 1996). Leadership support is crucial to all workplace behaviours, but in this retail environment our research shows it to be most effective motivating factor across our data groups. Supervisory support and leadership has been strongly linked with

success for sustainability in the workplace (Andersson et al., 2005; Nisiforou et al., 2012; Robertson and Barling, 2013). These motivating factors are unlikely to be completely consistent across different organisations; here the important thing is not the factor itself, but the identification of motivating factors within the context of the organisational culture that can be applied to energy management, rather than relying on the assumption of pro-environmental concern.

4.3. Study limitations

The main limitation to the study is that it was carried out within a single retail organisation. Despite this we contend that the general approach of using the socio-technical framework, and the application of multiple goal theory also has the potential to act as the basis of a research tool for similar studies. Although we present initial qualitative data, the study does not currently supply sufficient objective data to evaluate the effectiveness of the job-redesign intervention, using quantitative methods.

5. Summary, conclusions and future work

We present several original contributions to the literature in this study which should be of interest to academics and practitioners alike. Our application of a systems perspective within a workplace environmental context provided novel opportunity for the consideration of inter-relationships between socio-technical factors. This led to an exploration of issues arising from goal-setting particularly where multiple goal conflict is present. This perspective contributes to existing goal-setting, socio-technical frameworks, and job design literatures (Locke and Latham, 2002; Clegg, 2000; Morgeson and Humphrey, 2006). A common theme between these literatures is around the profound importance of the alignment between organisational objectives and practices. In particular, our work highlighted the inter-relationships which exist between individual autonomy, task strategy goal-setting and key socio-technical variances (Fig. 2a–c). Future work needs to explore these in further depth and focus on the nature of these cross-system level interdependencies and causal relationships (Thompson, 1967; Karsh et al., 2014). Our study also sheds light on the practical aspects of managing energy tasks as a secondary goal as a means to reduce multiple goal conflict. Our analysis concludes that this secondary goal needs to be in alignment with primary organisational goals, and with processes and practices used to manage those goals. Our contributions provide a highly practical direction for commercial applications that could be applied in a variety of different settings. Our data highlight the importance of an intervention that is based on systemic research and a deep understanding of organisational context. Clear task strategies and simple performance goals need to be in place to train and support operational staff. A consistent and responsive support system needs to be in place in order to build trust and engagement with staff on the shop floor. To boost energy as goal over time it needs to be supported by other incentives. In this organisation leadership support, results feedback and competition are identified as enablers. These areas could be explored further in future work. Further work is required to provide objective data through modelling energy consumption in stores following the intervention.

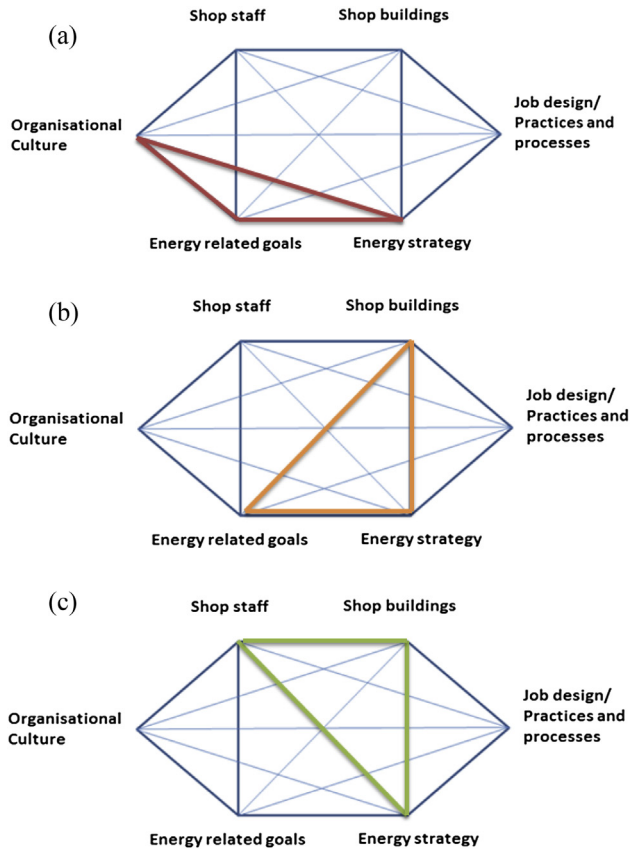

Fig. 2. (a): Key energy efficiency behaviours socio-technical relationships; Technology – Goal – Organisational Culture. (b): Key energy efficiency behaviours socio-technical relationships; Energy Goals – Shop Buildings – Energy Strategy. (c): Key energy efficiency behaviours socio-technical relationships; Energy Strategy – Shop staff – Practices and Processes.

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