

**APPLYING SOCIAL PRACTICE THEORY TO CONTEMPORARY
WORKING PRACTICES IN SUSTAINABLE OFFICE BUILDINGS:
IMPLICATIONS FOR THE PERFORMANCE GAP.**

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Abstract

The UK Government has committed to an 80% reduction of Greenhouse Gas (GHG) against 1990 levels by 2050. Widening understandings of the environmental impact of the built environment have fuelled debates around how the environmental performance of buildings should be approached. The UK non-domestic building sector presents a significant challenge within the field of environmental performance of buildings and an imperative to improve performance has led to the emergence of green or sustainable building as a long-term solution.

Sustainably designed buildings are increasingly present within the non-domestic building sector, however issues of discrepancy between environmental performance design targets, such as energy and water use, and actual 'in-use' performance have been widely reported and researched. The difference between predicted and operational building performance is termed the 'performance gap'.

Narrowing the performance gap is not limited to addressing technological, physical and economic aspects associated with design, but extends to social and psychological considerations. This research focuses on the performance gap with particular reference to building occupants and operational energy use.

The dominant approaches to understanding the role of building occupants in the performance gap are situated within the disciplines of economics and psychology. Individuals are placed at the centre of analysis with a focus on changing behaviour. This research reframes the approach to understanding occupants, applying sociological theories of social practice and shifting focus from individuals to the collective actions or 'practices' occupants are engaged in. Thus, the focus of the research is not evaluating *occupant behaviour* as an approach to understand the impact of office building occupants on the performance gap, but evaluating the

impact of the *social practices* office workers are engaged in within office buildings; the contemporary working practices.

This research provides a conceptualisation of contemporary working practices that underpin the empirical study. Contemporary working practices in three BREEAM Excellent certified office buildings are then evaluated through the lens of social practice theory and implications for energy use and the performance gap are appraised.

Research findings present novel insights into contemporary working practices and their implications for energy use, which may inform future office design and improve the efficiency of current sustainably designed office buildings. Implications for reframing the analysis of occupants in the performance gap are drawn out, and important subtleties of practice are revealed which impact on design for contemporary working. Issues of unpredictability of occupancy, multiple device use, shifts in peak energy use, design for functionality, handover and commissioning, standards and norms and cultural shifts emerge from this research.

The conceptualised working practices underpinning this research form a key contribution to the body of knowledge around the performance gap. This research challenges established approaches to the performance gap in respect of occupants and demonstrates that understandings of webs of interlocking practices provides deeper and broader insights into how ways of living and working may be rendered more sustainable. The research provides new knowledge on how social practice theory can be applied to understand the contemporary working practices occupants are engaged in within sustainably designed office buildings, and the implications of these practices for energy use and the performance gap.

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GLOSSARY OF TERMS

BACS	Building Automation and Control Systems
BBP	Better Buildings Partnership
BCO	British Council for Offices
BEAM	Building environmental assessment mechanisms
BEES	Building Energy Efficiency Survey
BIM	Building Information Modelling
BMS	Building Management Systems
BPE	Building performance evaluation
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
BUS	Building use studies
CCC	Committee on Climate Change
CIBSE	Chartered Institution of Building Services Engineers
CIRS	Centre for Interactive Research on Sustainability
CO ₂	Carbon Dioxide
CSR	Corporate social responsibility
DCLG	Department for Communities and Local Government
DEC	Display energy certificate
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DEMAND Centre	Dynamics of Energy, Mobility and Demand Centre
DfSB	Design for sustainable behaviour
EPBD	Energy performance of buildings directive
EPC	Energy performance directive

FTNC	Focus Theory of Normative Conduct
GHG	Greenhouse gas
HoL	House of Lords
HVAC	Heating, ventilation, and air-conditioning
IPCC	Intergovernmental Panel on Climate Change
LCICG	Low carbon
LCW	Low carbon workplace scheme
LEED	Leadership in Energy and Environmental Design
NABERS	National Australian Built Environment Rating System
OECD	Organisation for Economic Co-operation and Development
POE	Post occupancy evaluation
PROBE	Performance of Buildings and their Engineering
RIBA	Royal Institute of British Architects
RICS	The Royal Institution of Chartered Surveyors
SPT	Social practice theory
TIB	Theory of interpersonal behaviour
TPB	Theory of planned behaviour
UBT	Useable Buildings Trust
UNEP	United Nations Environment Programme
UNEP-SBCI	The United Nations Environment Programme - Sustainable Building and Climate Initiative
WCED	World Commission on Environment and Development
WGBC	World Green Building Council
WWF	World Wildlife Fund
UKGBC	UK Green Building Council

Part One: Background and Theory

“We must rid ourselves of the delusion that it is major events which most determine a person. He is more deeply and lastingly influenced by the tiny catastrophes of which everyday existence is made up, and his fate is certainly linked predominantly to the sequence of these miniature occurrence....The radicalism of these radicals would have more weight if it really penetrated the structure of reality instead of issuing its decrees from on high. How is everyday life to change, if even those whose vocation is to stir it up pay no attention?” (Kracauer, 1998, pp.62, 101).

“What counts is the big, and in some cases, global swing of ordinary, routinized and taken-for-granted practice...[and the] processes underpinning the normalizaiton of consumption and demand.” (Shove, 2003, p.9)

Chapter 1: Thesis Introduction

1.1 Introduction

This opening chapter of the thesis begins by examining the problem which it seeks to understand; the implications which contemporary working practices have for the performance gap in sustainable office buildings. The central research problem is considered, followed by an explanation of key terms. The underpinning rationale and justification for the focus of this research is examined through an introduction to literature discussing the limitations of settled approaches to understanding the role of occupants in the operational performance of sustainable office buildings, as a key variable contributing to the performance gap. Social practice theory is subsequently introduced, as an approach to understanding office building occupants. Overall aims of the research are identified and finally, the structure of the thesis is set out.

1.2 The research problem

Knowledge and understanding of the science of climate change and the undeniable impact of the built environment on natural systems has brought the environmental performance of the built environment sharply into focus in recent years (IPCC, 2014; BRE, 2003). The link between natural and economic systems is undeniable, as the rise of human wealth has depleted natural resources (Cole, 2005). Stern (2006) sets out the wider implications of unchecked anthropogenic climate change, as global temperature rises are associated with risk of flooding, extreme weather events, loss of biodiversity and negative economic consequences. Widening understandings of the environmental impact of buildings, responsible for approximately 40% of global energy use (DECC, 2016; Skea, 2012) and 8% of the UK's greenhouse gas emissions (Committee on Climate Change, 2016) have fuelled debates around how their environmental performance should be approached. Moreover, the UK Government has committed to ambitious targets within the Climate Change Act (2008) which aims to achieve an 80% reduction in greenhouse gas emissions against 1990 levels by

2050 (HM Government, 2008). The significance of buildings within the achievement of these goals is irrefutable as Urge-Vorsatz (in Frankiewicz, 2009) notes:

“...widespread implementation of presently available technology and practices could reduce building-related emissions by between 40 and 70 per cent by 2050.” (p.2)

The UK commercial building sector presents a significant challenge within the field of environmental performance of buildings, accounting for 8% of greenhouse gas emissions in the UK (Committee on Climate Change, 2016). Pett and Ramsey (2003) found that energy use in the commercial property sector increased by almost 70% between 1973 and 2003.

The imperative to improve the environmental performance of buildings has led to the emergence of ‘green building’ as a long term solution. ‘Green’ or ‘sustainable’ buildings are designed to achieve higher environmental performance than traditional buildings, in terms of energy efficiency, water efficiency and carbon emissions (Zuo and Zhao, 2014).

Whilst sustainable buildings are increasingly present within the non-domestic building sector, questions surround their capacity to achieve improved environmental performance once occupied. In particular, the issue of discrepancies between environmental performance design targets, such as energy and water use, and actual ‘in-use’ performance of sustainably designed buildings has been widely reported and researched since the early 1990s (Innovate UK, 2016; De Wilde, 2014; Butera, 2013; Menezes et al., 2012; Morant, 2012; Newsham et al., 2012; Bordass et al., 2004; Bordass et al., 2001; Norford et al., 1994). The difference between predicted and operational building performance discrepancy is termed the ‘performance gap’ (Bordass et al. 2004).

The seminal Post-occupancy Review of Buildings and their Engineering studies (the ‘PROBE studies’) drew widespread attention to the issue of the performance gap. The studies, part-funded by the UK Government between 1995 and 2002, undertook the post occupancy analysis of 23 sustainably designed, non-domestic buildings. The studies concluded that energy use in occupied buildings was up to two and a half times greater than predicted at

design stage in compliance with Building Regulations and ratings systems (De Wilde, 2014; UBT, 2013; Menezes, 2012).

The understanding and narrowing of the performance gap in non-domestic buildings has continued to be a focus for research. In 2011, the UK Carbon Trust, a private organisation set up by the UK government in 2001 with the aim of accelerating the “...*move to a low carbon economy by working with business and the public sector to reduce carbon emissions and develop commercial low carbon technologies.*” (Carbon Trust, 2018), estimated that 75% of performance discrepancies in non-domestic buildings related to higher than predicted energy performance. Van Dronkelaar et. al. (2016) noted an increase of 34% in actual energy demand compared to predicted values in their study of 62 non-domestic buildings. Whilst Van Dronkelaar et.al. (2016) acknowledge that some degree of discrepancy between predicted and in-use performance of buildings may be anticipated as a result of design-operation uncertainties and measurement limitations, “...*explaining its magnitude and underlying causes are necessary to more confidently forecast and understand energy use in buildings.*” (p.2). Watson (2015) notes that the problem of the performance gap “...*remains unresolved*” (p.1009) and by implication, progress towards environmental targets is impeded.

This research is grounded in the contention that the performance gap hinders progress towards the achievement of sustainability in office buildings. Narrowing the performance gap must not be limited to technological, physical and economic aspects associated with design, but must address social and psychological considerations (Hoffman and Henn, 2008). Existing literature reflects such a contention, with research into the performance gap identifying issues of built quality, inherent problems of fragmentation within the construction industry, technical underperformance, inaccurate models of prediction and measurement, building management and occupant behaviour (Fedoruk et.al. 2016). It is acknowledged that despite sustainable design for modern office working, the performance gap persists. Whilst this research is underpinned by principles of sustainable building design, the scope is narrowed through a focus on the performance gap with particular reference to operational energy use.

Sustainably designed office buildings are a focus for research concerning the performance gap, not only due to the growth in development of such buildings, but also as a consequence of their high profile, with many promoted as flagship exemplars at the heart of organisational corporate social responsibility and sustainability strategies.

The British Council for Offices (BCO) (2016) contend that the rise of sustainability on the agenda of office occupiers and owners has been driven by both regulation and voluntary environmental certification schemes, in particular the Building Research Establishment Environmental Assessment Method (BREEAM) in the UK - the most widely used environmental certification scheme in the UK - and by increased market demand from both landlords and tenants. This increase in demand, maintains the BCO (2016) may in part, be attributed to perceived economic benefits of sustainably designed office buildings including: reduced operating costs; reduced rental voids; reduced risk of obsolescence; rental and capital uplift (although there is limited empirical evidence to support increased value).

The Green Construction Board (2013) estimates the UK commercial office space sector is growing at double the rate of other non-domestic sectors. Cass (2017) identifies the “*unnecessarily high energy demands*” (p.1) of offices in the commercial sector, constructed to “*institutional specification*” (Guy, 1998 in Cass, 2017, p.1). The UK Department for Business, Energy and Industrial Strategy undertook an energy use survey of non-domestic building stock in England and Wales in 2014-15; the Building Energy Efficiency Survey (BEES, 2015). The survey analysed non-domestic building stock within ten distinct sectors (with a further 38 sub-sectors), namely: retail; office; hospitality; industrial; storage; health; education; emergency services; military; and community, arts and leisure. The survey concluded that the office and retail sectors represented the largest consumers of energy (Figure 1.1).

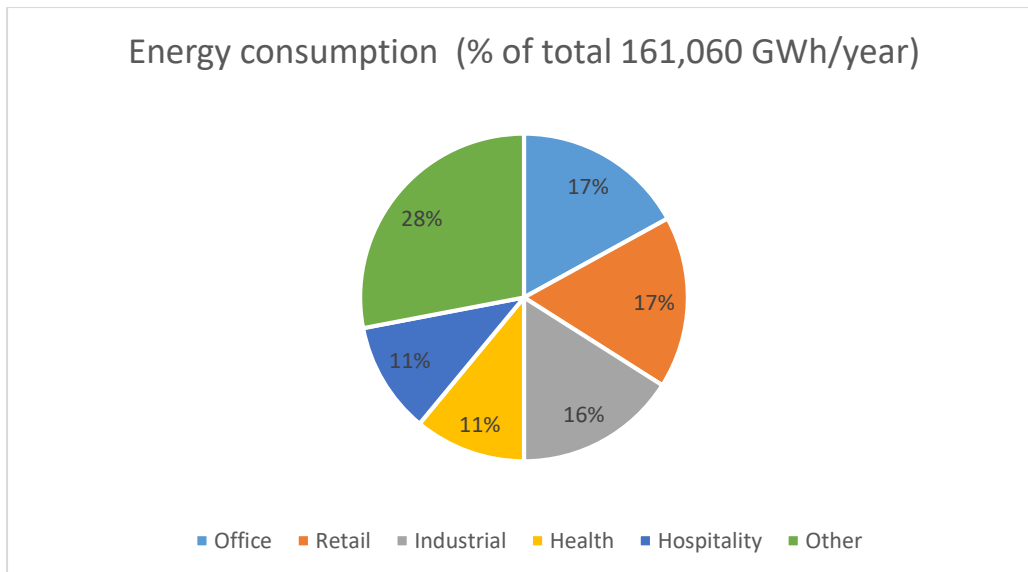


Figure 1.1. Five largest energy consumption sectors 2014-15

(BEES, 2015¹)

Energy consumption within office buildings is therefore a significant focus of efforts to minimise the environmental impact of buildings. Schiellerup and Gwilliam (2009) propose that empirical research focused on the environmental impact of the commercial property market is:

“...an important test case for society’s capacity for change in the face of the challenges of climate change if for no other reason than the enormous economic value embodied in it and the comparatively large potential for savings.” (p.812).

Robinson et.al. (2016) acknowledge that the office sector provides a complex challenge in deconstructing and understanding the environmental performance and particularly, energy use within buildings. A number of factors must be considered, including the physical size of offices, complex services and building management systems, which are building and organisation specific, and the role of occupants.

Building-user interaction is also complex in comparison to domestic building occupant profiles. Non-domestic building occupants demonstrate higher levels of transience, resulting in

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fluctuating occupancy rates. Organisational culture and structure, assert impact on occupant energy behaviours (Banks et.al., 2012).

Ucci (2010) submits that it is the most significant group of occupants, *employees* within office buildings, and *their* behaviour, which impact on the performance gap, through “...*energy consumption for heating, cooling and lighting) and support services (for example, waste and recycling).*” (p.175). The focus of this research is on office workers, the most significant group of occupants in office buildings. The scope of this research does not extend to cleaning and catering practices.

A wide body of research exists around the role of occupants within the context of sustainably designed buildings and the performance gap (Bordass et.al., 2016; Azizi and Wilkinson, 2015; De Wilde, 2014; McCunn and Gifford, 2012; Rashid et.al., 2012). The focus of much research is on the analysis of occupant behaviour to determine levels of satisfaction with building performance, engagement with building design and systems, aiming to develop insights into steering behaviour within buildings in more sustainable directions and narrow the performance gap. The central unit of enquiry is the individual or group of occupants. This research is underpinned by the contention that taking individuals as the central unit of analysis, limits understandings of the full complexity of building occupants and their impact on the performance gap.

Shove (2003) a leading scholar in the field of energy demand research, argues that approaches which take individual occupant behaviour as the central unit of analysis may fail to take into account wider issues of culture and context. A wave of sociological theorists (Shove, 2012; Gram-Hanssen, 2011; Hargreaves, 2012; Spaargaren, 2011; and Ropke, 2009) contend that the evaluation of the role of occupants in buildings must be reframed, shifting focus from the individual to shared, collective action. Thus this research seeks to move from an analysis of individual behaviours in sustainable office buildings to understand the performance gap, to an analysis of the collective activities or the ‘social practices’ office occupants are engaged in. Social practices are defined as “...*the range of activities that people*

and social groups enact and reproduce over time." (Cass et.al., 2015, p.3) and are examined in greater detail in section 1.4.4. below. The primary value of this approach lies "*...in framing the way the world is understood and how problems are defined.*" (Shove, 2012, p.16).

This research applies a social practice approach to reframe understandings of occupants in sustainably designed office buildings. Thus, the focus of the research is not evaluating *occupant behaviour* as an approach to understand the impact of office building occupants on the performance gap, but evaluating the impact of the *social practices* office workers are engaged in within office buildings; the contemporary working practices.

Whilst this approach encompasses understandings of how patterns of energy consumption enable contemporary working practices in sustainably designed office buildings, this research does not seek to demonstrate or measure the performance gap or energy use in office buildings. It seeks to understand contemporary working practices and their implications for energy use, providing novel insights which may inform future office design and improve the efficiency of current sustainably designed office buildings. Hargreaves (2012) posits that social practice theory may provide increased opportunities for behaviour change compared to conventional approaches.

As Shove (2003) notes, a focus on such aspects of everyday life which are increasingly resource intensive aims to "*...demonstrate the value of thinking about the environment and consumption in terms of the collective redefinition of convention and need.*" (p.17).

This work also resonates with a growing body of research around design for sustainable behaviour.

1.3 Gap in knowledge

This thesis contributes to a gap in knowledge around the impact of contemporary working practices on the performance gap in sustainably designed office buildings. The research is positioned within the wider context of the challenges of minimising the environmental impact of buildings; whilst there is an imperative for the UK to achieve energy reduction targets, there

is a gap in knowledge about how this may be achieved (Demand, 2018). Aiming to respond to this gap in knowledge, this thesis is concerned with developing understandings of operational energy use linked to contemporary working practices and implications for the future design of sustainable office buildings. Cass et.al. (2016) note the need for further empirical work in this field:

“Better understanding what people do in commercial offices...can play a crucial role in informing more appropriate designs... [research should focus on] empirically grounding the existence of claimed changes in technologies, work practices, hours and places of work, the diversity of space-planning, hot-desking and flexible working etc.” (p.7).

As noted in section 1.2, the field of behaviour change research within the context of energy use in sustainably designed buildings is well developed, particularly in relation to domestic buildings (Dantsiou, 2015). There is however, limited empirical evidence to evaluate alternative approaches to understanding the role of occupants. The relevance of this research lies in its empirical contribution both to the practical application of alternative approaches, namely social practice theory, and as a means to reframe arguments around the performance gap in sustainably designed office buildings.

1.4 Definition of key terms

A wide range of concepts are implicated in the fields of sustainability and social practices with shifting and contested definitions. It is therefore an important first step to define key terms and establish the scope of this research.

1.4.1 Sustainability

It is important to define sustainability as a starting point to this research. Sustainable development and sustainability are dynamic concepts with highly contested definitions and interpretations in literature. Dixon et.al. (2008) note over 500 definitions of sustainability can be identified. This research defines sustainability as the achievement of sustainable

development (Diesendorf, 2000). Therefore a sustainable office building is one which has achieved sustainability through the process of sustainable development.

Within the built environment profession, understandings of sustainability and sustainable development are ambiguous and inconsistent (Wilkinson, 2013). Jones et.al. (2015) propose a grouping of sustainability definitions ranging from a 'family' of definitions based on ecological principles to broader definitions incorporating social, economic and environmental goals. Jones et.al. (2015) further categorise definitions identified as 'weak' or 'strong', according to the extent of radical economic and societal change. Willers (1994), argues that the very concept of sustainable development is flawed and is inherently unsustainable, as it sets out a "*code for perpetual growth*" (p.1146).

DEFRA (2005) define the goal of sustainable development as seeking to "*enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations.*" (p.16). A focus on quality of life attained from the process of sustainable development is also reflected in the definition provided by the International Union for the Conservation of Nature, United Nations Environment Programme and The World Wildlife Fund (1991) "*improving the quality of life while living within the carrying capacity of supporting ecosystems*" (p.10). Whilst both definitions are recognised in academic literature, the most widely cited definition of sustainable development is found within the Bruntland Report (WCED, 1987) which outlines the key principles of sustainable development. Termed the "three pillars" approach to sustainable development (see figure 1.2) or the 'triple bottom line', the Bruntland report proposes that economic, social and environmental objectives must be equally balanced to achieve sustainable development and provide: "*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p.43). Other widely cited models of sustainable development include: the nested model of sustainable development (see figure 1.2) where society and economy must operate within the confines of the environment and natural resources may not be substituted; and the overlapping Venn model (see figure 1.2) where

sustainable development is the product of three overlapping systems and capital is interchangeable.

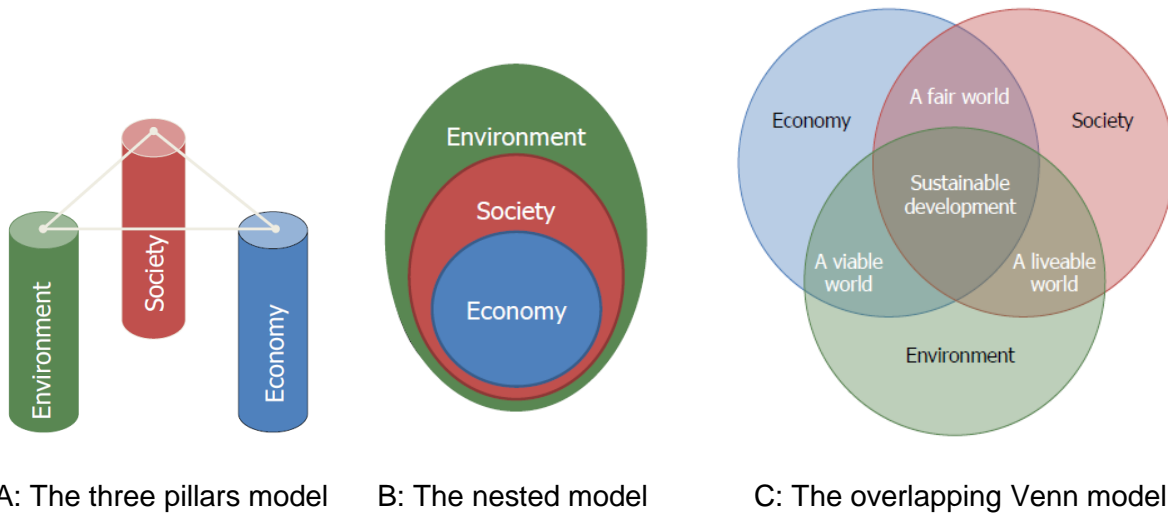


Figure 1.2 Visual Representations of Sustainable Development

(Adapted from Purvis et. al. (2018), p.682)².

In this research sustainable development is best conceptualised within the bounds of the widely accepted Bruntland (WCED, 1987) which incorporates those environmental, social and economic factors pertaining to the built environment. Sustainability is the achievement of or progress towards sustainable development. This research applies these definitions within the context of sustainably designed office buildings. It should however, be noted that the central aims of the research concern the environmental aspects of sustainability, with particular focus on energy use.

1.4.2 Sustainably designed office buildings

‘Green’ or ‘sustainably’ designed office buildings are terms which are used interchangeably within literature. As with the concepts of sustainable development and sustainability there is no universally accepted definition of a sustainable building. Spinks (2015) suggests that this

² Adapted from Sustainability Science, 1-15, Purvis, B., Mao, Y., and Robinson, D. (2018), Three pillars of sustainability: in search of conceptual origins with permission under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>).

may reflect highly segmented building processes which involve different professionals at different stages of development. Kilbert (2008) proposes a widely cited definition of green buildings as:

“...healthy facilities designed and built in a resource-efficient manner, using ecologically based principles.” (p.9).

The European Council for an Energy Efficient Economy (2009) define green buildings as those which aim *“...to use resources more efficiently and reduce a building’s negative impact on the environment.”* (p.9). Cole (2005) proposes five key considerations which reflecting a *sustainable* rather than *green* building, namely: building and context (including wider context such as links to transport and amenities); mitigation, adaptation and restoration; technical and

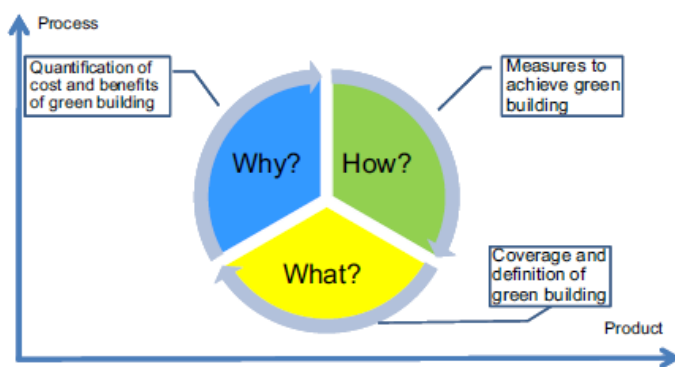


Fig. 1. Mapping of green building related studies.

socio-cultural aspects; value (including long term value); and long-time frame (lifecycle approaches). Zuo and Zhao (2014) however, contend that a focus on ecological principles and environmental aspects of

sustainability do not fully reflect the *“significance of social, [economic] and cultural aspects of green building developments [which are] rarely discussed”* (p.274). Zuo and Zhao (2014) propose that research into green building has relied upon the limited scope of definitions driven by considerations of ‘process’ and ‘product’ (Figure 1.3).

Figure 1.3: Mapping of green building related studies

(Zuo and Zhao, 2014, p.272)³

³ Reprinted from Renewable and Sustainable Energy Reviews, 30, Zuo, J. and Zhao, Z.Y. Green building research—current status and future agenda: A review, Elsevier (2014), with permission from Elsevier.

Lutzkendorf and Lorenz (2007) moreover, suggest that such research is focused on the energy efficiency of sustainable buildings, failing to consider a true definition to be one which “*goes far beyond the narrower concept of lowering a building’s energy consumption*” (p.60). Robichaud and Anantatmula (2011) propose such a wider definition of green buildings comprising four pillars: minimizing environmental impact; enhancing occupant health; providing an economic return to investors and the local community; and a whole life-cycle approach to planning and development. The research focus of the impact of contemporary working practices on resource use, in particular energy use could be considered to reflect narrow definitions of sustainable building, however the research aims to reframe the issue of the performance gap placing, practices, and not energy use, at the centre of analysis.

The above discussion provides an overview of key definitions of sustainable buildings, however for the purposes of this thesis, it is vital to consider more specific understandings of sustainable commercial, and in particular office, buildings. Rodi et al. (2015) provide a detailed list of building-specific characteristics (‘green features for commercial buildings’), which comprises six key categories. These are: energy efficiency; indoor environmental quality; sustainable site planning and management; materials and resources; water efficiency; and innovation (see Table 1 below).

Such characteristics can be considered to resonate with the BCO who propose a UK Commercial Office Guide to Specification. The latest edition of the Guide, published in 2014, is described as incorporating “*best practice standards [which] now reflect the high priority given to sustainability by both developers and their clients*” (BCO, 2014, p.6). This definition of a sustainable office is synonymous with a ‘high-performing’ office:

“...that gives an occupier a competitive advantage by supporting, smart, flexible occupancy or one that protects the owner’s investment by being proofed against high running costs and obsolescence...the first impression...the part that a great workspace plays in making

employees feel that what they do is worthwhile and engaging.... The reality, of course is that a high-performing office must respond to all of these requirements.” (BCO, 2016, p.28).

The BCO (2014) suggest key issues which provide opportunities for vital benchmarking to improve the operational performance of offices: “*operational energy, carbon footprint, water consumption and occupant satisfaction*”. (BCO, 2014, p.5)

Von Paumgarten (2003) contends that it is only through the adherence to defined standards that a certified ‘green’ or ‘sustainable’ building may be recognised. A wide number of national and international green building councils and organisations have developed voluntary sustainable building assessment tools and as such defined standards of widely recognised best practice. The most established of these are the Building Research Establishment Environmental Assessment Method (BREEAM) and Leadership in Energy and Environmental Design (LEED). Within the UK BREEAM is the most widely used standard of measurement for commercial buildings whereas LEED is most widely used in the USA (Rydin 2010; Van de Wetering and Wyatt, 2011). The majority of assessment tools focus on issues of location, energy, air quality, water efficiency, innovation and design with certification providing a proxy for building sustainability (Van de Wetering and Wyatt, 2011). This study draws upon Rodi *et.al.*’s (2015) definitions of sustainable building characteristics, together with Von Paumgarten’s (2003) contention that sustainably designed buildings are defined through environmental certification.

Table 1.1: List of Green Building Features for Commercial Buildings (Rodi et.al. 2015)⁴

Sustainability Category	Key targets	Operational design/fit out features
Energy Efficiency	Design and Performance	Minimum EE Performance Lighting Zoning Electrical Sub-metering Renewable energy Advanced or Improved EE Performance – BEI
	Commissioning	Enhanced or re-commissioning On-going post occupancy commissioning, monitoring, improvement and maintenance. EE monitoring and improvement Sustainable maintenance
Indoor Environmental Quality	Air Quality	Minimum IAQ performance Environmental Tobacco Smoke (ETS) control Indoor air pollutants Mould prevention
	Thermal comfort	Thermal comfort – system control Air change effectiveness
	Lighting, visual and acoustic comfort	Daylighting Daylight glare control Electric lighting levels High frequency ballasts External views Internal noise levels
	Verification	IAQ before/during occupancy Occupancy comfort survey
Sustainable site planning and management	Facility management	GBI rated design and construction Building exterior management Integrated pest management, erosion control and landscape management.
	Transportation	Green vehicle priority Low emitting and fuel efficient vehicles Parking capacity
	Reduction of heat island effect	Green roofs Building user manual
Materials and resources	Reused an recycled materials	Materials reuse and selection Recycled content materials Sustainable supply chain
	Sustainable materials and resources policy	Sustainable construction Sustainable procurement
	Waste management	Storage, collection and disposal of recyclables
	Green products	Refrigerants and clean agents
Water efficiency	Water harvesting and recycling	Rainwater harvesting and water recycling
	Increased efficiency	Water efficient irrigation/landscaping Metering and leak detection system
Innovation	Innovation and environmental initiatives	
	Green building index facilitator	

⁴ This table is published under the terms of the [Creative Commons Attribution-NonCommercial-No Derivatives License \(CC BY NC ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/).

1.4.3 *The performance gap*

With high economic significance and far reaching environmental and social impacts, the built environment is under increasing scrutiny in the context of sustainable development. Warren-Myers (2011) suggests “...*the importance of increasing the level of sustainability in the commercial real estate stock is paramount for reducing the negative impact of the built environment on the planet.*” (p.1115).

However, despite the focus from both policy makers and industry on designing and constructing sustainable buildings, a growing body of research has emerged around the discrepancy between the predicted and actual performance of sustainably designed buildings: the ‘performance gap’ (Way *et al.*, 2009; Bordass and Leaman, 2012).

De Wilde (2014) defines the performance gap as:

“...the differences between prediction and measurement of the energy performance of a complete building, including the full complexities of sub-systems, control settings, occupancy behaviour, climate conditions and others.” (p.41).

Watson (2015) adopts a wider definition, describing the performance gap as the discrepancy “...*between the anticipated and the measured environmental performance of newly constructed green buildings.*” (p.999).

The issue of energy efficiency in commercial office buildings has generated many academic studies, including considerations of: benchmarking (Hsu, 2014); market rents and values (Kontokosta, 2015); behaviour change interventions (Hong and Lin, 2012; Mulville *et.al.*, 2016; Tetlow *et.al.* 2015); standards and overprovisioning (Cass, 2016); and the performance gap (Cohen and Bordass, 2015; De Wilde, 2014; Fodoruk *et.al.* 2015; Lewry, 2015; van Dronkelaar *et.al.* 2016). The PROBE studies (Bordass *et al.*, 2001) and Closing the Gap (Carbon Trust, 2011) highlighted the underperformance of buildings (see Section 2.2).

The BCO (2016) note that over its 25 year existence, the “elimination” of the performance gap has not been achieved: “*Buildings routinely still do not perform as expected – whether due to shortcomings in design, construction or operation and maintenance.*” (p.5).

For the purposes of this study, Watson’s (2015) definition of the performance gap guides the development of a set of research questions, widening the scope of research to the environmental performance of newly constructed, sustainably designed buildings.

1.4.4 *Social practice theory*

It is important to address the conceptualisation of individual action as ‘behaviour’ or ‘practice’ which is discussed in depth in chapters three and four. Individual action conceptualised as behaviour is grounded in academic and policy-based approaches of individualism and rational choice, while practices stem from a sociological approach to collective action. As is discussed in chapters three and four, a practice-based approach underpins the theoretical framework of this research.

1.5 Research aim

As discussed in the opening section of this chapter, this research adopts a social practice approach to examine the performance gap in sustainably designed office buildings. The overall aim of the study is:

To use social practice theory as a framework to analyse contemporary working practices in sustainably designed office buildings in order to better understand the performance gap.

In order to achieve this aim, it is necessary to understand the performance gap, conceptualise contemporary working practices through the lens of social practice theory and analyse the performance gap through this theoretical lens, articulated below in four key research questions. It is important to note that the study does not seek to provide generalised findings as defined by Ritchie and Lewis (2003), rather to propose theoretical generalisation, with emerging themes and trends (Flick, 1998).

1.6 Research questions

1. How is the performance gap between sustainable building design and operational energy performance considered in literature?
2. How can contemporary office working practices be conceptualised using the lens of social practice theory?
3. What is the relationship between contemporary office working practices and sustainably designed office buildings?
4. What are the implications for the performance gap in terms of practice and for future sustainable office design?

1.7 Research objectives

The process of addressing research questions is expressed below as a series of objectives which guide the study.

1. To define the relevant key terms for the purposes of this research.
2. To establish the context and background to the research through undertaking a critical review of the relevant literature.
3. To set out the theoretical background to the research, which underpins the strategy and design.
4. To develop hypothesised relationships between buildings and contemporary working practices.
5. To review established methodological approaches and select the appropriate methodology to address the research questions.
6. To consider the practical and ethical implications of the data collection methods adopted.
7. To undertake a pilot study in order to evaluate the proposed research methods.
8. To undertake empirical research in order to evaluate relationships between buildings and contemporary working practices.

9. To identify the observed contemporary working practices in relation to operational resource use.
10. To develop the analysis of research outcomes using an appropriate framework to deconstruct contemporary working practices.
11. To critically assess and discuss the research findings with reference to literature and hypothesised relationships.

1.8 Thesis structure

This thesis comprises nine chapters, separated into three parts. Part one sets out the context and background to the study. Chapter two introduces the performance gap and reviews literature and policy surrounding the issue. Chapters three and four consider responses to understanding building occupants within the context of the performance gap, reviewing literature around behaviour change and social approaches from both a theoretical and applied standpoint.

Part two presents the methodology of the study, firstly by setting out the background literature informing the conceptualisation of contemporary working practices in chapter five which contribute the research questions and methodological approach applied. Chapter six introduces the ethnographic approach undertaken and its appropriateness for this research. Ethical considerations and research limitations are also presented. The research process is then described.

The presentation of results is set out in part three. Chapter seven sets out results within the framework of deconstructed social practices, thus presenting some initial analysis of findings. Chapter eight reconstructs practices to provide a more in-depth analysis guided by research questions. Finally, chapter nine presents a concluding discussion relating to findings from the literature and study, including recommendations for future research.

Chapter 2: The performance gap

2.1 Introduction

The chapter reviews literature around issues of underperformance associated with sustainably designed non-domestic buildings, and in particular, office buildings. It is contended that the performance gap impacts on the achievement of sustainable office buildings. The background to underperformance is considered, firstly examining the highly influential PROBE studies. The second, third and fourth sections examine literature and policy concerning the performance gap. This includes an examination of ratings and assessment metrics and an overview of legislative and regulatory measures. The final section of this chapter concerns occupants within the context of building underperformance and discusses the prevailing focus on 'changing behaviour'. The chapter provides a justification for the focus of this research and a background to research questions.

2.2 Post Occupancy Review of Buildings and their Engineering (PROBE)

The issue of underperformance came to prominence through a series of studies which ran from 1995-2002, undertaken by the Partners in Innovation scheme (jointly funded by the UK Government and The Builder Group, publishers of Building Services Journal - now the CIBSE Journal), known as the 'PROBE' studies (Post-occupancy Review of Buildings and their Engineering). Over the seven year research period the in-use performance of 23 non-domestic buildings identified as exemplar designs by the Building Services Journal (Bordass and Leaman, 2004) was studied. The PROBE studies sought to improve knowledge and understanding around the in-use performance of non-domestic buildings and aimed:

"...to promote an openness of post-occupancy evaluation and feedback, rather than simply allowing professional critics to fête new buildings on their completion, before their occupants have had time to settle in." (Whyte and Gann, 2001, p.460).

Occupant satisfaction in the PROBE studies were evaluated through questionnaires, an approach which has since been widely adopted across post occupancy evaluation (POE)

studies and has led to the emergence of licensed survey tools such as Building Use Studies (BUS Methodology). Questions in the BUS survey focus on building design and occupant requirements, including querying: environmental comfort; personal control; occupant health; and productivity (Robinson et.al. 2016). Responses to questions are measured on a standard scale metric (1-10 with 5 the average response). Once collated, a traffic light system identifies key concerns (Robinson et.al. 2016).

The findings from the PROBE studies concluded that energy use in occupied buildings could be up to 2.5 times that predicted at design stage in compliance with Building Regulations and ratings systems (De Wilde, 2014; UBT, 2013; Menezes, 2012). Bordass and Leaman (2004) contended that the central requirement for improved building performance lay in systematic and applied post occupancy evaluation.

Literature around the performance gap supports Bordass and Leaman's study (2004), with a focus on Post Occupancy Evaluation (POE), a systematic process to feedback, feed forward and provide benchmarking, defined by Preiser and Vischer (2005) as:

"...the act of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time." (p.8).

POE, whilst not currently mandatory, is nevertheless well developed for a number of building typologies, and methodologies for undertaking POE range from building simulation modelling to socio-psychological evaluations (Stevenson, 2009; Menezes et al., 2012). One such well-developed typology is office buildings (Preiser and Vischer, 2005). As noted by Stevenson (2009) this typology provides a layout which is:

"...relatively simple...compared with others, offers a large number of users to consult in the same space and is repeated within organisations." (p.125).

The following sections consider the performance gap in greater depth and literature surrounding attempts to narrow the gap.

2.3 The performance gap

The discrepancy between design and actual performance (in-use) identified by Bordass and Leaman (2004) is widely termed the 'performance gap'. Empirical studies evaluating the gap in non-domestic buildings have resulted in varied outcomes.

Thus, whilst buildings may achieve standards set out by UK building regulations at design stage, operational use of the building frequently results in a gap between predicted and actual energy use (Robinson et.al. 2016).

As increasing numbers of sustainably designed office buildings are constructed and occupied, a growing body of literature has emerged around understanding and explaining building underperformance in this sector (Bordass et.al. 2016, Innovate UK, 2016a; Choi et al., 2012; Menezes et al., 2012; Hargreaves, 2012; Carbon Trust, 2011; Leaman and Bordass, 2007; 2012; Sawyer et.al., 2008; Heerwagen, 2005;). Bordass et.al. (2004) identified in-use CO₂ emissions in office buildings were two or three times greater than design targets.

The Carbon Trust's 'Closing the Gap' report (2011) considered the diverse factors contributing to the performance gap ranging from discrepancies in design assumptions and modelling to building management, control, occupant behaviour and built quality (Carbon Trust, 2011; Menezes et al., 2012). Van Bueren (2009) suggested that an inherently fragmented building industry with competing interests, presents a problem at conceptual project level as diverging knowledge, backgrounds and objectives compete to achieve project aims (Van Bueren (2009) in Fedoruk et.al. 2015). Improving communication amongst parties and reframing "...*how buildings are planned, designed constructed, commissioned and operated...*" (Fedoruk et.al.2015, p.751) is suggested to mitigate such an impact on building performance.

Bordass et.al. (2004) concur that diverse stakeholders must engage more closely with performance targets and outcomes. More coherent collaboration would also help to reduce issues of assumption between project teams (Bordass et.al. 2004) who note "... *few people who design buildings go on to monitor their performance.*" (p.1).

Fedoruk et. al. (2015) evaluated the anticipated and achieved energy performance of the Centre for Interactive Research on Sustainability (CIRS) building at British Columbia University, Vancouver. Key findings indicated the importance of effective building energy monitoring systems, an integrated design process, continuous feedback loops from design to operation, and a “...culture of learning and embracing failure... to achieve building performance success.” (Fedoruk et al. 2015, p.760). A lack of systems thinking was also identified as a barrier to performance, with building systems commissioned individually (Fedoruk et.al. 2015).

Robinson et.al. (2016) identify three key factors leading to a performance gap: building fabric; mechanical and electrical systems; and building occupants. De Wilde (2014) contends that three categories can be identified which underpin the performance gap: issues at design stage; construction; and operation, although the weighting of issues varies between buildings. Based on De Wilde’s (2014) classification, Table 2.1 sets out key issues identified in literature as contributors to the performance gap.

Table 2.1: Summary of issues contributing to the performance gap

Design	Construction	Operation
Miscommunication regarding performance targets within project team/design team/client.	Built quality – insulation and airtightness inadequacies. Installation problems due to quality or competency of installers. (van Dronkelaar et.al.(2016); De Wilde (2014); Sunikka-Blank and Galvin (2012); Carbon Trust (2011))	Technological underperformance. Performance of high efficiency technology may be below anticipated performance (De Wilde (2014); Rye and Scott (2012)).
Prediction limitations due to clarity of future use. Poor communication between landlord/future occupant in tenanted buildings (Robinson et.al. 2016).	Change orders and value engineering during construction.	Complex control systems, software dependence.
Design issues e.g. overspecification. Flawed design, inadequate	Inadequate commissioning and handover of systems (De Wilde (2014); Carbon Trust (2011)).	Occupant behaviour differs from modelled assumptions (Cali et.al. 2016; De Wilde, 2014; Menezes et.al. 2012; Haldi and Robinson, 2008).
Inadequate/inappropriate modelling/simulation. Modelling software inconsistent, models are not monitored/revised as design and deliver develops		Technological development

Design	Construction	Operation
(De Wilde (2014); Sunikka-Blank and Galvin (2012); Schwartz and Raslan (2013); Carbon Trust (2011)). Fundamental problems associated with predictive modelling e.g. occupant behaviour, weather conditions, plug loads. Unregulated loads unaccounted for (Carbon Trust (2011)).		
Cycle of Blame (Cadman, 2000) stakeholders are disincentivised by absence of demand from each other (investors, developers, designers, landlords, tenants). The market has failed to correct (Cass, 2016).		Differences in operational control settings, and facilities management from design stage assumptions. Split performance incentives in tenanted buildings (Robinson et.al. 2016).
Absence of a green premium/grey discount (Fuerst and McAllister, 2011).		

Discussions of the performance gap, also link to wider debate surrounding organisational culture and strategy. There is a wide acknowledgement within the corporate community that the concepts and principles of sustainability underpin current and future organisational strategy, impacting on opportunity and risk. Such acknowledgement is far from novel, Warren-Myers (2012) noted:

“...the importance of increasing the level of sustainability in the commercial real estate stock is paramount for reducing the negative impact of the built environment on the planet” (Warren-Myers, 2012, p.115).

Sayce et.al. (2007) suggest overarching categories *“driving sustainable property investment”* (p.633); statutory requirements; and market-led drivers e.g. future value of green buildings. However Falkenbach et.al. (2010) and Jones et.al. (2015) note the tension between strategic corporate sustainability goals and problematic implementation citing the lack of clear economic evidence driving investment in sustainability and measurement and evaluation difficulties. Jones et.al. (2015) suggest that many corporate approaches may be disingenuous,

outwardly promoting sustainability whilst affording little true importance to strategic aims other than economic concerns.

Mallaburn (2016) identifies an 'energy efficiency gap', focusing on the lack of organisational investment in energy efficiency. This gap is defined as "...*the wide disparity between what is apparently cost-effective and what is actually implemented in the real world.*" (Hirst and Brown (1990 in Mallaburn, 2016).

Occupants are considered key to understanding in-use performance of sustainably designed buildings. The conceptualisation of occupants within this context has evolved since the early 1990s (Livingstone and Ferm, 2017) and continues to generate debate. Cadman's vicious cycle of blame (see Table 2.1) proposes that occupants are passive consumers consuming sustainable buildings. Livingstone and Ferm (2017) note the resonance of this conceptualisation with Von Hippel's (2005) framing of users in the innovation process as "...*passive consumers of technology, waiting patiently for manufacturers to innovate*" (Ivory, 2010 in Livingstone and Ferm, 2017, p.7). Ivory (2010) however, asserts that occupants in the construction process make a dynamic contribution to design and drive innovation. Spinks (2015) concurs with this assertion, regarding occupants as powerful actors in the construction process, shaping the process at all stages of development.

Jailani et.al. (2015) place occupants at the centre of in-use evaluation, the satisfaction of occupants considered commensurate with the successful operation of the building. The emphasis however, is placed very much on the occupant as a 'rational actor' - as will be examined in chapter three – with knowledge and understanding of building functions impacting on engagement with the building and the resultant extent to which their behaviour is 'sustainable'.

Livingstone and Ferm (2017) argue that the framing of occupants has shifted "...*from framing the problem as one of [blame]... towards an emphasis on cooperation and collaboration.*"

(Andelin et.al. 2015 in Livingstone and Ferm, 2017, p.8). Thus the cycle of blame is arguably transformed into a cycle of potential collaboration between key stakeholders.

Fedoruk et.al. (2015) suggest that increasing research into the performance gap is driven by cost implications for both landlords and tenants, regulatory and market pressure. De Wilde (2014) contends that expectations for the performance in-use have risen as public and industry understanding of environmental issues has grown. There is an expectation that sustainably designed buildings will meet environmental performance targets, De Wilde (2014) notes the emergence of “...*novel modes of building delivery and facilities management, enabling concepts such as performance based building or performance contracting*” (p.140). Such concepts are grounded in specific in-use performance tolerance levels, for example “*comfort boundaries*” rather than specific design and fit-out specifications (De Wilde, 2014, p.40). Bordass et.al. (2004) highlight the challenge of collecting accurate underpinning data informing predictive models due to a lack of in-use monitoring. Bordass et.al. (2004) and Robinson et.al. (2016) conclude that landlord-tenant relationships are a contributory factor to the performance gap. Divided responsibility, hold Bordass et.al. (2004) lead to inhibited investment and wasteful operation of building systems.

This research does not seek to measure the performance gap in sustainably designed office buildings. Such measurement would confirm the existence of the gap, already widely established in existing literature (see table 2.1), however would not contribute to a greater understanding of the role of occupants within the performance gap. Thus the starting point for this research is the acceptance of a performance gap and a research aim of providing new insights for current and future sustainably designed office buildings, understanding how contemporary working impacts on energy use.

Having considered some of the key literature concerned with the performance gap, the following section presents the impact of legislative and regulatory context to issues concerning the performance gap, followed by a discussion of the role of sustainability metrics. An overview of literature concerning narrowing the performance gap is then presented in section 2.6.

2.4 Legislative and regulatory background

Buildings globally contribute 40% of all annual energy consumption and 36% of CO₂ emissions in the EU (European Commission, 2016; UNEP-SBCI, 2010). The IPCC's Climate Change Fifth Assessment Report (2014) warns of the potential for energy use in buildings to double or even triple on 2010 levels if no significant change is undertaken. Moreover, risks of a lock-in effect resulting from the long-lifecycle of inadequately designed buildings are noted (IPCC, 2014).

Bodies, such as the IPCC and the World Business Council for Sustainable Development, emphasise the urgent need for the construction industry to improve existing practice through a reduction in energy use and a focus on economic and social sustainability (IPCC, 2007; WGBC, 2018). A policy driven approach is recommended by the IPCC (2014) to address barriers to the design, retrofit and implementation of energy efficient buildings and technology. Such an approach would include:

"...public procurement, appliance standards, tax exemptions and soft loans... tighter building codes preferential loans, grants, subsidised finance, use of Energy Performance Certificates (EPCs), energy supplier efficiency obligations and tradeable white certificates." (IPCC, 2014, p.7-8).

2.4.1 EU commitments

The UK Government's response to the sustainability agenda in the context of the built environment is embodied in regulatory frameworks, directives, conventions and policies at both national and international level. As a member of the European Union, the Climate Change Act (2008) reflected the UK's legal commitment to Kyoto emissions reduction target, providing a legal framework with five year carbon budgets leading to long-term target emissions for 2050 and the development of a climate change adaptation plan (Committee on Climate Change, 2016).

The Kyoto Protocol has set stringent targets to reduce Greenhouse Gas emissions to 80% of 1990 levels by 2050, legally binding the UK to achieve these targets (UN, 2012). The Doha amendment to the Kyoto Protocol cemented a further commitment to an 18% reduction of emissions across all sectors by 2020 (based on 1990 levels).

The UK committed to reducing Green House Gas (GHG) emissions both in 2020 by 26% (compared to 1990 levels) and in 2050 by 80%. Reduction targets are set out in the Climate Change Act 2008 (IGT, 2010). The Climate Change Act (2008) sets out the binding legal framework for the UK to reduce greenhouse gas emissions and to adapt to climate change.

The Act sets out requirements to:

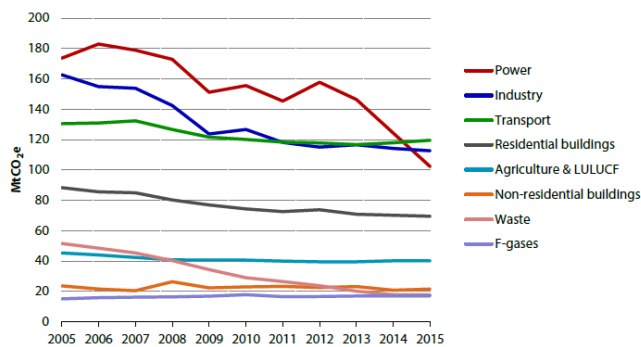
- Assess risks and opportunities arising from climate change on a five year basis with the latest risk assessment published in 2017.
- A five yearly adaptation programme responding to risks set out in the Risk Assessment report, ensuring resilience to climate change in the country with the latest programme published in 2013.

The EU Directive on Energy Performance of Buildings sets minimum energy performance standards for new and some existing buildings. The European Union Directive on the Energy Performance of Buildings (EPBD) came into force from 2007 and has driven requirements to display Energy Performance Certificates in the UK (EPC) for newly constructed properties and as part of sales and lettings transactions. EPCs display energy efficiency ratings ranging from A-G. Office buildings must meet a minimum target performance of E or better prior to letting. From 2018, buildings must achieve an A-F rating prior to sale or letting. This minimum legal requirement leads to the evolution of EPCs from rating to benchmarking tool (Cass *et.al.*, 2016).

Display Energy Certificates (DECs) go some way to addressing this issue, reporting operational energy performance of buildings however DECs are required only in public buildings and as the BCO (2014) state there is insufficient political will to extend certification

to private sector buildings. Moreover, Lewry (2014) suggests that industry wide mistrust of both EPCs and DECAs exists due to “...their inability to be tailored to real-life building conditions, they are seen as merely a compliance exercise” (Lewry, 2014, p.361).

The EU Waste Framework Directive and National Waste Strategy drive waste efficiency while EU Water Framework Directive and the Water Blueprint aim to improve water quality, management and efficiency. In its 2016 progress Report to Parliament on meeting carbon budgets, the Committee on Climate Change (2016) identifies that whilst building regulations and EU EPBD have been implemented, scant progress has been made in non-domestic building emissions required to meet reduction targets as can be seen in figure 2.1.



Source: DECC (2016) *Provisional GHG statistics for 2015*; DECC (2016) *Final GHG statistics for 1990-2014*; CCC analysis.
Notes: Chart shows temperature-adjusted emissions in power, residential and non-residential buildings. This smooths out the large changes in heating emissions between years with mild and cold winters to give a clearer impression of genuine progress.

Figure 2.1: Reduction of non-domestic building emissions

(DECC, 2016⁵)

The European Commission set out its agenda to develop a common assessment system for the Environmental Performance of Buildings in 2012 as part of its strategy for sustainable competitiveness of the construction sector (EC, 2012). Lorenz et.al. (2016) note that this strategy embodies the intent to “...develop and establish a common framework of core indicators, focussing on the most essential aspects of environmental performance between 2014 and 2016 within a broad stakeholder-dialogue... it is acknowledged that this will be a

⁵ Contains public sector information licensed under the Open Government Licence v3.0.

slow process.” Clearly, the implications of such an agenda for harmonization of environmental performance metrics across the EU is called into question following the UK vote to leave the Union.

The EU policy landscape forms a key context within which sustainably designed office buildings operate. The BCO (2014) highlight the challenging nature of this context “*Uncertainty is everywhere, in new regulations, changing market dynamics and constantly evolving customer preferences.*” (BCO, 2014, p.4). The recent vote for the UK to exit the European Union has led to greater future uncertainty on the direction and evolution of policy. Whilst the UK Parliament has legislated for the emissions reductions, relevant policies driven by EU directives may be impacted, for example EU Emissions Trading System and directives on waste.

2.4.2 *National commitments*

Many prevailing national policy approaches around the environmental performance of buildings are bound up in what Harmelink et.al. (2008) term “barrier-based” approaches. Barriers to the uptake and proliferation of sustainably designed buildings are widely recognised in the literature. Bond and Perrett (2012) suggest four key factors inhibiting wider investment in such buildings:

- Perception that green building will incur greater cost;
- Lack of direct incentivisation – in traditional landlord/tenant relationships, the landlord may bear greater initial costs which the tenant alone will benefit from e.g. utilities costs;
- Limitations of appropriate knowledge and experience; and
- Lack of clear incentive for all parties.

In the 2016 report to the Committee on Climate Change, ‘A new approach to non-domestic energy efficiency policy’, Mallaburn identifies approximately 70 barriers and ‘market failures’ impacting on energy efficiency which fall into seven groups: risk; lack of information; hidden costs; access to capital; principal/agent – if the stakeholder bearing costs will not realise

investment; bounded rationality; and biases (Sorrell, 2011 in Mallaburn, 2016). A focus on barriers in terms of energy efficiency translates to policy in a number of ways, for example:

- Performance labelling for electrical goods;
- Performance labelling for buildings (e.g. Energy Performance Certificates, Building Ratings Systems);
- Regulation through technology standards, for example national building codes
- Energy audits (formal performance reviews);
- Voluntary or long term agreements (sectoral agreements to reduce emissions over time, for example UK Climate Change agreements);
- Energy management systems and standards – formal practices for measuring, reporting, managing and reducing energy use at national or international level, for example ISO 20001;
- Technical information and advice, information programme e.g. the UK's Energy Efficiency Best Practice Programme (1983-2002);
- Standards of Performance schemes – a levy on energy bills to pay for energy efficiency programmes;
- Public procurement e.g. minimum efficiency specifications for products and services; The UK Governments Soft Landings scheme (Bunn *et.al.*, 2009) sets out a new approach to publically funded projects, with emphasis on virtuous circles of feedback (BCO, 2014). and
- Financial support, for example grants or taxation incentives.

The UK Building Act 1984 forms the basis for the statutory guidance of the UK Building Regulations overseen by the Department for Communities and Local Government (DCLG). Of particular relevance to the design and construction of sustainably designed office buildings are Building Regulations, approved document (AD) Part L conservation of fuel and power and Part G sanitation, hot water safety and water efficiency. Subject to regular revision and update,

the non-domestic sector target of zero carbon newly constructed buildings by 2019⁶ is currently uncertain.

The UK's energy efficiency building regulation for the conservation of fuel and power in new buildings (Part L, Building Directives, 2002 and 2010) do not provide benchmarked minimum standards. Instead, modelling and assumptions underpin calculations which compare building performance with similar reference buildings and require an improvement in comparison (Raslan and Davies 2010).

In the UK, the EU Energy Performance of Buildings Directive has impacted on Part L of the UK Building Regulations and sets binding requirements for both new build construction projects and significant renovations (Sawyer et.al. 2008).

2.4.3 *The role of Government*

The UK Government is central to the construction industry, in terms of procurement, development and processes. Jones (2014, in Design Commission, 2017) asserts that the UK is “*one of the most centralised countries [in the OECD]*” (p.18). Such centralisation results in a lack of flexibility in the application of legislation and regulation (Design Commission, 2017). Moreover, such an inflexible framework is positioned in contrast to private sector deregulation, creating difficulties for local authorities to exert control and maintain standards. The House of Lords (Building Better Places, 2016) concurs with this political dichotomy, asserting:

“The Government is pursuing a deregulatory agenda as seen, for example, in the introduction of more flexible arrangements for office to residential conversions and the strong policy emphasis placed on the financial viability of new developments. These changes, however, have the cumulative effect of progressively diluting the capacity of local authorities to scrutinise new developments, to safeguard quality and sustainability and to ensure that proposals contribute to an overall and beneficial sense of place.” (HoL, 2016, p.3).

⁶ www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/approved

Sayce et. al. (2007) suggest that an evolving political landscape has influenced market driven decision making, with an emphasis on anticipation and mitigation of future legislation and risk, and an understanding of potential links to future property value. Lorenz et. al. (2016) concur that increasingly stringent sustainability requirements resultant from building codes may confer negative value impacts on buildings failing to meet standards stipulated.

In 2017, the All-Party Parliamentary Design and Innovation Group released a report resulting from an inquiry into the interrelationships between people and the built environment. The Group comprise:

“...a cross-party coalition of Parliamentarians and design sector organisations that works to develop new design policy ideas, critique existing government decision-making around design, communicate within Parliament the enormous potential value of design, and help the design community better engage with the policy process.” (Design Commission, 2018).

The published report, ‘People and Place’ (2017) discusses the role of the UK government and private sector in both design principles and changing behaviour. The role acknowledges the unchartered context and probable environmental legislative changes following the UK’s decision to leave the European Union. The four aims of the report, include a focus on environmentally sustainable behaviours. Following on from the Farrell Review of Architecture and the Built Environment and the cessation of the Commission for Architecture and the Built Environment’s (CABE) research functions in 2011, the report holds:

“...there is not yet a generally accepted understanding of the role of the design of the built environment in furthering policy. In particular, there is not enough research into this complex and multi-factorial field.” (Design Commission, 2017, p.10).

Recommendations for the future direction of policy in relation to people and the built environment are drawn, based on a wide range of academic, organisational and political contributions. It is however, of particular relevance to the rationale of this research, that the

report authors suggest a continued focus on methodological individualism to steer future policy:

“It is not our view that individuals lack agency, but we have been convinced by evidence that design makes some kinds of behaviour more likely than others.” (Design Commission, 2017, p.10).

2.4.4 *Initiatives and guidance: best practice, corporate social responsibility and occupant responsibility*

Together with EU and national regulations, legislation and guidance, a number of initiatives and best practice recommendations have been developed by institutions and professional organisations. The Stoddart Review (The Workplace Advantage) (2016), suggested that the physical workplace is central to organisational performance. The Review surveyed multiple industries and business leaders, concluding that insufficient strategic importance is awarded to the role of workplaces as influencer of performance (Stoddart Review, 2016). Stevenson (2009) suggests that issues of design, construction, commissioning and occupation of buildings must be addressed by the built environment industries in the context of resource use (Stevenson, 2009).

Whilst the scope of this work does not extend to a comprehensive review of initiatives in this field, significant developments are discussed below, together with an overview of corporate initiatives.

Carbon Buzz, an initiative conceived by the Royal Institute of British Architects (RIBA) and the Chartered Institution of Building Services Engineers (CIBSE) provides a voluntary forum where organisations share energy use information from design to occupation, aiming to address *“...a realisation that the construction industry suffers from a poor awareness of the link between CO₂ emissions and the energy use of buildings”* (Carbon Buzz, 2017). Participating organisations anonymously share data drawn directly from Part L Building Regulations outputs (section 2.4.2), Display Energy Certificate reports and Post Occupancy

Evaluation (POE) data. The development of this platform aligns with principles of POE, to share building performance data through feeding back and forward key information. There is however, some criticism of the scheme in that many occupants have failed to engage with the platform, further exacerbated by a reliance on voluntary submissions.

The Carbon Trust was established as an independent company by the UK Government in 2001 with the aim of accelerating the move to a low carbon economy by developing low carbon strategies for government and business. In 2010 the Low Carbon Workplace (LCW) scheme, comprising a partnership between the Carbon Trust, fund manager Columbia Threadneedle Investments and property developer Stanhope. The LCW acquire and refurbish commercial properties and provide ongoing support to occupiers. Bordass *et.al.* (2016) suggest that the LCW scheme provides an opportunity for organisations to demonstrate commitment to sustainability.

The Royal Institution of Chartered Surveyors (RICS) commissioned a study in 2008 to identify the key drivers for pro-environmental change in property professionals. The research concluded five drivers: UK and EU legislation; the regulatory framework governing building development and use; the need to develop best practice and new standards; pressure from non-governmental organisations; and market demand (Dixon *et.al.*, 2008). Sayce *et.al.* (2007) suggested that investment in environmental improvements was considered to increase market investment risk due to the financial cost.

A number of publications have emerged within property professional practice. Most of these focus on drivers for change and cite requirements for increased legislation and awareness of green issues (GVA Grimley, 2005; Kingsley, Lipsey Morgan and IPD Occupiers, 2008). Van de Wetering and Wyatt (2011) undertook a study of office occupants and found that 77% of these organisations had developed CSR or environmental policies. Most policies, however, focused on energy consumption and waste, with fewer taking into account staff development, building management and transport, and limited consideration of materials and water use. Moreover, many respondents commented that policies were merely 'greenwash' preserved

for flagship head office buildings and little political will existed within organisations to pursue the effective implementation of policies. Traditional attributes associated with property investment drivers were identified by respondents as of greatest importance, for example location, flexibility and lease terms were considered the most important attributes (van de Wetering and Wyatt 2011). JLL, an international real estate consultancy consider the importance of landlord-tenant relationships to the strategic occupation of sustainable buildings, citing the rise of 'green leases' whereby arrangements to adhere to sustainability strategies in occupation, for example, the agreement of a sustainability plan to reduce emissions and the sharing of resource consumption data (JLL, 2008). Livingstone and Fern (2017) however note that in spite of the increased occupation of sustainable buildings, "*Just because a sustainable building is occupied, it does not hold that the building will be managed and used in a sustainable way day to day.*" (p.11). Further details of corporate sustainability initiatives are summarised in table 2.2 below.

Table 2.2: Overview of key corporate sustainability initiatives

Corporate Sustainability Metric	Overview
CDP (formerly Carbon Disclosure Project)	A not-for-profit organisation formed in 2000, CDP holds largest database of corporate climate change information globally, collating and analysing data to promote greater efficiency and understanding of climate change amongst its corporate contributors (CDP, 2017).
Global Real Estate Sustainability Benchmark (GRESB)	Created in 2009, global sustainability benchmark for real estate portfolios (public, private and direct). Aims to provide an indicator of a property funds sustainability performance (GRESB, 2018).
Dow Jones Sustainability Index (DJSI)	Launched in 1999, a suite of indices which aim to address “Sustainability challenges...shaping companies’ competitive landscape” (ROBECOSAM, 2017). Listed Dow Jones Global Total Stock Market Index companies are assessed on long-term economic, social and environmental asset management plans.
FTSE4 Good Index	Index measuring performance of FTSE listed companies with strong environmental, social governance practices (FTSE Russell, 2017).
Global Reporting Index Construction and Real Estate Sector Supplement (GRI CRESS)	Global standards for sustainability reporting, setting out best practice for reporting on a range of economic, environmental and social impacts (GRI CRESS, 2017).
EPRA Reporting Guidance – European Public Real Estate	Best Practice Recommendations on Sustainability Reporting
Investment Property Databank (IPD)	The IPD have developed an environmental code which consists of best practice guidance for the collection, measurement and analysis of environmental information (IPD, 2018). The IPD has also established the sustainable property index (ISPI) which monitors the investment performance of sustainable property.
The Better Buildings Partnership	A collaborative initiative aimed at fostering coordinated approaches to improving performance of existing commercial building stock through the publication of guidance such as BBP Managing Agents Sustainability Toolkit and BBP Better Metering Toolkit (BBP, 2017).

Such initiatives link to wider concepts of corporate social responsibility and corporate reputation. The importance of corporate reputation within sustainable building design and occupation is widely acknowledged within the literature. Cajias *et.al.* (2012, 2014) examine the role of environmentally ‘responsible’ real estate companies and corporate reputation, demonstrating a link between the performance of listed real estate companies in Europe and sustainability agendas. Livingstone and Ferm (2017) identify wider stakeholder benefits from

a review of literature, extending to shareholders and clients whilst Hilltrop (1999) and Albinger and Freeman (2000) suggest that organisational CSR agendas may be of greater importance than salary for the most employable candidates.

The size of organisations was found to be a relevant factor in sustainability strategies, larger organisations tending towards high level CSR policies, smaller organisations “*often adopting sustainability practices in all aspects of their business and being more focused on energy efficiency*” (Levy and Peterson, 2013, p.279). This would suggest a largely cost-driven approach to sustainability in smaller organisations.

Levy and Peterson (2013) conclude “*large organisations locating in a sustainable building has become the market norm not only satisfying company policy but also reflecting an environmentally conscious image...much to do with the perception of the market as opposed to a scientific approach on carbon neutrality*” (p.281).

Smith and Pitt (2011) contend that a sustainable approach to buildings occupied can enhance productivity and health and well-being. However Paul and Taylor (2008) concluded that there was no measurable benefit for employees working in green buildings. Measurable benefits of occupying green buildings, therefore, continue to prove contentious in the literature, however it is clear that the very pursuit of the *measurable* supports economic arguments that a business case must be made for sustainability in order to engage employers and occupants. This resonates with the UKGBC findings (2018) that location, build quality and flexibility continue to be driving factors in building selection, rather than sustainability credentials (van de Wetering and Wyatt, 2011; Dixon et.al. 2009).

Cass et.al. (2016) maintain that the “*...origins of the various formal standards used in the UK are evidence of attempts to use regulation and market signals to incentivise the construction of more energy efficient buildings*” (p.3). Van der Heijden (2016) contends that traditional forms of governance to support and encourage sustainable building, such as planning codes and building regulations are inadequate due to their lack of dynamism and focus on occupants and

behaviour change. However, Van der Heijden (2016) suggests that contemporary forms of governance which have emerged in light of limitations of traditional approaches, are no more successful, with limited engagement and a focus on the technical rather than behavioural aspects of achieving low carbon buildings.

The role of metrics in this context is now considered in greater depth.

2.5 Metrics

Another driver in sustainable building is the use of metrics. Numerous regulatory and voluntary assessments, certification, ratings and labelling schemes provide a proxy for efficiency or performance of office buildings in the UK, developing the quantification of the environmental impact of the built environment (van de Wetering and Wyatt, 2011). Faulconbridge, Cass and Connaughton (2017) note that such schemes “*define acceptable, expected, normal, legitimate and uniform features of buildings.*” (p.2). Rees (2009) contends that such metrics have fuelled the sustainability discourse within the construction sector. Moreover, holds Cole (2005) metrics have dominated debates around buildings and the environment. Goulden et.al. (2017) argue that “*building environmental assessment mechanisms (BEAMs) have become fairly synonymous with what is more colloquially known as ‘green building’*” (p.414). Metrics have also represent a standardisation of building design, offering a means of comparison within the property market (Cass et.al., 2016).

Situating certification within the wider political context, an underlying link to neo-liberal principles is suggested by Schweber (2017):

“The overlay of transnational, national and local policies along with private voluntary guidelines and certification schemes all point to a highly directed area of activity. In keeping with the principles of neo-liberalism, a number of these techniques are designed to construct markets, as is the case of carbon trading...others...are directed at producing exchangeable commodities and influencing consumer choice, while others...are designed to specify and

support good practice... with some kind of formally specified standard, certification and associated label.” (p.296).

This suggested connection places certification within the context of economic issues of sustainability and reflects a desire to standardise and measure sustainability (Shove and Walker, 2007). Cole (2005) posits that assessment methods applied to green buildings have “*dwarfed all other mechanisms of establishing environmental issues within the building industry*” (Cole, 2005, p.53).

The following section provides a brief overview of key schemes including building environmental assessment mechanisms.

2.5.1 Overview of environmental assessment mechanisms

A number of metrics and guidance has been developed to evaluate and benchmark sustainably designed buildings. Such mechanisms provide a framework for green design and performance requirements (Fedoruk et.al. 2015).

The British Council of Offices (BCO) have provided guidelines for the environmental performance of offices since the early 1990s. Guidelines were twofold in nature, aiming to improve performance and to curb the so-called ‘arms race’ in specifications of offices (Guy, 1998). Whilst guidelines aimed to provide a ceiling to excessive and environmentally damaging implications of ‘high specification’ offices, Cass et.al. (2016) contends that conversely, guidelines have provided a baseline, or a minimum specification, within the office market. This, suggests Cass (2016) is due to perceived market ideals which equate to “*quality with high levels of glazing, lighting, occupational density and small power capacities [and] results almost inevitably in air-conditioned offices*” (p.14). Schindler (2010) contends that this perception leads to the misuse of what would have been effective standards set out by the BCO. This is acknowledged by the BCO:

“We are aware...the institutional purchasers of office buildings benchmark against similar properties... irrespective of occupier needs...favouring buildings with higher specification the

resulting higher value reinforces the cycle towards generally higher specification...the Guide has become, in reality, more of a prescriptive standard than a guide.” (BCO, 2013, p.30).

Assessment tools provide the opportunity to achieve accepted sustainable certification and are largely grounded in predictive energy and resource use. Predictive or modelling tools assess outcomes based on building characteristics and ‘average’ occupant behaviour.

The most widely used metrics include: Building Research Establishment Environmental Assessment Scheme (BREEAM, UK); Leadership in Energy and Environmental Design (LEED, USA); Green Building Council of Australia Green Star; DGNB (Germany); CASBEE (Japan) and the Green Building Label (China). The metrics are largely similar (although the Chinese evaluation process is state-administered (Zuo and Zhao, 2014), with accredited assessors evaluating sustainability criteria and awarding varying weighted credits. Much of the development of rating tools is driven by national Green Building Councils, which fall under the umbrella of the World Green Building Council.

Cole (2005) posits that voluntary environmental assessment tools “...*have the primary objective of stimulating market demand for buildings with improved environmental performance.*” (p.57). The development of environmental metrics filled a previous gap in building performance assessment in a manageable, relatable form. The wide recognition of environmental performance metrics has contributed to debates around building performance issues. Moreover, metrics provide a means to publicise and demonstrate commitment to environmental policy and offer:

“...a voluntary, consensus-based, market-responsive set of criteria that evaluate project performance from a whole building perspective, providing a common understanding for what constitutes a green building.” (Cole, 2005, p.57).

Environmental assessment mechanisms have been criticised for issues of inherent subjectivity and the basis of measurement. Haapio and Viitaniemi (2008) note that whilst assessment methods are explicit, the interpretation of achieved ratings is ambiguous, with

differing users interpreting results subjectively. Lewry (2014) suggests that fundamental to the performance gap is the incompatibility of metrics applied in the non-domestic market. Lewry (2014) proposes the divergence between EPC's and DEC's as an example of such incompatibility, with the former based on predicted, and the latter operational, performance. Lewry (2014) proposes a 'Green Deal' tool to overcome this issue, drawing on accurate operational data to inform predictive models.

Bordass *et.al.* (2016) argue that BREEAM and other voluntary schemes exacerbate the performance gap as little emphasis is placed on in-use building performance, reinforcing a culture of 'design for compliance'. Thus it could be contended that a sustainably designed building achieving a high BREEAM or LEED rating, has merely demonstrated minimum compliance with necessary criteria and the certification is superficial. Rydin (2016) suggests that a high BREEAM rating may infer the status of prime real estate on a building, driving rental and capital values, though there is limited evidence to support such uplifts (Fuerst and van de Wetering, 2015).

The issue of value and sustainability is highly contentious with regard to commercial buildings. Whilst there is some evidence of rental and capital premium for sustainably designed and accredited commercial buildings (Fuerst and McAllister, 2011; Fuerst and van de Wetering, 2015), the motivation for investment in sustainable building is wider. Livingstone and Ferm (2017) suggest three drivers for investment in sustainable commercial buildings, placing each driver in overarching categories of property-level and corporate-level drivers:

- “ *reduced operational costs (property-level driver)*;
- *enhanced productivity and employee well-being (corporate-level driver)*; and
- *reputation and brand strategy (corporate-level driver)*.” (p.9)

The World Green Building Council (WGBC) in its review of literature on building design and productivity, identifies access to daylight, views of nature, ambient temperature agency may be consistent with higher levels of employee productivity (2013). Indicators of health and well-

being are suggested, including levels of absenteeism and recorded stress levels (WGBC, 2013). However, a lack of consistent integration of these factors into building design is acknowledged in the WGBC review. Feige et.al. (2013) contended that whilst it was not possible to demonstrate a causal link between comfort and productivity, effective engagement with work was correlated with comfort, for example higher levels of comfort may be associated with lower rates of staff turnover.

The UK Green Building Council's (UKGBC) 2018 publication 'Capturing the Value of Sustainability', recognises the limitations of clear and consistent integration of indicators and metrics in the context of creating a business case for sustainable building. A drive to collate data is instigated in the report to create more robust benchmarking for cost savings through sustainable building design and management.

Cass et.al. (2016) suggests a threefold understanding of the functioning of environmental standards which fail to deliver low-energy buildings: firstly that the achievement of regulatory compliance is linked to legal and thus market legitimacy; secondly, normative and cultural legitimacy is achieved by conforming to the normalised perceptions of high specification office buildings, that is, the inclusion of 'environmental features' for example, highly glazed buildings, small power load capacity and; thirdly the manipulation of features utilising calculation and modelling methods within flexible BEAMs in pursuit of the achievement of ratings.

The following section considers the most widely used metric in the UK, BREEAM, in greater detail to understand the contextual drivers underpinning the emergence and aims of the rating system and how in turn, these constraints have shaped sustainable office design.

2.5.2 Building Research Establishment Environmental Assessment Method

BREEAM was established in 1990 and is now a fully privatised non-governmental organisation. The credit based system on which BREEAM ratings are founded, focuses on nine categories of sustainability. The BREEAM Offices scheme is described as providing an "*Independent recognition of performance through third party certification*" (BREEAM, 2018).

Building typologies are assessed differently for example, BREEAM includes typology-based schemes, for example offices and retail. Buildings are then rated according to credits scored, in the case of BREEAM this ranges from Outstanding, Excellent, Very Good to Good. BREEAM is updated on an annual basis to reflect best practice. As such a rating awarded may fluctuate if a previous version of BREEAM has been applied (Sawyer et.al.2008).

Sustainability within BREEAM is framed within nine key sustainability indicators, with an overarching focus on the environmental aspects of sustainability:

1. Management
2. Health and wellbeing
3. Energy
4. Transport
5. Water
6. Materials
7. Waste
8. Land use and ecology
9. Pollution

Within the context of this research, BREEAM provides the framing for a focus on operational energy use, the achievement of a BREEAM 'Excellent' rating, requires the achievement of buildings which "*...minimise their operational energy consumption through good design.*" (BREEAM, 2018).

As of May 2018, there are 563,490 BREEAM certified buildings, with over 2.2million registered buildings over 77 countries (BREEAM, 2018). The establishment of the metric formed part of what Wilkinson (2015) terms "*...the era of voluntary rating tools.*" (Wilkinson, 2015, p.99). Such metrics are limited in scope, in particular, given ratings are based in predictive, potential energy, carbon and water use outcomes as opposed to operational reality. Rydin (2010)

contends that the process of BREEAM ultimately shapes “...*what it means to build sustainably and...can shape practices of development themselves.*” (p.76).

Criticism surrounding BREEAM, resonates with wider criticism of environmental assessment tools, that certification relies on predictive assumptions. It should be noted, however that the rise of BREEAM-in-Use offers the potential to overcome such limitations. This assessment scheme, introduced in 2009, is divided into three parts, considering the asset performance (the building), the building management performance (operational performance) and the organisational effectiveness (building management undertaken by occupants) (BRE, 2018). A BREEAM Outstanding rating also takes into account in-use performance, however currently less than 1% of certified buildings have achieved this rating (BRE, 2018).

Ding (2008) suggests that BREEAM provides a ‘tick list’ which can be manipulated to achieve desired ratings. Goulden et.al. (2017) contend that Building Environmental Assessment Methods (BEAMs) “*do not necessarily excel in or emphasize energy-efficient design*” (p.9). This, contend Cass et.al. (2016) is the result of the strategic use of assessment tools to demonstrate “*‘badges’ of performance potential*” (p.13). In this way, argue Cass et.al. (2016) methods of calculation are selected to model and support desired outcomes, therefore accurate predictions of performance become secondary to *in use* performance.

Moreover, Schweber (2013) contends that BREEAM assessments provide a “*substitute for technical or more detailed knowledge*” provided to clients (p.134). In this context, hold Cass et.al. (2016) design aims are concerned with market requirements rather than energy efficiency. Thus design should permit a range of potential occupants to rent the building, without prohibitive design or technical constraints.

De Wilde (2014) notes that despite the predominance of BREEAM as an environmental assessment method it does not automatically imply low energy performance. Whilst the criticism levelled at BREEAM as a predictive tool of performance is acknowledged, this research uses it as an indicator of organisational intent to actively engage with the

environmental performance of an office building. Moreover, BREEAM Excellent certification is a key element of the British Council of Offices (BCO) Guide to UK office specification (BCO, 2014). The following section provides an overview of literature concerned with narrowing the performance gap.

2.6 Closing the performance gap

A vast body of research and literature considers how the performance gap may be narrowed, notably Innovate UK's (formerly Technology Strategy Board) four year Building Performance Evaluation Programme which monitored and evaluated the performance of 50 exemplar non-domestic buildings across building typologies and 76 homes in sustainably designed domestic developments (Innovate UK, 2016). The programme reported non-domestic buildings regularly exceeding carbon emission design predictions by an average of 3.8 times. The heterogeneous nature of non-domestic buildings was highlighted in the programme's findings, hence a generic route to efficiency could not be applied. Key considerations common to many of the case study buildings were, however, identified:

- Committed client and owners: clients and owners committed to the development of environmentally sensitive buildings were found to also demonstrate commitment to the successful operation of the building;
- Quality: a systematic approach to quality and ongoing validation of technology and approaches were found to result in improved performance, although this was typically found in committed clients;
- Integrated design and manageable complexity: the study found that where services were included in order to meet regulatory or labelling requirements, underperformance typically followed. Simple systems and early engagement with building services engineers improved performance, again this was found to be associated with committed clients; and

- Handover: a clear handover supported by straightforward documentation and extended support were associated with higher levels of building performance. (Innovate UK, 2016)

Moreover, a key finding related more broadly to the ability of organisations to “*learn and adapt....changing practice as a result* [of the BPE programme]” (Innovate UK, 2016, p.4). This focus on building occupants and their impact on the performance gap is echoed in Prindle and Fontaine’s (2009) survey of corporate energy efficiency strategies:

“...efficiency has often been a behind the scenes engineering function driven by technology investment, today’s most successful efforts draw as much on human capital and culture change to drive results as they do engineering expertise and technology investment.” (p89).

Brook (2016) concurs with Innovate UK’s findings, asserting that sustainable building performance is dependent on both technical and non-technical factors: building structure, systems and users. Such factors, contends Brook (2016) are subsequently dependent on systems of automation often integrated into the design and structure of the building. Three key areas of automation are identified as pivotal to performance:

- *Controls of shading and thermo-active building systems as parts of the building envelope;*
- *Controls and integration of building technical systems, traditionally HVAC and lighting; building automation is the “brain” and the “command center” for the building systems.*
- *Aid in efficient building operation as per design specifications and current facility requirements.”* (Brook, 2016, p.264).

The potential for such systems, termed Building Automation and Control Systems (BACS) or Building Management Systems (BMS) is widely recognised as contingent upon appropriate installation, operation and maintenance. The Energy Performance of Buildings Directive (European standard EN 15232) considers the Impact of Building Automation, Controls and

Building Management. The revision of the Directive, which came into force on 19th June 2018 further supports the use of smart technology and automation:

“Smart technologies will be further promoted, for instance through requirements on the installation of building automation and control systems and on devices that regulate temperature at room level.” (European Commission, 2018).

The European Copper Institute contends that the design, installation, commissioning and operation of BACS/BMS is pivotal to maximising energy-saving potential, some 35% of energy savings in commercial/public buildings could be achieved by 2035 if such potential was fully exploited (ECI, 2016).

Complex and ineffective controls, issues of building design and management, and behavioural responses have been identified as key issues in building underperformance (Design Commission, 2017).

A recent, notable report was published by the UK Green Building Council (UKGBC, 2016) entitled ‘Delivering Building Performance’. Key report findings suggested requirements to: clarify shared, ambitious aspirations and set specific performance targets across the delivery process; ensure collaboration and control to secure predictable outcomes throughout the delivery process; commit to monitoring and feedback throughout the process, particularly during and post-handover; and improve knowledge and create a culture of openness and ‘learning from mistakes’ (UKGBC, 2016). The UKGBC’s ‘Mapping the Success Factors to the Building Life Cycle’ presents these factors as part of a wider chronological life cycle.

The Low Carbon Innovation Coordination Group (2016) suggest that organisational sector, size, culture and individual “inclinations of staff” impact motivations for the adoption of energy efficiency strategies (p.28). They suggest examples of connections between corporate financial objectives and energy use. The means by which such strategic aims translate into practical implementation will, consider the LCICG (2016), also vary by sector and organisation.

The report suggests requirements and aspirations to demonstrate legal compliance (for example within the oil industry) may drive formal energy strategies

Hashemi et.al. (2016) considered issues of underperformance related to energy, health and comfort within a university building. The study identified a need to reframe perceptions of energy efficiency in the context of the performance gap, shifting focus from energy to health and wellbeing (comfort) of building occupants. A more comprehensive approach would include the resolution of technical problems, disaggregation of data and occupant behaviour change together with broader consideration of occupancy patterns, social norms and occupant requirements to improve energy efficiency. The broadening of understandings around contributing factors would, hold Hashemi et.al. (2016) integrate stakeholders from the outset “...to understand potential trade-offs between aesthetic, comfort and energy values to close the gap.” (p.266).

In their study investigating the actual and predicted energy performance of the Centre for Interactive Research on Sustainability (CIRS) in Vancouver, Fedoruk et.al. (2015) identified four key areas contributing to a performance gap: limitations of monitoring systems to meaningfully and effectively measure performance; understanding “boundaries” in energy systems and analysis; effective feedback loops throughout the building lifecycle, with a focus on an open culture of “*learning from failure*” (p.760); and integrated design processes (taking into account complete lifecycle).

In their review of green building literature Zuo and Zhao (2014) conclude that a shift of focus from purely technical building-related studies to interaction between building and users can be identified in recent research. Watson (2015) however, contends that academic attention has focused largely on energy-efficient design, performance monitoring and post-occupancy user satisfaction.

Lewry (2014) suggests whole building energy benchmarking, modelling whole-building energy calculations at design stage against robust benchmarks could provide a more accurate

assessment of in-use performance. Moreover, he suggests more dynamic modelling to take into account unregulated energy uses. This, to some extent has been addressed by the development of the Chartered Institute of Building Services Engineers' TM54 'Evaluating Operational Energy Use at Design Stage' (CIBSE, 2013). However, it has been contended that TM54 does not take into account contributory factors which reach beyond building characteristics (Robinson *et.al.* 2016).

Robinson *et.al.* (2016) suggest a mandatory post-occupancy review of newly constructed sustainable buildings (see section 2.5 for a discussion of BREEAM New Construction guidelines) together with a soft landings approach (discussed below) drawing together design team, occupants and owners and the implementation of CIBSE TM54 to support more accurate modelling. Robinson *et.al.* (2016) propose a formalised framework and methodology termed the non-domestic energy efficiency performance gap (nDeep) model. Figure 2.1 shows the proposed model which aims to draw together building design factors and user behaviour with the Building Management System (BMS). An interrelationship between Organisation A and energy use is suggested, the organisation occupying a non-domestic building is influenced by energy use which impacts on economic, cultural and policy *and* that the organisational culture and policies in turn, influence energy use. Robinson *et.al.* (2016) propose that the model is applied in conjunction with surveys of organisational behaviour and culture (Stephenson *et.al.* 2010). Survey data should then be supplemented by interviews with staff members in a range of hierarchical roles.

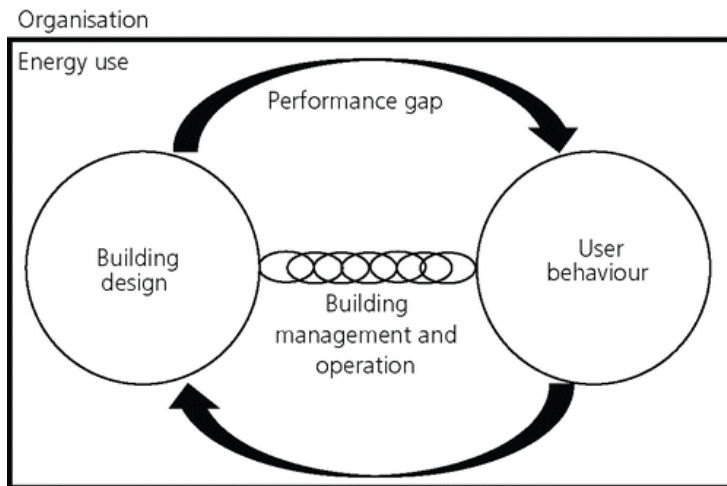


Figure 2.2 The devised non-domestic energy efficiency performance gap (nDeep) model

(Robinson et.al. 2016, p.33)⁷

An alternative approach was proposed by Van Dronkelaar et.al. (2016) who advocate stricter regulation throughout construction and operational processes aiming to improve data collection, monitoring and dissemination. Cali et.al. (2016) contend that such use of enhanced monitoring led to the resolution of building performance issues, both technical and behavioural, in a study of refurbished domestic buildings.

Azhar et.al. (2009), however, contend that the most effective decisions within the process of sustainable design and construction are those undertaken at design and pre-construction phases. Azhar et.al. (2009) suggest the process of Building Information Modeling (BIM) provides a more detailed tool to support sustainable design than traditional computer aided design techniques. BIM uses computer generated models to simulate stages of development: planning, design, construction and operation of buildings. The resultant model is generates detailed information, on both physical and operational aspects of developments, which can guide and shape decision making (Azhar et.al. 2008). BIM aims to eradicate retroactive design

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modifications and to allow the early and ongoing evaluation of building performance (Schlueter and Thesseling 2009).

An extended BIM (Building Information Management) approach is proposed by Tuohy and Murphy (2014) to include more nuanced operational performance. This includes the proposal of a system of performance related ratings and credentials, providing more robust feedback as part of the design process.

The above approaches to narrowing the performance gap share the common theme of the importance of a cyclical model, which resonates with the well-established principles of Post Occupancy Evaluation (POE). POE provides a systematic review of buildings in occupation, gathering and analysing relevant data and providing a structured route to analyse and reduce the performance gap (Stevenson, 2009). Bordass and Leaman (2004) summarise the aims of POE in four key questions:

- How is this building working?
- Is it intended?
- How can it be improved?
- How can future buildings be improved?

In short, POE's key strands of feedback, feed-forward and benchmarking are outlined. The Carbon Trust (2011) underlines the importance of occupant behaviour, ranging from influence of building occupants on hours of use, facilities management and change of use to consumption patterns within buildings. When considering occupants in office buildings, many POE's focus on factors considered to impact on productivity. Stevenson (2009) identifies "*...comfort; responsiveness to need; ventilation type; work groups and their layout in the space; and design intent (including how this has been communicated to users).*" (p.127) as key POE themes in this context.

The building specific nature of POE has necessarily given rise to numerous techniques and methods to analyse occupant behaviour or satisfaction. The absence of formally structured

POE, moreover, has led to a highly client-driven, tailored approach. The PROBE studies led to the development of the Soft Landings Framework (UBT, 2013) which sought to provide a more pragmatic approach to POE through a structured process summarised below:

- **Stage 1: Inception and briefing**
More time for constructive dialogue between the designer, constructor and client.
- **Stage 2: Design development and review**
Brings the entire project team together to review insights from comparable projects and detail how the building will work from the point of view of the manager and individual user.
- **Stage 3: Pre-handover**
Enables operators to spend more time on understanding interfaces and systems before occupation.
- **Stage 4: Initial aftercare**
Continuing involvement by the client, design and building team benefiting from lessons learned and occupant satisfaction surveys.
- **Stage 5: Years 1 - 3 extended after care and POE**
Completing the virtuous circle for future projects, to close the loop between design expectation and reality. (UBT, 2013)

As is outlined above, occupants in the soft landings process are considered in the context of measured satisfaction. This approach to understanding the impact of occupants is reflected in many studies. Sawyer *et.al.* (2008) undertook a POE of office buildings focusing on energy performance and occupant satisfaction applying the BUS assessment questionnaire followed by focus groups to discuss survey findings. Choi *et. al.* (2012) examined dissatisfaction with indoor air quality in modern office buildings and its impact on occupant health, comfort and performance using a combination of metered analysis, technical field records and on-site user satisfaction surveys. Higgins *et. al.* (2016) considered the importance of control in net zero

energy buildings through a case study approach, surveying design firms, case study building design teams, operators and occupants. The occupant survey was described as focusing on “...the awareness of the occupant of energy targets, their engagement and experience with control systems, and their desire for greater or less ability to control energy using features” (Higgins et.al. 2016, p.333).

Studies such as Innovate UK’s Building Performance Evaluation Programme recognise the importance of building occupants and how occupant behaviour can impact on building performance (Bordass et al., 2001; Innovate UK, 2016), which could be termed the ‘human performance gap’.

Zuo and Zhao (2014) in their review of green building research, note the prevalence of comparative studies in this field, comparing common characteristics of existing and sustainably designed buildings and performance outcomes. Zuo and Zhao (2014) assert that literature suggests three interrelated categories which are integral to achieving successful green buildings:

- technological innovation, including building-integrated renewable energy (Hashim et.al. 2011 and Ye et.al., 2013 in Zuo and Zhao, 2014) and strategic waste management, for example Design for Deconstruction approaches (Yeheyis et. al. 2014 and Danielle and Buick, 2012 in Zuo and Zhao, 2014);
- managerial strategy, for example procedural issues (Häkkinen and Belloni, 2011), appropriate skill level and training opportunities (Robichaud and Anantatmula, 2010) and senior management commitment (Beheiry et. al., 2006 in Zuo and Zhao, 2014); and
- behavioural and cultural considerations, ensuring occupants are well informed regarding sustainability issues (Deuble and de Dear, 2012), overcoming social and psychological barriers (Hoffman and Henn, 2008).

Such categorisation could arguably be condensed into barriers to green building, which concurs with much of the existing literature and policy on this field, that is, focus is typically placed on ‘overcoming’ barriers to green building and ‘changing behaviours’.

There are however, a number of recognised limitations to this approach. Robinson et.al. (2016) suggest that the identification of building users represents a significant challenge at design stage, they astutely note “...*a continually changing workforce...the user profile at design stage may be very different to that at the time of occupancy, which calls into question the feasibility of designing a building to perform at a specific level of energy consumption.*” (p.36).

De Wilde (2014) acknowledges the need to extend predictive approaches to building performance, to include “forecasting of technological trends (for instance the power required by office equipment), socio-economic developments (occupant density in buildings) and the effects of climate change” (De Wilde, 2014, p.47). De Wilde (2014) also notes the problematic nature of monitoring occupant behaviour whilst ensuring privacy and data protection laws are adhered to. Zuo et.al. (2012) suggest that a consideration of socio-economic issues should be integral to the construction process and should extend to local communities.

Some progress has been made in this field. A feasibility study into ‘UK Commitment Agreements’ proposes a reduction of the performance gap through specific, in-use commitments from developers set out in table 2.2 below (Bordass et.al., 2016).

Table 2.2: Overview of scope of proposed Commitment Agreements
(adapted from Bordass et.al., 2016)

Proposed Commitment Agreement	Aim
Move to Design for Performance (DfP)	To address in-use operational outcomes in buildings throughout the design process and eliminate performance gaps.
Integrate commitment agreements with other guidance	To integrate current widely used guidance on building performance: CIBSE Technical Memorandum TM39 on metering; CIBSE Technical Memorandum TM54 on operational energy use predictions; CIBSE Applications Manual AM11 on building performance modelling; and BREEAM for new offices.
Integration of 'Soft Landings' process	To maintain coherence from design intent to operational outcomes, focusing on all design team members.

The study suggests the use of Commitment Agreements as part of a Soft Landings framework, to complement existing regulatory requirements and aims to support a shift from compliance to beyond compliance minimum requirements for energy use, overcoming a “design-for-compliance culture”. The authors argue that the approach is low cost and proven in the context of the Australian NABERS (National Australian Built Environment Rating System) Commitment Agreement (Bordass et.al.,2016).

2.7 Chapter summary

This chapter has set out an overview of the performance gap and the subsequent impact on achieving sustainable office buildings. The underlying causes identified in literature are examined, including attempts to reduce the gap, legislation and guidance and environmental assessment mechanisms. An underlying focus on narrowing the performance gap by closing the feedback loop: monitoring buildings in use; understanding the operational reality and implications for performance is revealed. It is also useful to note that whilst a wide body of literature exists in relation to the performance gap, the predominant focus is energy consumption in buildings. This supports the focus of this research on energy use in the context of the performance gap, which aims to contribute to this existing research and provide novel

insights through the evaluation of contemporary working practices in relation to the performance gap.

In terms of occupants, approaches typically adopted can be considered to narrow the scope of analysis to an individual level: how does the individual behave in a sustainably designed building? What values and beliefs drive or inhibit behavioural decisions? How can we change individual behaviour? The answers to such questions can form part of a post occupancy evaluation and may contribute to future considerations of design teams and occupiers. Moreover, a body of literature has been noted, which supports increased building automation as a solution, contrasting with occupants' desire for greater control within sustainably designed buildings. Bunn (2015) contends that technological advancement is outpacing built environment professionals, implying that occupants must adapt to technology which will script their behaviour (see chapter three).

This chapter has discussed the numerous certification, assessment, regulatory and legislative frameworks within which sustainable offices operate. Whilst sustainability and, in particular, energy efficiency of offices has been widely discussed within the literature, the performance gap in this sector persists. Cass *et.al.* (2016) suggests that “...*standards do not deliver low-energy office buildings.*” (p.2). Cole (2005) however suggests it is only in moving beyond a focus on sustainable building design and technology to a focus on buildings which “...*support sustainable patterns of living.*” (p.53) that sustainability can truly be embedded into the built environment. This research aims to widen understandings of occupancy, moving beyond the framing of building occupants as individuals who can be influenced and engaged in ‘sustainable behaviour’. It is firstly important to understand the theoretical underpinnings of such behavioural approaches. Literature reviewed in the following chapter demonstrates that evidence supporting these approaches is ambiguous and contested. It situates the literature within the context of the performance gap.

Chapter 3: Understanding behaviour and behaviour change

3.1 Introduction

An extensive body of research has developed around theoretical understandings of individual action, which ranges from the disciplines of economics and psychology to sociology, providing differing approaches to 'changing behaviour'. The following two chapters provide an overview of key theoretical approaches to changing behaviour and consider developments in the context of sustainability and environmental behaviour. The following chapters contextualise the theoretical underpinnings of this thesis.

This chapter discusses behaviour change, which is theoretically situated within the disciplines of economics and psychology. Jackson (2005) undertook an extensive review of behaviour change literature and described the volume of evidence as bordering on the "*unmanageable*" (Gabriel and Lang, 1995 in Jackson, 2005, p.6). The focus of such approaches place the individual at the centre of analysis, where individual cognitive processes lead to action, termed 'behaviour'. Behaviour in the context of this thesis is defined as 'observable actions'.

Socio-psychological theoretical approaches aim to 'change behaviour', seeking, in the context of the environment, to engage the individual in more environmentally sustainable behaviours. Socio-psychological approaches have long dominated research and policy, however there is an increasing recognition of their limitations as will be discussed in chapters three and four.

The following section of this chapter considers literature around behaviour change and the concepts of 'environmental behaviour'. The third section provides a background to behaviour change approaches, in particular an overview of behaviour change theories and models - over 60 socio-psychological models and theories were identified by Darnton (2008). Section four of this chapter provides a discussion of sustainable behaviour strategies and how building occupants are framed. Section four discusses the implications of literature reviewed for the development of research questions and methodology. Finally, section six summarises the chapter.

3.2 Behaviour change and environmental behaviour

As this research is concerned with the implications of contemporary working practices for the performance gap, it is important to consider the wider field of existing research relating to unsustainable ways of life. In this context, there is a significant body of research focusing on environmental behaviour. The following sections provide an overview of relevant literature, which is considered particularly pertinent to this research as the focus of the performance gap is predominately environmental sustainability.

The urgency to change patterns of consumption and ways of living that are environmentally unsustainable has galvanised policy makers in their efforts to change behaviour (Evans et. al., 2012). UK policy has sought to change unsustainable behaviour and patterns of consumption, by focusing on the promotion of *pro-environmental* behaviour and consumption, with individuals or communities considered the agents of change (Shove, 2010). Research in the field of environmental behaviour typically focuses on the individual, emphasising decision-making processes influenced by psychological, emotional or environmental context. Focus is firmly placed on changing behaviour, which is reflected in Jackson's (2005) review of evidence on consumer behaviour "*behavioural change is fast becoming the 'holy grail' of sustainable development policy*" (p.13).

The concept of 'environmental behaviour' has been widely debated, not least as it focuses on one aspect of sustainability: environmental sustainability. Spaargaren (2011) surmises that the conceptualisation of environmental behaviours comprises issues surrounding how:

"...ordinary people deal with environmental matters and in what ways do they perceive, understand, evaluate and manage the connections between their personal lifestyles and routine (consumption) practices on one hand and global environmental change on the other."

(Cohen and Murphy, 2001; Southerton et al., 2004; Jackson, 2006 in Spaargaren, 2011, p.813).

Stern (2000) defines environmental behaviour as “...*behaviour that changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere.*” (p.12).

Stern (2000) suggests that pro-environmental behaviour can be separated into two distinct understandings: “*intent oriented*”, driven by individual values; and “*impact oriented*” behaviour which minimises environmental impact regardless of intent. Kollmuss and Agyeman (2002) maintain that pro-environmental behaviour is intentional and consciously aims to minimise impact resulting from behavioural decisions on the natural world. Nye and Burgess (2008) term such intentional action “...*environmentally responsible behaviour*”.

Environmental behaviour is also considered in terms of practical, ‘lifestyle’ actions and politically motivated actions (Pickerill, 2003; Corning and Myers, 2002). For example, the act of recycling or green consumerism may be considered environmental behaviour motivated by lifestyle or practical considerations, while voting for or supporting political parties or interest groups with specific environmental commitments may be deemed environmental behaviour motivated by political interests (Pickerill, 2003; Corning and Myers, 2002).

UK policy approaches to environmental issues focus on “*fostering environmentally friendly behaviours at the level of households and individuals*” (Evans et.al. 2012, p.114). As such, the focus of policy driven interventions and initiatives frames the problem as individual behaviour and the solution as influencing and persuading individuals to adopt environmental or pro-environmental behaviours (Southerton et.al. 2004). A policy focus on changing behaviour, noted Dolan et.al. (2010) is “*promoted as an attractive alternative to the more established approaches of legislation, regulation, and taxation* (p. 4).”

Based on theoretical understandings drawn from neo-classical economics, behavioural economics and social psychology, interventions in policy fields have shifted from established approaches of legislation and regulation in the 1980’s enforcing behaviour change, to psychological and behavioural economics approaches in the 1990s and 2000’s. However, the

promotion of behaviour change as a cost and time effective solution to encourage pro-environmental behaviour may also explain its popularity amongst policy makers (Wilson and Chatterton, 2011).

Laitos et.al. (2015) suggest that at an individual level there is a failure to “*relate personal consumption choices and infrastructure behaviour to emerging, and growing problems, like climate change, biodiversity loss, natural system destruction, resource depletion and pollution.*” (Laitos et.al. 2015, p.2). This citation highlights the underpinning theoretical approach to change, situated at an individual level. Kollmuss and Aggeman (2002) posit that in targeting ‘behaviour’ a more sophisticated approach is offered than that of paternalistic political instruments. Shove (2010) characterises the translation of behaviour change approaches into policy as an ABC approach “*A stands for attitude, B for behaviour and C for choice*” (p.1274).

This section has provided a brief overview of environmental and pro-environmental behaviour and its translation into UK policy. The following sections consider the theoretical development underpinning behavioural models, where the individual is the central unit of analysis.

3.3 Theoretical development of socio-psychological approaches

As noted in the introductory section of this chapter, over 60 models of behaviour change were identified by Darnton et.al. (2011). It is beyond the scope of this thesis to discuss all behaviour change models in depth, however key theoretical developments will be considered, contextualising the empirical research undertaken in this thesis.

3.3.1 *Economic theories of rational choice*

Theories of economics have driven the development of a number of widely used behaviour change models. The key concept underpinning these models is the economic theory of rational choice: individuals make decisions on the basis of a cost/benefit calculation: the individual’s perceived benefit from undertaking a particular behaviour (Jackson, 2005; Darnton, 2008; Evans et. al., 2012). The availability of information to determine decision making is considered

crucial, it is only in having access to information that individuals will be able to make informed choices. In discussing energy efficiency policy, Mallaburn (2016) cites early examples of 'neoclassical' driven policy, for example the UK's Energy Efficiency Best Practice Programme, designed to overcome perceived barriers to organisational investment. Consumer Preference Theory (Begg et. al., (2003) in Jackson (2005)) suggests four elements which inform the individual's rational choice to adopt a particular behaviour: consumer's available income; cost of goods; consumer's taste or preferences; and assumption of utility maximisation. The underpinning assumption is one of human rationalism, weighing up costs and benefits from an entirely individual perspective. Such an approach is also termed the *homo economicus* model, essentially "*the economic model of humans as inevitable rational maximizers of their self-interest*" (Tversky and Kahnemmn, 1981, in Laitos and Okulski 2015, p.6).

Laitos and Okulski (2015) contend that policy resulting from rational choice models assumes individuals "(1) *have rational preferences, (2) maximise individual outcomes and (3) act independently on the basis of complete information.*" (p.6). As such, many policies are regulatory in nature, for example bans or restrictions; or market driven, for example taxation, incentives, subsidies to compel individuals to change behaviour (Laitos and Okulski, 2015; Kollmuss and Aggeman, 2002).

Economic models of consumer choice can generate predicted behavioural outcomes, however they may also suggest an assumption of what Darnton (2008) terms an "*amoral self...socially isolated individuals acting in pursuit of their own interests*". Christakis and Fowler (2009) hold that framing individuals in these terms is fundamentally flawed, as influencing factors extend beyond self-interest, for example altruistic desires are deemed irrelevant. Wilson and Chatterton (2016) note that the concept of *homo economicus*, the 'idealised man' was not intended as a complete representation of a human being, rather was a "*convenient and parsimonious*" starting point for theoretical development, which may function effectively in isolation but does not take social context into account.

In considering energy behaviours and decision making in the non-domestic sector DECC (2012) concurred with the view that the neoclassical economic model of decision making fails to capture the complexity of organisational behaviour. The clear emphasis on self-interest and rational thought has been widely criticised (Jackson, 2005). As a consequence, in policy terms, models grounded in economic theories of rational choice have increasingly extended their complexity taking into account input from other disciplines such as psychology to overcome limitations.

3.3.2 Socio-psychological models of behaviour change

With foundations in rational choice theory, psychology and neo-classical economics, a wide range of theories and models have developed, suggesting a linear, individualistic approach to decision making and behaviour. In its simplest form (Figure 3.1) this linear decision making and behaviour approach is described as the ABC process: attitude; behaviour; choice/context/constraint (Wilson and Chatterton, 2011).

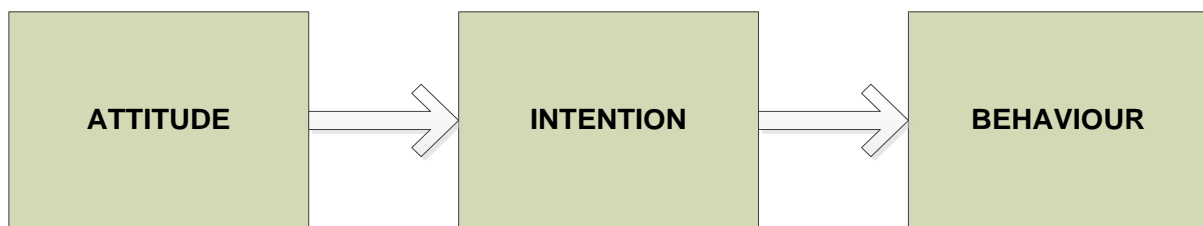


Figure 3.1: Linear model of decision making and behaviour

(Wilson and Chatterton, 2016⁸)

In basic terms, this model assumes that an individual's attitudes are formed by perceptions, beliefs and preferences, which create a rational basis for behaviour (Bamberg, 2003; Darnton, 2008). Attitudes, combined with information provided to the individual, lead to intentions which are then enacted by the individual (Jackson, 2005; Chatterton, 2011). Shove (2010) holds that in the context of promoting sustainable lifestyles, the ABC model aims to persuade individuals to change their behaviour by changing their values and removing barriers to translating those

⁸ Contains public sector information licensed under the Open Government Licence v3.0.

values into action. The implication of this theory is that if a behaviour is not required or does not reap a tangible reward, more difficult, time consuming or costly behaviours are less likely to be dependent on attitudinal factors (Stern, 2000).

Fishbein and Ajzen's Theory of Reasoned Action (1975) provided an early insight into the wider complexity of linear approaches to decision making, suggesting attitudes may predict intention, however it does not follow that predicted actions will follow. Fishbein and Ajzen's (1975) Theory of Reasoned Action subsequently led to the development of the Theory of Planned Behaviour (Ajzen, 1991, TPB, Figure 3.2), to include factors such as perception of control. This model has been widely applied in the context of environmental behaviours as is discussed below.

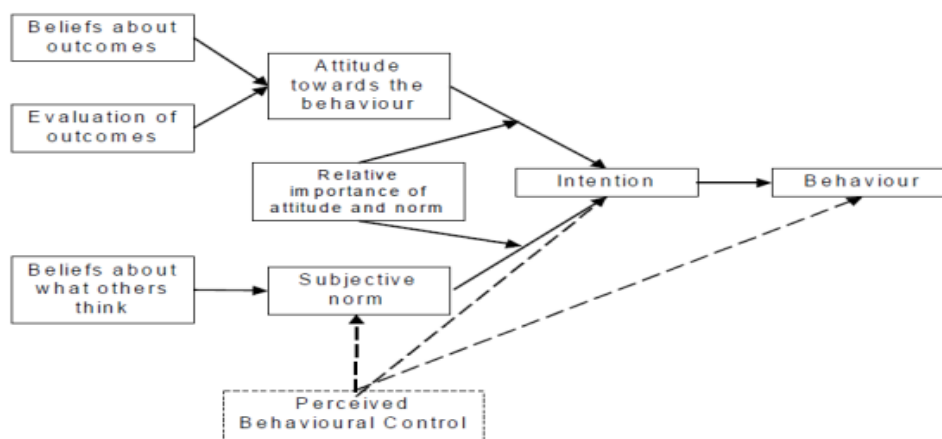


Figure 3.2: Ajzen's Theory of Planned Behaviour

(Ajzen, 1991⁹)

The TPB is one of the most widely applied models of behaviour and has been adapted to studies of recycling, energy use and consumption behaviours (Bamberg, 2003; Knussen et al., 2004; Davis et al., 2006; 2009; Menezes et al., 2012). The TPB is based around three factors:

- an individual's attitudes influence their evaluation of enacting the behaviour;

⁹ Reprinted from Organizational Behavior and Human Decision Processes, 50(2), Ajzen, I., The theory of planned behaviour, p.33, Copyright 1991, with permission from Elsevier.

- the individual's perception of social pressure to enact the behaviour; and
- the individual's perception of their ability to enact the behaviour, their "perceived control" (Davis et al., 2006, p.119).

The underpinning assumption is that behaviour is rooted in rational thought and decision making. To apply this model as a predictive tool for behaviour, it is therefore necessary to understand whether the individual is in favour of undertaking the behaviour, the degree of social pressure they experience in the context of the behaviour and whether the individual feels in control of the action. By identifying and adjusting these predictive factors, Ajzen (1991) contends that the probability of adoption of certain 'desirable' behaviours can be increased. Jackson (2005) noted that the ability to adjust and adapt the TPB, for example the addition of factors such as habit and self-identity, which may explain its longevity.

Francis et. al. (2004) note that the use of the TPB to predict behaviour assumes the behaviour is intentional. Moreover, the importance of context is not considered, which may override cognitive factors (Stern, 2000). The TPB has been used as the basis for more complex behavioural models, which include multiple variables in an attempt to overcome such limitations. One widely used model in the field of sustainable consumption behaviours is Triandis' Theory of Interpersonal Behaviour (TIB, Figure 3.3).

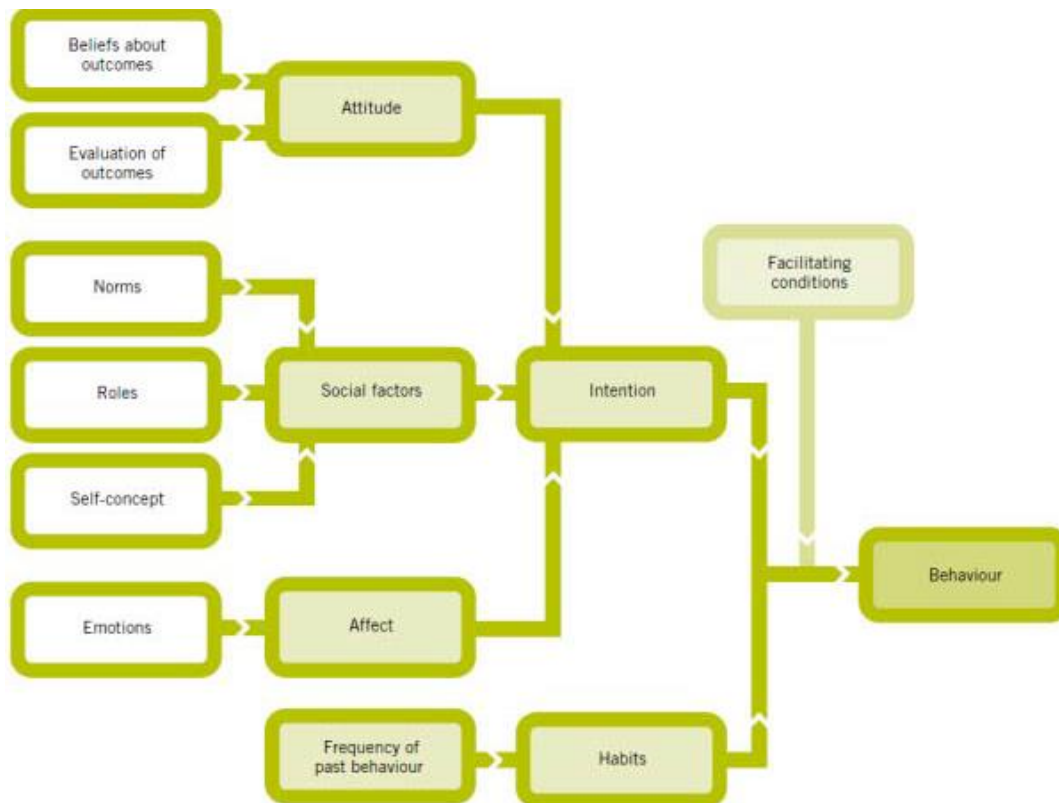


Figure 3.3: Triandis' Theory of Interpersonal Behaviour

(in Chatterton, 2011¹⁰)

The TIB maintains the underpinning assumption that cognitive elements form attitudes, values, beliefs, needs and motivations and that in identifying these elements, behaviour can be changed, however it expands to include contextual and habitual variables. Habits are considered to be actions and routines which are automatic or reflexive, whilst contextual factors such as external barriers or enablers are framed as facilitating conditions (Chatterton, 2011; Hargreaves, 2012).

Cialdini *et.al.* (1991) developed a behavioural model which takes into account morality, values and social norms: the Focus Theory of Normative Conduct (FTNC). The FTNC suggests that individual decision making is made within a powerful context of social norms, dictating the acceptability of actions. Stern *et.al.* (1991) propose the Value-Belief-Norm theory, which

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suggests that values and beliefs combine to create personal norms which influence individual actions. Jackson (2005) notes that while the inclusion of factors such as values, beliefs and norms improves the efficacy of behavioural models in predicting outcomes, the failure to consider issues of habit and social context limit the potential for models to impact on behaviour.

Psychological factors involved in the shaping of intentions are further explored in the field of behavioural economics. Diverging from rational choice theory, behavioural economics draws together both economic and psychological theory (Darnton, 2008). Behaviour is considered to be a result of reflective or automatic systems within the human brain. Reflective systems are where rational, considered decisions are determined; automatic systems allow unconscious or routine behaviours, such as habits. Policy makers in the UK have favoured this approach with the development of MINDSPACE by the Institute for Government (Dolan et al., 2011).

MINDSPACE (Table 3.1) is policy tool for behaviour change, with its foundations in DEFRA’s 4E’s framework which holds that behaviour change should be underpinned by actions to: Enable, Encourage, Engage and Exemplify (Dolan et al., 2011) and in ‘nudge’ techniques including framing, social norming, choice architecture and psychological discounting (Darnton, 2008). Nudge approaches are presented as less paternalistic than traditional approaches to behaviour change. The mnemonic MINDSPACE, outlines nine influencing factors for policy makers to consider when aiming to change behaviours:

Table 3.1: Institute of Government MINDSPACE Approach: Influencing behaviour through public policy
(Dolan et. al., 2011¹¹)

Influences on human behaviour and change	Explanatory notes
Messenger	We are heavily influenced by who communicates information.
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses.
Norms	We are strongly influenced by what others do.
Defaults	We “go with the flow” of pre-set options.

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Influences on human behaviour and change	Explanatory notes
Salience	Our attention is drawn to what is novel and seems relevant to us.
Priming	Our acts are often influenced by sub-conscious cues.
Affect	Our emotional associations can powerfully shape our actions.
Commitments	We seek to be consistent with our public promises, and reciprocate acts.
Ego	We act in ways that make us feel better about ourselves.

The establishment of the Cabinet Office Behavioural Insights Team in 2010 and the House of Lords (HoL) Science and Technology Select Committee Inquiry into “*The use of behaviour change interventions to achieve policy goals...*” (HoL, 2011, page 88) demonstrated the then Government’s commitment to this approach. However the HoL report found a lack of empirical evidence to support positive outcomes of behaviour change strategies at population level (HoL, 2011).

Criticism of a behavioural economics approach has suggested there is a lack of an empirical evidence base and that wider, unintended impacts are not fully considered (HoL, 2011). The ethical implications surrounding paternalism, equity and personal responsibility are raised by Darnton (2008) and Dolan et. al. (2010). Moreover, they raise the issue of unintended ‘spillover’ effects.

Shove (2010) contends that MINDSPACE offers a universal model, which can be successful in certain contexts, for example the rewording of a tax letter, however it is unlikely to provide significant change in, for example, car ownership. MINDSPACE can be considered to provide a more holistic approach to behaviour change, however the individual remains the focus of action and change (Shove et. al., 2012).

The above approaches place the individual at the centre of analysis. Increasingly complex variable factors are integrated, from linear models seeking to address an information deficit (Burgess et. al., 2003): better informed individuals make (desired) rational choices and adapt beliefs and values which, in the context of sustainability lead to pro-environmental behaviours,

models such as the TIB and the MINDSPACE framework which take into account wider contextual factors and techniques such as social marketing which may create new social norms to motivate pro environmental behaviours (DEFRA, 2008; Hargreaves, 2012).

Stern (2006) contends that a useful behavioural model must incorporate:

1. Motivational, attitudinal and value driven factors;
2. Contextual and situational factors;
3. Social norms and influences;
4. Individual capabilities; and
5. Individual and social habits.

Darnton (2008) however, posits that the vast and complex models framing motivations and decision making as part of a holistic and integrative approach are challenging in their application.

From a policy perspective, Al-Saleh *et.al.* (2015) suggest that behavioural 'green policy-instruments' can be categorised into carrot, stick and sermon approaches. For example Energy Saving Obligations, Mandatory Building Codes, Fuel/Carbon taxation, congestion charges may be considered paternalistic, whilst tax credits, grants and loans are enticing 'carrots' and provision of information, eco-labelling and sustainability awareness campaigns could be termed 'sermons'. Considering policy instruments in this way highlights the underpinning rationale that individual behaviour can be changed if the correct policy instrument is applied. Shove (2010) contends that behaviour change sits within wider policy strategy and is considered narrowly. Fudge and Peters (2011) observe an increased awareness within government of the limitations of "behaviour change objectives alone", using as an example the Big Society initiative where agency is shifted away from the individual.

Walker *et.al.* (2016) hold that the positioning of sustainability within policy is inherently problematic. Energy and waste policies for example, target conspicuous consumption; energy

management and waste processes. The myriad of domains where such resources are consumed inconspicuously are not targeted.

Having considered the key theoretical approaches in the field of behaviour change, the next section discusses the variables incorporated into models which may impact on environmental behaviour.

3.3.3 *Knowledge, values, emotions and attitudes*

The concept of a knowledge deficit is central to behavioural models grounded in theories of rational choice. Rowlands (2000) demonstrated a significant correlation between climate change knowledge and action to minimise greenhouse gas emissions. Cole (2005) suggested a lack of 'urgency' to change behaviour in light of evidence of human impact and resource use can be explained by a number of factors including the interpretation of information through individual values, bringing inherent bias to bear on any form of action.

Bord *et.al.* (1998) found a link between climate change knowledge and support for environmental policies. However, the correlation between knowledge and behaviour is widely debated, with many scholars noting little or no connection (Fliegenschnee, 1998; Grob, 1995).

Attitudes are also held to provide a key to predicting and understanding behaviour. Schultz *et.al.* (2004) define environmental attitude as "...a collection of beliefs, affect and behavioural intentions a person holds regarding environmentally related activities or issues" (p.31).

Attitudes are split into three concerns in this context: egoistic, altruistic and biospheric (Schultz *et.al.* 2000). Bamberg (2003) outlines the research into the attitude-behaviour relationship developed in the 1980s and driven by the understanding that changing and diffusing pro-environmental attitudes would lead to widespread pro-environmental behaviours. The identification of attitudes has largely been undertaken by means of questionnaires. A number of studies identified a correlation between environmental attitudes and behaviour including links to environmental consumption behaviours (Schelgelmilch *et.al.*, 1996), energy consumption (Brandon and Lewis, 1999) and environmental impact minimisation behaviours

(Chan, 1998). Deuble and de Dear (2010) identified a correlation between occupants' tolerance of varied levels of comfort in sustainably designed buildings, for example naturally ventilated buildings, and high levels of environmental concern.

Models such as the Theory of Planned Behaviour (Figure 3.2 above) included attitudes as a key determinant in predicting behavioural outcomes. Moreover, values and emotion have also been found to correlate with environmental behaviours. Environmentalists were more likely to hold altruistic values (Karp, 1996), and to demonstrate non-materialist values (Gilg *et.al.*, 2005). Jackson (2005) proposes potential for attitude-behaviour relationship to move beyond a linear, causal relationship. In this context, 'spillover' effects may be derived from a more circular relationship, that is, sustainable behaviours may lead to a change in attitudes towards sustainability. However, empirical evidence to support this contention is limited (Jackson, 2005).

Shove (2003) posits that a focus on understanding and changing environmental attitudes diverts attention from the dynamics of social practice which underpin the rising environmental impact of consumption. Kollmus and Agyeman (2002) found a correlation between environmental awareness and mobility, for example they found that the more individuals care about environmental issues, the greater the incidence of regular driving. This was not found to be a result of a causal relationship, rather wider issues of affluence, social mobility and mobility, that the bundle of practices through which affluent lifestyles are enacted, involves higher levels of personal mobility (Welch, 2016).

Bamberg (2003) posits that general environmental attitudes can be linked to fewer than 10% of specific environmental behaviours, that it is specific environmental attitudes which may predict behaviours. However, as noted by Bamberg (2003) and Jackson (2005) such a nuanced approach reduces the utility of the attitude-behaviour relationship as each specific pro-environmental behaviour must account for numerous attitudinal variables. Resultantly, such models are less useful (Hargreaves, 2012).

This may in part be explained by Blake’s Value Action Gap (Blake, 1999), which essentially contends that attitudes are not necessarily borne out in action, for example a pro-environmental response in a survey may not accurately reflect behaviour *in situ*. This disconnect between attitudes and behaviour is presented in the context of environmental concern in Figure 3.4 below. Kollmuss and Agyeman (2002) suggest that there may also be methodological issues where measured attitudes and values may be far wider than measured behaviours and actions.

Darnton (2008) notes the role of emotions within attitude-behaviour relationships, “...attitudes are formed based on the emotional response to the behaviour not on the target attribute of the behaviour itself.” (Slovic [2002] in Darnton, 2008 p.24). Kollmuss and Agyeman (2002) cite Grob (1991) who found that a strong emotional reaction to an issue increased the likelihood of actively engaging with the issue. Kollmuss and Agyeman (2002) go on to propose emotional strategies inhibiting action: denial, delegation and distancing. Lewin (1951 in Darnton, 2008) suggests a link between emotion and habit, for example emotion generating a change of habit.

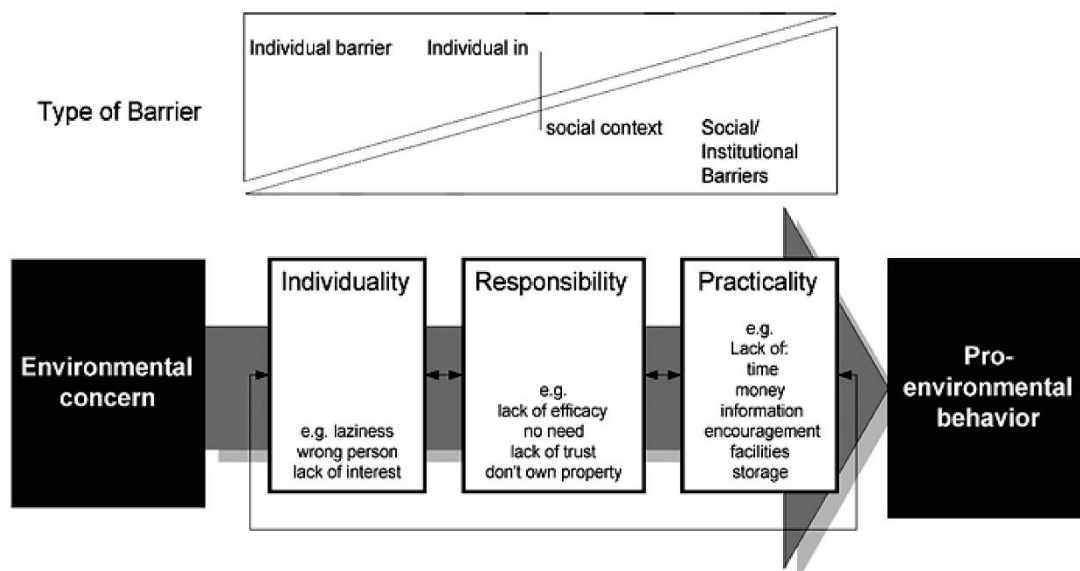


Figure 3.4: Barriers between environmental concern and action

(Blake, 1999¹²)

Blake posits that individuality, responsibility and practicality are barriers to pro-environmental behaviour. Darnton (2008) notes that these barriers are found within many socio-psychological models of behaviour as determining factors.

In attempting to understand the value-action gap, a number of theoretical approaches have developed, including incorporating wider contextual factors into theoretical frameworks such as social norms (Ajzen, 1991) and knowledge (Arbuthnot and Lingg, 1975). Kraus (1995) suggests that attitudes developed in line with individual values are likely to prove more robust. Kollmuss and Agyman (2002) however, surmise that an explanation or enabling framework remains widely contested. Gough (2002) contends that the difficulty of understanding the value-action gap lies in more fundamental methodological and epistemological issues such as ineffective reflection on the role of the researcher in formulating key characteristics of environmental behaviour. Such fundamental issues and their implications for this research are discussed in section 3.5 below.

Having considered some of the literature surrounding knowledge, values, emotions and attitudes, it is clear that relationships to behaviour change are highly contested. Approaches aiming to fill perceived information deficits, influence environmental attitudes and underlying factors such as values and emotion, underpin much of current behavioural policy. The following section provides an overview of agency and control variables.

3.3.4 Agency and control

Darnton (2008) defines agency as “*an individual’s sense that they can carry out an action successfully, and that the action will help bring about the expected outcome.*” (p.18). In the context of socio-psychological models, the individual is considered as the active agent of change. Ballard and Ballard (2005) suggest that the individual agent must believe that his action will effect change. Darnton (2008) notes that a malaise amongst the public in matters

¹² Reprinted with permission from Taylor and Francis.

of climate change is the outcome of a lack of agency, a lack of belief that individual action will have a positive impact and that responsibility for change lies at institutional level. Bickerstaff (2004) notes that power and status are embedded in the concept of agency. Agency, suggests Eden (1993) may precede a sense of individual responsibility or moral obligation to act.

Efficacy is characterised in Ajzen’s TPB (1991) as Perceived Behavioural Control, where individuals perceive ‘ease or difficulty’ of undertaking an action or behaviour. Kollmuss and Agyeman’s (2002) Model of Pro-Environmental Behaviour (Figure 3.5 below) includes a recognition of control factors, as dispositional factors reflecting low or high agency. This can be deemed particularly relevant in the context of sustainably designed office buildings, where perception of control over what may be a complex technical building, may be felt by occupants to be minimal or nil (Ucci, 2010).

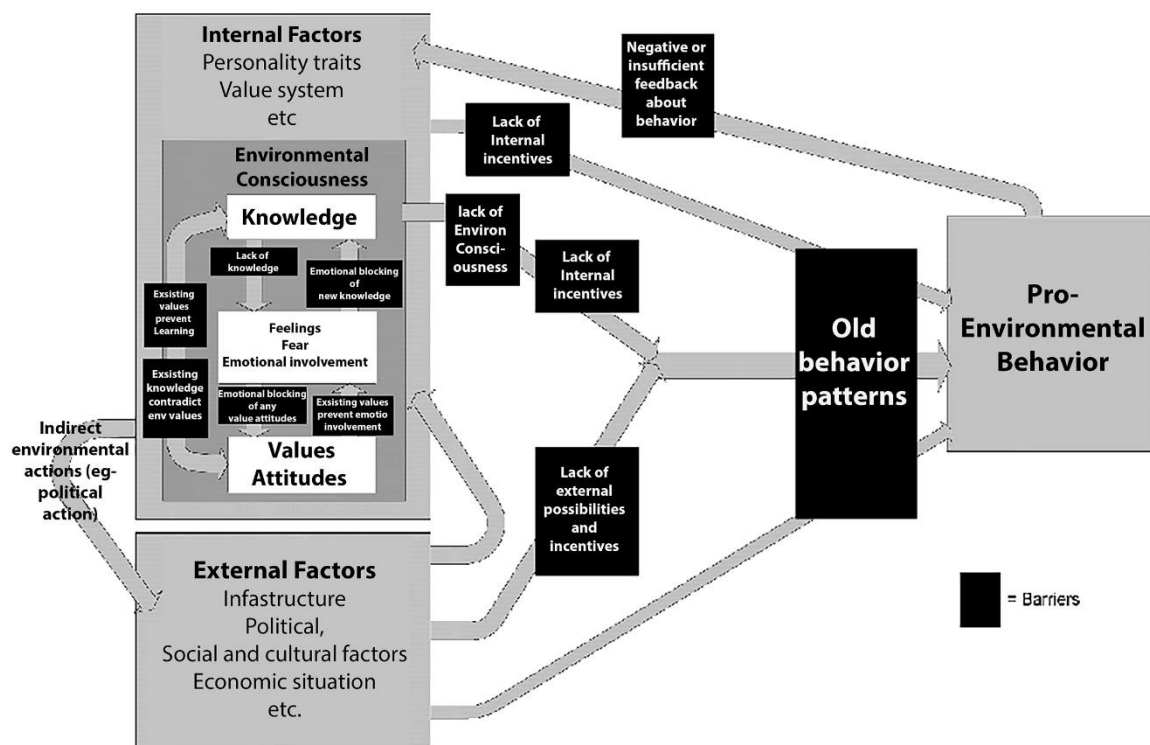


Figure 3.5: Model of pro-environmental behaviour

(Kollmuss and Agyman, 2002¹³)

The next section considers the variables of habit and routine.

3.3.5 *Habit and routine*

Habit and routine are widely recognised as determinants of behaviour. In their 2011 report 'Habits Routines and Sustainable Lifestyles', the Department for Environment, Food and Rural Affairs (Defra) acknowledges the significance of habits within the context of sustainability:

"Habit is especially important in the context of advancing sustainability, as many behaviours with the biggest environmental impacts are habits." (p.2)

Stern (2000) concurs that *"Many environmentally significant behaviours are matters of personal habit or household routine...and are rarely considered at all"* (p.410)

Numerous definitions of habits exist in literature. Triandis (1980 in Bamberg and Schmidt, [2003] in Darnton et.al., 2011) defines habit as *"...situation behaviour sequences that are or have become automatic...The individual is not usually 'conscious' of these sequences."* (p.23).

For Darnton et.al. (2011), three establishing characteristics must be present for a habit to be so-defined, *"...frequency, automaticity and a stable context."* (p.25). In this definition, it is significant to note that habit is not merely a repetitive behaviour driven by past actions, it must exist within a stable environment.

This understanding of habit is reflected in Triandis' Theory of Interpersonal Behaviour, which provides a pathway from habit directly to behaviour. The importance here is the exclusion of motivating or contextual factors influencing deliberative, rational decision making processes. Darnton (2008) describes habit in this context as *"...heuristic...minimising the cognitive load to make frequently-repeating decisions."* (p.23).

¹³ Reprinted with permission from Taylor and Francis.

Darnton et.al. (2011) suggest that habitual behaviour, undermines traditional incentives, aiming to influence behaviour through for example, filling information deficits or incentivising behaviour. Studies undertaken by Ajzen (1991) and Verplanken et.al. (1998) found that where habits dominate, intentions lose relevance.

Proposed policy interventions targeting habitual behaviour include goal setting to aid in the establishment of new habits, targeted intervention at moments of disruption (e.g. changing job, moving house) and targeting routine practices (Darnton et.al., 2008). Of note in the policy approaches advocated, is the proposition that such interdisciplinary approaches should be used subject to the context (Chatterton et.al. 2011, Darnton et.al.2008). However this may be considered at odds with leading practice theorists (e.g. Shove, 2010).

Having considered multiple determinants of behaviour change models, the following section provides a brief overview of strategies to facilitate or promote sustainable behaviour.

3.4 Sustainable behaviour strategies

The variables discussed in the preceding sections have impacted on strategies aimed at changing behaviour which Steg and Vlek (2009) categorise as informational and structural. Informational strategies implement initiatives based around changing perception, knowledge and understanding, social norms, in other words, motivational factors. Structural strategies focus on contextual factors such as economics, availability or encourage alternative behaviours. Ucci (2010) posits that behavioural change initiatives share many of the characteristics of social marketing campaigns, namely: “(i) *the identification of the target behaviour*; (ii) *the examination of barriers and motivations for those behaviours (including, if suitable, segmentation of the target audience)*; (iii) *the development of an intervention strategy*; (iv) *pilot*; (v) *measurement and evaluation*” (McKenzie-Mohr, 2000 in Ucci, 2010 p.178).

Cameron (2011) suggests that the shift towards sustainable buildings and organisations lies in the ability of organisations to successfully change employee behaviour:

“The role of the HR manager can only go so far and at some point people need to start taking responsibility for their own actions in the workplace. It is employees that keep their computers running, run the taps, forget to switch off the lights, print out, bin instead of recycling, drive to the business meeting and so on. It is employees who can help control costs, protect your business and ensure your sustainability. But they need to be in the right mindset and have permission to make decisions based on your environmental and sustainability objectives, as well as your financial targets.” (p.3).

In 2015, the BCO proposed a ten point checklist to improve the relationship between office building owners, occupants and managers. Greene et.al. (2014) contend that in order to meet environmental commitments organisations must:

“...develop more environmentally sustainable business practices...create more environmentally sustainable workplaces and work styles requiring less energy and resources.” (p.439).

Cameron (2011) proposes a model to target individuals within the organisational hierarchy (figure 3.6).

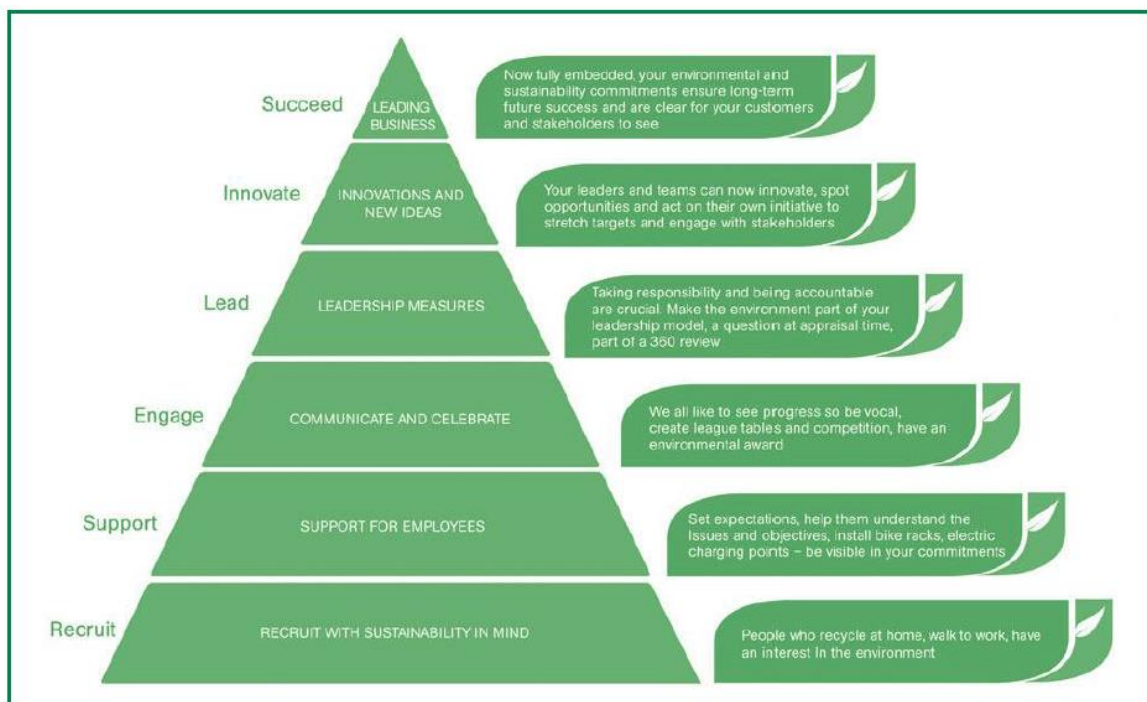


Figure 3.6: Organisational hierarchy and pro-environmental behaviour

(Cameron, 2011) ¹⁴

In terms of building performance, a number of behaviour change innovations were utilised in the first BREEAM accredited office building in England (BDP, 2009; Spinks, 2015). This included the installation of video technology on each floor of the office building which aimed to educate occupants about sustainability features and ensure their engagement with relevant sustainable behaviours (Spinks, 2015).

Dantsiou's (2015) study of CO₂ feedback initiatives in commercial office buildings, focusing on thermal comfort, highlighted an initial lack of engagement with feedback systems from building users. Dantsiou found this resulted from overly technical feedback information provided, a lack of clear motivating factors and attitudinal distinctions between domestic and non-domestic work environments. The inclusion of insights from social practice theory in the study, led to identification of the collective shaping of practices, for example, comfort practices were collectively shaped in order to minimise conflict. Conclusions drawn from the study supported the assertion that the provision of information, though undertaken using technologically advanced systems such as real time feedback, failed to changed behaviour effectively. The role of social dynamics and infrastructure must be considered if such initiatives are to succeed (Dantsiou, 2015).

In their 2011 study van de Wetering and Wyatt suggest a number of energy reduction behavioural interventions undertaken by organisations occupying office buildings including:

- Nightly 'switch off' undertaken by security personnel;
- Nightly 'switch off' undertaken by environmental champions, leaving reminders for staff who failed to switch off;

¹⁴ Reprinted from Strategic Direction, 28(1), Cameron, A. A sustainable workplace—we're all in it together, Copyright 2011 with permission from Emerald Publishing.

- Shared contractual obligations and savings between outsourced contractors and occupants;
- Green leasing arrangements;
- Travel plans;
- Video and teleconferencing facilities;
- Sub-metered electricity;
- External carbon offsetting;
- ISO 140001 certification;
- Establishment of environmental champions;
- Cycle to work schemes;
- Daylight sensors; and
- Automatic shutdown for equipment.

However initiatives were subject to subversion or contradiction. For example, IT services providers requiring computers to be left on overnight for software updates or travel plans skewed by inconvenient office locations.

The House of Lords (2011) report suggested that interdisciplinarity of approaches is central to future behaviour change policy (Table 3.2 below), focusing on the provision of a suite of interventions, for example regulatory and non-regulatory.

Table 3.2: Table of behavioural Interventions
(House of Lords, 2011¹⁵)

¹⁵ Contains public sector information licensed under the Open Government Licence v3.0.

TABLE 1

Table of interventions

	Regulation of the individual		Non-regulatory and non-fiscal measures with relation to the individual							
			Choice Architecture (“Nudges”)							
Interventions category	Eliminate choice	Restrict choice	Guide and enable choice							
			Fiscal disincentives	Fiscal incentives	Non-fiscal incentives and disincentives	Persuasion	Provision of information	Changes to physical environment	Changes to the default policy	Use of social norms and salience
Examples of policy interventions	Prohibiting goods or services e.g. banning certain drugs	Restricting the options available to individuals e.g. outlawing smoking in public places	Fiscal policies to make behaviours more costly e.g. taxation on cigarettes or congestion charging in towns and cities	Fiscal policies to make behaviours financially beneficial e.g. tax breaks on the purchase of bicycles or paying individuals to recycle	Policies which reward or penalise certain behaviours e.g. time off work to volunteer	Persuading individuals using argument e.g. GPs persuading people to drink less, counselling services or marketing campaigns	Providing information in e.g. leaflets showing the carbon usage of household appliances <i>*Regulation to require businesses to use front of pack nutritional labelling, or restaurants to provide calorific information on menus</i>	Altering the environment e.g. traffic calming measures or designing buildings with fewer lifts <i>*Regulation to require businesses to remove confectionery from checkouts, or the restriction of advertising of unhealthy products</i>	Changing the default option e.g. requiring people to opt out of rather than opt in to organ donation or providing salad as the default side dish	Providing information about what others are doing e.g. information about an individual's energy usage compared to the rest of the street <i>*Regulation to require energy companies to provide information about average usage</i>

Note: * Demonstrates how regulation of businesses might be used to guide the choice of individuals, thus distinguishing it from regulation which restricts or eliminates the choice of individual.

Having reviewed relevant sustainable behaviour strategies, the following section will discuss the concept of design for sustainable behaviour.

3.4.1 Design for sustainable behaviour

Design for sustainable behaviour (DfSB) has been identified as an emerging field of research which has sparked debates around the achievement of a reduction in resource use through sustainable design and supporting environmental policy (Kuijjer and Baker 2015). Bhamra et.al. (2011) define DfSB as: “*exploring how design (in the broadest sense) can influence user behaviour to reduce the social and environmental impacts of products during use*” (p.430). Wever et.al. (2008) emphasise the underpinning aims of design strategies, “[designing] *products in such a way that unsustainable behaviour is made difficult or impossible, while sustainable behaviour is made easy or easier, or even automatic*” (p.220). In the context of sustainably designed office buildings, the relevance of this approach can be asserted, with building design and fit out aiming to support, encourage or script behaviour to enable sustainability.

Moreover, a segmentation approach, often associated with the fields of marketing and social marketing, is applied to the analysis of ‘users’ in DfSB. “*Positive users*” (Zachrisson et.al.

(2012) are those who intend to act sustainably; this could be considered in line with environmental values discussed in Chapter three (section 3.3.3.). Zachrisson *et.al.* (2012) suggest that building design should facilitate the 'good' intentions of these users, with efficient and accessible systems and design. The second group of users identified are those not engaged with sustainability debates, who are disinterested. Bhamra *et.al.* (2011) propose that design strategies should focus on persuasion to act sustainably and understand the impact of their actions. This strategy aligns with theories of rational choice and also values discussed above, that in filling information deficits and shifting values sustainable behaviours will be enabled. The final group of users identified are those resistant to persuasion. The suggested strategy in this instance is one of automation, removing agency from individuals and providing technological solutions, for example automating lighting. Latour (1992) describes this as a process of delegating agency.

Kuijjer and Bakker (2015) cite research undertaken by Elias *et.al.* (2007, 2009a, 2009b in Kuijjer and Bakker, 2015) on improving refrigeration efficiency. A number of product design strategies were undertaken to reduce energy consumption, targeting the relationship between product and user. This included audio signals to encourage door closing when the fridge door was open, 'lock-in' locations of food groups to reduce time taken to find products according to assumptions around user consumption, transparent fridges and boxes containing common items. However the potential for DfSB to achieve sufficient reductions in resource use has been widely debated, with many criticisms levelled at the approach similar to those levelled at behaviour change approaches.

Firstly, change observed resulting from DfSB may be limited in timespan, results may only be evident for the life of the intervention. This assertion is very much in line with the criticism levelled at cognitive behavioural change approaches (Shove, 2010; 2003). Kuijjer and Bakker (2015) suggest that the problem is framed around design and technological solutions, and does not take into account the long term development of products and users. Reframing the problem in practice theory, would bring focus to the trajectories of practices and dynamic

interrelationships between technology, understandings and competencies, as is discussed in detail below.

Shove (2003) discusses the change in understandings around cleanliness over time, showering, for example, no longer simply provides a means of basic cleanliness but is an indulgent and luxurious practice which carriers (of practice) perform once or several times a day, depending on wider networks of practice. Kuijer and Bakker (2015) posit that “...*a focus on specific actions tends to isolate specific situations and metrics: energy saving achieved runs the risk of disappearing in larger trends.*” (p.222). This can be highlighted in considering the technological evolution of office life. Computers, which are a significant contributor to small power load energy use in offices, simply did not exist 40 years ago.

The second limitation of DfSB is one of unintended consequences. In targeting specific changes in behaviour, negative spillover or subversion may take place. Verbeek and Slob (2006) suggest that users may *resist* DfSB, for example subverting heating and ventilation systems by the use of desk fans and heaters. Zachrisson et.al. (2015) note the underpinning assumption of a continuation of the *status quo*, assumptions that those baseline standards set will continue to be acceptable. Moreover, the issue of spillover effects is also raised, for example, as discussed above, the provision of instant hot water for showering may lead to an increase in showering practices and by implication resource use, evidence of the ratcheting effect (Shove et.al. 2008).

Brynjarsdottir et.al. (2012) propose that the use of sustainable design and technology implies a code of *correct* behaviour, “[technology is a seemingly] *objective arbiter over complex issues of sustainability*” (p.947). Designers in this context make unilateral decisions around sustainable behaviour, and unsustainable behaviour occurs only when a product is used incorrectly or unnecessarily (Blevis, 2007). Ellison et.al. (2007) suggest that occupants must adapt to the changing practices to be undertaken in sustainably designed buildings in order to fully benefit from energy efficiency features. Such narrow definitions are based on average consumption patterns (Kuijer and Bakker 2015). Moreover, note Kuijer and Bakker (2015), not

only are codes of behaviour unilaterally established, but behaviours deemed *sustainable* remain unchallenged. The example of tumble drying is cited, as the convenience of tumble drying laundry is assumed to be a necessity the need to dispense with line drying is not questioned. Shove and Southerton (2000) propose that issues of consumption are far more complex than this narrow understanding and are tangled up with daily life. In reducing complexity to such narrow definitions, opportunities for change are missed.

Wider opportunities for change, note Kuijer and Bakker (2015) may be missed in DfSB approaches. The focus for analysis or intervention is placed squarely on designers or consumers/users/occupants. Social and cultural context and agents are not considered as offering scope for change. Brynjarsdottir et.al. (2012) suggest that DfSB approaches “...*tend to neglect the need for change at other scales beyond the individual consumer.*” (p.952). Kuijer and Bakker (2015) cite the example of refrigeration, where focus for energy efficiency is placed on the technology and user, *not* on the food industry, regulatory context surrounding best before dates, the cookery industry, fridge location and so on.

Throughout this brief discussion of the limitations of DfSB, clear links can be identified between socio-psychological theories of behaviour change and DfSB. Such an approach, therefore, shares inherent flaws and may not bring about sufficient change in resource consumption to respond and adapt to climate change. Kuijer and Bakker (2015) propose that DfSB aligns with the concepts underpinning “...*user-centred design (Norman, 1986) which have become widespread in design research, education and professional practice over the last decades*” (p.225).

3.5 Implications for research

Having reviewed literature relating to behaviour change approaches, a number of key issues can be drawn out, which have informed and shaped the research questions and methodology. Firstly, it is clear that placing the individual as focus of analysis continues to dominate climate change mitigation strategies. A myriad of models and theories of behaviour have emerged, underpinned by this focus. Moreover, technological advancement may suggest that initiatives

will move from changing behaviour to the automation of behaviour through smart devices. This shift, however, arguably supports unsustainable practices which may ultimately prove untenable.

There is little consensus as to how individual environmental behaviour should be understood and interventions designed. Factors relating to internal, cognitive processes and those taking into account external structures and social contexts are considered, however the successful application of interventions based on socio-psychological approaches to changing unsustainable behaviour remains contentious. Moreover, as noted, the impact of habits and routines, which may negate individual, deliberative decision making is excluded from much of the literature. A central unresolved question involves the emerging field of social research, within which social practice theory has become more widely recognised. Whilst there is a recognition both in academic and political circles that socio-psychological approaches may fail to successfully increase the occurrence of pro-environmental or sustainable behaviour (Shove, 2010; Darnton et al. 2008), there is limited empirical work surrounding the implications of socially driven approaches. The implication here, is that there is a need for further research which moves away from models or frameworks, favouring the analysis of the individual as focus.

Those wider institutions involved in offices and impacting on those practices office occupants are engaged in, are not addressed. Shove (2010) notes that individualistic models consider 'needs' of individuals as fixed and "*fail to capture vital processes of social change*" (p.8). Wenger (1998) notes that all action, whether undertaken by an individual or as part of a social group, is fundamentally subject to the influence of social norms. In questioning the *status quo* more radical opportunities for change are revealed and the focus of intervention is not placed on individual agents.

Many of the approaches and models reviewed also fail to reflect dynamic processes implicated in sustainable behaviour. These implications have shaped the research questions and methodology of this thesis.

3.6 Chapter summary

The section above has provided an overview of key variables considered in literature to impact on behaviour, and more specifically environmental behaviour. Both social and contextual factors have been discussed, and the acknowledgement of the role of habit and routine on behaviour considered.

In the context of environmental behaviour, individualistic approaches are underpinned by the contention that the solution to changing behaviour is to influence and persuade individuals to adopt more pro-environmental ways of living (Southerton et. al., 2004). Moreover, there is an underlying assumption that behaviour is deliberative and individuals have the capacity to achieve change (Welch, 2016). Munasinghe et. al., (2009) contend that interventions based on ABC principles (where a linear relationship is assumed between attitude-behaviour-choice), have not led to the scale of social change required to respond to climate change challenges. Ucci (2010) describes assumptions around occupant behaviour in relation to building design are “*often based on a generic and simplistic understanding of occupants’ psychology and needs*” (p.175). Moreover, the contextual factors which shape social processes and may override any cognitive decision making may not be fully considered by these approaches (Hargreaves, 2012; Spaargaren, 2011; Shove et.al., 2012).

As has been discussed in this chapter, there is a clear focus on ‘environmental behaviour’ but how can individuals be better understood, in terms of their own values and beliefs and through processes of rational decision making through to understanding individual habits and social context? It has been argued that the very focus on ‘environmental behaviour’ is problematic. It can polarise understandings and as such opportunities for change towards more sustainable futures. Conventional behaviour change strategies assume that individuals have the means to achieve change and that behaviour change itself is deliberative. Attempts to change or steer environmental behaviour are grounded in the conceptualisation of behaviour as a static entity with set characteristics, rather than a dynamic process.

The following chapter considers alternative approaches to understanding behaviours grounded in sociological theory, offering a very different framing of occupants. Welch (2016) succinctly notes:

“From a social practice perspective, [individualistic models] structurally overestimate the role of choice in routine behaviour and fundamentally underestimate the extent to which individuals’ autonomous action is constrained by infrastructures and institutions, by collective conventions and norms, and by access to resources: social, cultural and economic” (p.240)

Chapter 4: Social approaches to understanding practices

4.1 Introduction

Chapter three sought to outline approaches to sustainable behaviour grounded in individualism. The limitations of these approaches and the strategic implications for concepts such as DfSD have been discussed. Dolan (2002) criticises the static nature of individualistic approaches which fail to take into account wider contextual factors, including the inherent social nature of the world individuals inhabit. The criticisms levelled at individualistic approaches have supported the development and attention given to social approaches to sustainable consumption and resource use. Spaargaren (2003) notes:

“If we contextualize the norms and environmental behaviors of individual human actors, we not only move away from overly individualistic accounts of environmental change, but at the same time open up a new research agenda for environmental sociology in studying environmental change from a life-world perspective.” (Spaargaren, 2003, p.691)

Theories of social practice have emerged as alternative means by which to conceptualise and frame human activity. Practice theories shift focus from placing the individual as the central unit of analysis with a concept of behaviours as predictable outcomes, to wider, cultural and contextual analysis. The complexity of consumption is deconstructed by examining the dynamic relationships between materials and practices (Reckwitz, 2002).

This chapter explores social approaches within the context and developing framework of this research. Section 4.2 considers alternative approaches to methodological individualism. Sections 4.3 to 4.7 provide an overview of social practice theory. The final section considers the implications and value of practice based approaches to this study. It should be noted that whilst this section provides an overview of relevant literature, it is not considered definitive.

4.2 Alternative approaches

The dominant individualist paradigm seeks to place responsibility for change with the individual (Spaargaren and Mol, 2008; Shove *et al.*, 2012). Spaargaren and Mol (2008) argue

that whilst the application of such individualistic models in the context of sustainable behaviour has led to an increased awareness of environmental issues, it has proved problematic in its translation to action. A number of alternative approaches have developed following the recognition of the limitations of conventional, behaviour change approaches.

4.2.1 *Systemic approach: institutional actors, physical and environmental determinism*

The systemic paradigm is considered by some scholars to have developed in response to criticism of individualist models (Spaargaren and Mol, 2008). This approach removes individuals from policy making considerations and focuses on wider institutional actors such as organisations, companies and local authorities. The paradigm relies on the principles of physical and environmental determinism, that in providing the physical environment, infrastructure and technology in line with stringent regulation, it will follow that sustainable behaviour is inevitable (Van Vliet et al., 2005).

This approach is criticised for the lack of consideration given to individuals and their capabilities and to the dynamics of social life (Spaargaren, 2011; Shove et al., 2012). What is termed the agency-structure debate has emerged in response to the wide range of behaviour change research and literature, highlighting the limitations of both the individualist and systemic paradigms.

4.2.2 *Socio-technical systems*

Socio-technical systems were highlighted as a means of understanding connections between social systems and modern technology in the 1980's. Hughes demonstrated the significant social change which followed the electrification of Western society (Hughes, 1983). Guy and Shove (2000) undertook an analysis of the building industry drawing attention to the role of "*non-human actors (technologies, infrastructures)*" (p.7). Socio-technical approaches have since attempted to understand the dynamics of technology and human action (Strengers and Maller, 2009) have been increasingly applied to the study of the built environment. Geels (2005) suggests an inextricable link between technology and the social world:

“...it is only in combination with social organisation and structures that technical building design fulfils a purpose in a specific time and place...” (Geels, 2005, in Watson, 2008, p.1000). Such theoretical underpinning supports the contention that building occupants are active consumers of technology (Rohracher, 2001). In this context the need for understanding of building technology is crucial in order for effective engagement with design intent.

Geels’ (2004) multi-level perspective model (figure 4.1) is widely cited in the field of socio-technical transitions. The model frames technology in terms of its co-evolution with regulation, ‘users’ and markets, and illustrates the development and normalisation of new configurations (Shove et. al. 2015).

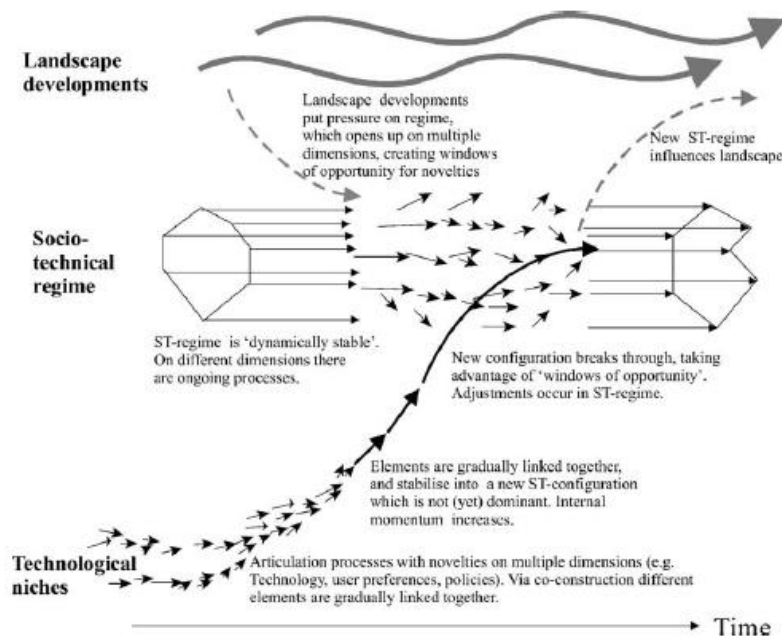


Figure 4.1: A dynamic multi-level perspective on system innovations

(Geels, 2004, p.915¹⁶)

Guy and Shove (2000) contend that policy responses framed in this way may be viewed as distinct, responding to technical and behavioural issues in isolation. This disconnect, argue

¹⁶ Reprinted from, Research Policy, 33(6/7), Geels, F.W., From sectoral systems of innovation to socio-technical systems, Copyright 2004, with permission from Elsevier.

Stengers and Maller (2011) fails to recognise the role technology may have in “*Moderating, effecting and scripting [behavioural] responses*” (p.156). Moreover, contradictory strategies may emerge. Stengers and Maller (2011) recognise “...*socio-technical studies have demonstrated that technology and social systems are intricately connected.*” p.157.

4.2.3 *Theories of consumption*

Theories of consumption, when framed in terms of sustainability, focus on the attempt to reduce the environmental and social impacts of consumption. Termed ‘sustainable consumption’, this may be enacted through for example, reduced or more sustainable forms of consuming or increased efficiency of consumption (Hinton and Goodman, 2009). Sustainable consumption is also concerned with supporting environmental and social causes, for example fair trade.

Sustainable consumption extends from government and organisational level to individual consumption decisions. Seyfang (2006) terms individuals purchasing ethical and environmental products as ‘ecological citizens’.

Hobson (2006) suggests that sustainable technological and material developments, for example low energy lightbulbs and shower timers, are implicated in the construction of the “*eco-modernisation project*” (p.318). Moreover, such materiality allows the visible demonstration of self-identifying sustainable consumers (Hinton and Goodman, 2009). The promotion of ethical and sustainable products aims to persuade consumers to develop ‘ecological citizen’ identities through everyday consumption decisions.

In terms of individual choice, Shove (2003) asserts that “...*consumers are positioned as ‘key switches’ in the environmental system.*” (p.3). In the context of consumerism, the individual’s motivations are placed at the centre of analysis and intervention points. This may include the use of persuasive social marketing or more conventional policy instruments such as regulation or taxation.

Southerton *et al.* (2011) reviewed 30 policy interventions to promote sustainable consumption and found a common aim to “...*change the behaviour of autonomous consumers – whether by providing economic incentives, correcting informational efficiencies, seeking to reframe attitudes, or removing the barriers* [to individual behaviour change].” (p.118). Those interventions which considered wider issues of social context were found to achieve greater levels of success.

Financial and technological policy measures have been adopted with the aim of shifting consumption behaviours (Dantsiou, 2015). For example, the installation of smart meters in the UK, providing energy feedback to users is set to be widely adopted in the UK with around 23 million homes and two million business installing smart metering devices by the end of 2020 (DECC, 2013). The policy aims to reduce consumption through increased information provision and personal responsibility.

Spaargaren and Mol (2008) and Spaargaren (2011) argue that the majority of interventions and policies to promote sustainable consumption are underpinned by the individualistic paradigm. Increased environmental awareness has not led to the significant behaviour change predicted (Spaargaren, 2011). Criticism of this approach has underlined the limitations of such an individualistic focus, which may fail to consider wider social change and the complexities of daily life.

Hinton and Goodman (2009) suggest a shift in the conceptualisation of sustainable consumption from narrow consumption practices to consumption undertaken to accomplish lifestyles. Thus resource consumption is inconspicuous occurring through everyday practices, whilst conspicuous resource consumption is associated with consumerism (Shove and Warde, 2002). Warde (2005) surmises that moments of consumption in which individuals are implicated are embedded in the social organisation of practices (Warde, 2005).

Having considered alternative approaches to conventional individualistic approaches to behaviour, the following sections introduce and situate social practice theory, which provides the theoretical underpinning for this study.

4.3 Theories of social practice

Theories of practice developed as an alternative to the agency-structure debate and have their foundations in the works of Bourdieu (1977) and Giddens (1984). Giddens (1984) outlines the approach where “...*the basic domain of study of the social sciences...is neither the experience of the individual actor, nor the existence of any form of societal totality, but social practices ordered across space and time.*” (Giddens, 1984, p.2). The focus of analysis is moved from the individual to “*shared behavioural routines*” (Spaargaren, 2011, p.815). More recently, a second wave of practice theorists have emerged, notably the works of Schatzki et. al. (2001), Reckwitz (2002), Schatzki (2002), Warde (2004; 2005), Shove and Pantzar (2005) and Shove (2003; 2010; 2012).

The diverse work of practice theorists has not led to a universal definition of social practice theory, however Schatzki (2001) notes that practice theories offer a perspective which is neither individualist nor holist, and which encompasses interactions between knowledgeable and capable individuals and social structures such as technology, infrastructure, institutions and so on. The definition of a practice has been extensively debated amongst practice theorists (Giddens, 1984; Schatzki, 2001; Reckwitz, 2002). Reckwitz (2002) offers the following widely cited definition:

“A practice is a routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.” (Reckwitz, 2002, p.249)

Reckwitz (2002) argues that many interconnected elements come together over time to shape and form practices, for example cooking, laundering, cycling and so on. As with the definition

of a practice, there is no authoritative typology of elements which configure practices, although those frequently cited in key works include: cultural conventions, images, meanings and symbols; artefacts, materials and technologies; competencies, skills and knowledge; social and economic institutions; and spatial and temporal organisation (Warde, 2005; Shove and Pantzar, 2005; Southerton, 2006; Shove et. al., 2012).

The individual in practice based-approaches, is the carrier of practices, sustaining and developing practices through repeated performance. Spurling et.al. (2013) note that practices are in their essence, social; "...*their performance entails the reproduction of cultural meanings, socially learnt skills and common tools, technologies and products*" (p.3). Chatterton (2016) suggests that practices are "*abstracted behaviours as a social phenomena (termed practices) rather than the specific manifestations of these by discrete individuals.*" (p.27). Practice theory does not deny individual agency in its entirety (Schatzki, 2002), but contends that agency "*...transpires chiefly through the medium of social practices.*" (Welch, 2016, p.242).

Welch and Warde (2015) define a practice as "*...an organised, and recognisable, socially shared bundle of activities that involves the integration of a complex array of components: material, embodied, ideational and affective*" (p.85) whilst Cass et.al. (2015) describe social practices as "*routinized forms of behaviour engaged in by large numbers of people which structure, and are structured by the 'material arrangements' of society.*" (p.1)

Welch (2016) contends that a practice approach engenders the identification of components which converge to form practices and the understanding of the dynamic relationship between components is thus the "*core task of analysis*" (p.238).

Reckwitz (2002) suggests that social practice theory is in itself a conceptualisation of ways of viewing and analysing social phenomenon. Kuijer and Bakker (2015) posit that "*all practice theorists emphasize the positioning of practice theory as a middle ground between opposing dichotomies*" (p.226). If this position is accepted, then theories of practice are at the heart of and provide an alternative to, the agency-structure debate.

Shove et.al. (2012) conceptualise social practice theory in their Three Elements Model (Figure 4.2), which suggests that practices are formed as a result of the interconnections and interactions between **meanings**, **materials** and **competencies**. Materials are deeply embedded in the performance of a practice, including material elements such as objects, tools, infrastructure and technology. Competencies consider the necessary skills and know-how required to successfully perform a practice. Meanings draw attention to social norms, cultural conventions and expectations (Welch, 2016). Schatzki (2002) posits that the convergence of elements of practice simply informs “*what makes sense for someone to do*” (p.75). For example, in the context of a sustainable office building, the practice of drinking coffee may entail:

Materials: a kettle, coffee machine, café, disposable cups, electricity. This includes links to wider socio-technical networks. Practices may be constrained by available materials or a practice may give rise to the demand for new objects/technologies.

Competencies: the ability to operate equipment, read instructions. Competencies, or skills, to undertake practices may range from complex intellectual operations to simple, mundane activities such as pressing a button, however the individual is actively engaged in carrying out the practice and the individuals’ behaviour is shaped by the practices they engage in, to a greater extent than they can exert control over how practices are performed (Hargreaves, 2012).

Meanings: what it means to have a cup of coffee, for example, is it fashionable or a symbol of status to drink a latte from a disposable cup? Do certain rituals surround the coffee break? Different images and meanings influence how a practice is engaged in and how practitioners relate to it.

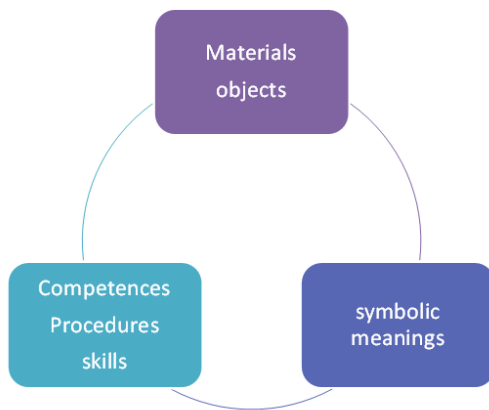


Figure 4.2: Three Elements Model of Social practice theory

(Shove et.al., 2012) Used with permission of SAGE Publications Ltd.

This framing emphasises the social nature of practices “...*their performance entails the reproduction of cultural meanings, socially learnt skills and common tools, technologies and products*” (Spurling et.al., 2013, p.3). Central to the Three Elements Model, is the configuration of all the elements to form practices and how links between the elements transform over time. Practices are dynamic, constantly changing entities and do not exist in isolation (Warde, 2005; Shove et al., 2012). Historical influences, technological change and economic growth all impact on the life of a practice. Individuals engage in multiple practices which form part of a normal life, and practices impact on each other, creating overlapping bundles of practice (Shove and Pantzar, 2005; Shove et al., 2012). Warde (2005) contends that:

“An individual’s pattern of consumption is the sum of the moments of consumption which occur in the totality of his or her practices. If the individual is merely the intersection point of many practices, and practices are the bedrock of consumption, then a new perspective on consumer behaviour emerges.” (Warde, 2005, p.144).

It follows, therefore that interventions based on isolated unsustainable behaviours are likely to have limited success as they do not take into account all the elements which coordinate to shape practices and the totality of practices individuals are engaged in (Evans et. al., 2012).

Practice based approaches would, therefore, target multiple elements simultaneously to create more sustainable ways of life at a societal level.

Giddens (1984) defined social practices as daily tasks or routines performed by people which construct social reality. Schatzki (1996) terms social practices “*a nexus of doings and sayings*” (p.89) which are held together by practical understandings, rules and teleoaffective (motivating) structures (p.89). Schatzki’s (1996) analogy of cooking requires practical understandings of vegetable preparation, rules around cooking times and teleoaffective structures such as the need to make dinner. Unlike Reckwitz’ (2002) and Shove’s (2012) definitions, material elements, for example cooking implements, are considered merely as a product of social practices. Strengers and Maller (2011) suggest that strategies to remain cool are “*an outcome of socially shared, institutionally positioned and technologically mediated practices, rather than an outcome of personal attitudes, opinions or preferences*”. (Strengers and Maller, 2011, p. 167).

Gram-Hanssen (2010) suggests four key elements of practice: technology; know-how or embodied habits; institutionalised knowledge and engagements and meanings. The social enactment of practices is also noted, creating connections through direct interactions and with other carriers of the practice.

Sociological, practice based theories provide a balanced approach, taking both agency and structure into consideration, generating insights into change at societal level with a focus not on individuals but on practices as the central unit of analysis (Spaargaren, 2003; Shove, 2003; Southerton et.al., 2004). Having considered the theoretical underpinnings and background to social practice theory, the following section discusses the importance of trajectories of practice.

4.4 Trajectories of practice

The trajectories of practice are central to understanding the dynamics of social change. Shove (2003) notes “*Few can pin down just how and when their habits change but... there is a sense*

that things were not always so." (p.2). A range of interlinking conventions, habits and technological development impact on the dynamics of social practices, leading to their perpetuation, transformation or extinction. The historical development of practices provides the context for understanding trajectories of practice and how "*...new arrangements become normal*" (Shove, 2003, p.3).

Schatzki (2002) defines the differences in practice trajectories as "*...where multiple mutations are accompanied by continuities in other components, a practice lives on...when changes in organization are vast or wholesale, or a practice's projects and tasks are simply no longer carried out, former practices expire*", (Schatzki, 2002, p.244). Gronow (2009) discusses the distinction between innovations, fashions and fads and implications for practice. Fashions, contends Gronow (2009) are short-lived; the advent of novel design seeking to enable existing practices fail "*...to change any social habits*" (p.134). Innovation, however, brings about significant and long lasting change in social habits, whilst fads are merely momentary, lacking broader connections with wider networks or bundles of practice (Shove et.al. 2012).

Warde (2005) notes that practices have an implicit history, which informs both their current expression but also future trajectory. "*Practice theory emphasises routine and habit over conscious reflection, dispositions over deliberation and constraint over choice.*" (Welch, 2016, p.241).

Shove (2003) invokes the example of flying to demonstrate the importance of trajectories in 'ratcheting demand'. That is, increasing social expectations and technological developments to meet those needs which leads to an increasing 'ratcheting' effect on our practices, and on our resource use. Technological development and infrastructure allow people to shift or store time, thus schedules are increasingly flexible. This, contends Shove (2003) can be related to flying, short haul flights allow people to travel to Scotland for afternoon meetings, therefore more people schedule afternoon meetings in Scotland, expecting attendance, and increasing dependence on energy intensive technologies. Technology here provides a 'service' to meet an existing social demand, and concurrently creates new sets of conventions and

expectations, establishing a new standard of normality which is usually more resource intensive and provides new opportunities for technology to help. Shove (2003) succinctly asserts:

“...the efficiency of one technology or another matters less than the concept of service that each sustains. In effect, the real environmental risk is of a sweeping convergence in what people take to be normal ways of life, and a consequent locking in of unsustainable demand for the resources on which these depend.” (p.416).

Resource intensive behaviours are therefore not considered a matter of individual choice, but that peoples' actions are part of a complex set of societal expectations and conventions and different socio-technical regimes within the context of dynamic trajectories of practice. Step changes can occur (e.g. mobile phones) but patterns of demand and expectation accelerate use. It is problematic to isolate particular behaviours as they may link to different aspects of a person's life and targeting isolated behaviour may have inadvertent consequences. Policy makers can try to develop a broader understanding of patterns of demand and expectation to know which levers to pull on to attempt to effect change. By trying to understand patterns and linked aspects of life, inadvertent impacts may be predicted and softened making policy changes more legitimate.

In understanding trajectories of practice, it may be possible to steer trajectories in more sustainable directions. The following section considers the important theoretical distinction of social practices as entities and practices as performance.

4.5 Distinction between practices as entities and practices as performance.

Shove et.al. (2007) distinguish between practices as performance and practices as entities. A practice as entity is defined as the dynamic interrelationship of elements which converge to form a practice over space and time. A practice as performance is defined as the moment the practice is accomplished by carriers of practice, though as Warde (2005) notes practices as performance are “...internally differentiated on many dimensions” (p.138), and as such the

performance of practices will differ according to varying situations. Moreover changes, such as technological change, will alter the configuration of practices as entities and elements may converge to result in a different reproduction of performance of practice, for example the advent of a new technological development may impact on both entity and performance of a practice (Kuijjer and Bakker, 2015). This presents a number of methodological considerations, namely the dynamic nature of practices must not be disregarded or overlooked when applying practice theory.

The conceptualisation of a practice as entity is critical in understanding the limited success of interventions grounded in individualistic behaviour change. Spurling *et al.* (2013) illustrate this in figure 4.3 below. Here, observed behaviours are considered commensurate with practice as performance, which represents the tip of the iceberg, whilst the practice is underpinned by socially embedded dynamics which form the practice as entity. It is thus contended that intervention in the practice as entity will provide far greater opportunities for social change, and subsequently, in the observable performance of the practice.

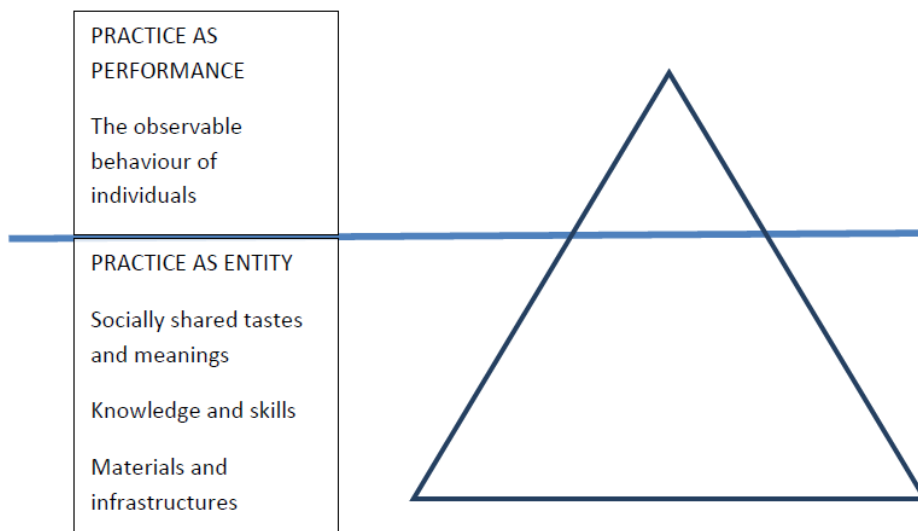


Figure 4.3 Observable behaviour is the tip of the iceberg (Spurling *et al.*, 2013, p.8¹⁷)

¹⁷ Reproduced with permission from Spurling, N.J., McMeekin, A., Southerton, D., Shove, E.A. and Welch, D., *Interventions in practice: reframing policy approaches to consumer behaviour*, Copyright, Manchester: 2013, Sustainable Practices Research Group.

Importantly, practices as entities have trajectories, both historical and a path of development (Welch and Warde, 2015). The analysis of a practice as an entity, therefore negates focus on 'behaviour change' as the analysis has shifted to the practice as an entity. Moreover, behaviour has become the observable action of the performance of the social practice (Spurling et.al. 2013). The analysis focuses the elements of practice.

Having considered the theoretical underpinning of social practice theory, section 4.6 will give a brief overview of literature in the context of sustainably designed buildings.

4.6 Social practices and building occupants

The relevance of practice theory to sustainable ways of living and to this research, was highlighted by Warde (2005) in his contention that people consume in pursuit of practices: *"It is the fact of engagement in the practice, rather than any personal decision about a course of conduct, that explains the nature and process of consumption."*

In this context, sustainable ways of living and patterns of consumption are embedded within social practices. Social practice theory has been increasingly used as a conceptual framework to analyse consumption behaviour, which is of particular relevance to this research. As Warde (2005) notes *"...the principal implication of a theory of practice is that the sources of change behaviour lie in the development of practices themselves."* (Warde, 2005, p.140). Therefore, the focus of analysis moves to an understanding of practices and how they can be transformed in a way in which environmental impact is lessened or how unsustainable practices can be eradicated (Shove and Pantzar, 2006).

Empirical work using social practice theory to analyse environmental and sustainability issues, has been led by Shove (2003) to explore diverse energy related issues such as air conditioning, laundering and showering to provide insights into the trajectories of these practices. Gram-Hanssen (2010) took a practice based approach to consider household energy consumption, whilst Hargreaves (2012) explored workplace consumption routines and the challenges faced by environmental campaigns. Hargreaves (2012) in his study of a

workplace behaviour change programme, applied a social practice approach. The programme aimed to encourage pro-environmental behaviour within the workplace and enjoyed some success, however did not necessarily lead to a shift in the environmental attitudes of participants, but rather a change in habitual and routine behaviours.

Recent work undertaken within the DEMAND Centre has focused on understanding “...*end use energy demand, recognising that energy is not used for its own sake but as part of accomplishing social practices at home, at work and in moving around...*” (DEMAND Online, 2018). Studies undertaken within the centre include home heating, offices and office work (see chapter five), business travel and car dependence.

Halkier *et.al.*, (2011) note that whilst a wide body of research and literature exists around social practices, empirical work is limited and often related to single practices. Hargreaves (2012) contends that it is more useful to consider multiple, intersecting practices as opposed to single practices.

This brief overview of empirical work is discussed in the following section in terms of implications for this research.

4.7 Implications of social practice theory for this research

The review of theoretical literature and empirical work has shown that there is a wide body of research around social practice theory in the field of sustainability. Research undertaken by the DEMAND Centre, has considered wider issues underpinning demand for energy use. This research builds upon this existing research and considers the contemporary working practices within sustainably designed office buildings and their implications for resource use. The starting point for analysis, therefore, is the practices themselves and not the measured performance of buildings. In undertaking this approach, a new lens of analysis is generated, and the application of social practice theory in this context is undertaken.

Strengers and Maller (2011) contend that a social practice approach can provide insight for policy makers in refocusing and realigning practices, taking into account the dynamics of

practices. Shove (2004) notes that the task of applying social practice theory in a research and policy context is challenging and involves:

“...paying attention to the intersection of actors’ definitions, understandings, competences and senses of obligation on the one hand, and to rules, resources, institutions and infrastructures on the other.” (Shove, 2004, p.1064).

The emphasis lies therefore on questioning the everyday, taken for granted structures, systems and infrastructures, debating what is perceived as ‘normal’ and habitual in order to deconstruct practices and offer insight into more sustainable future trajectories. An understanding of the complexity of the application of social practice theory is recognised in the methodological underpinning of this research, as detailed in chapter six.

Wilson and Chatterton (2011) contend that behaviour change either in the context of practices in performance or sitting within more individualistic models will endure as important in policy making, as a cost and time effective means to achieve stringent climate change commitments.

As a final point, it is also important to briefly discuss multi-model approaches. Wilson and Chatterton (2011) contend that a multi-model approach would provide a more pragmatic response to behaviour change. Following the identification of a behavioural outcome, a model for change is selected retrospectively to achieve desired outcomes. Socio-psychological models may be used to understand for example, kerbside recycling considering issues such as ease or proximity, however, sociological approaches would be required to understand consumption behaviours. Wilson and Chatterton (2011) suggests that actors, scope, durability and domains are considered when selecting a model to change behaviour, providing different ways to frame issues and offering different insights and means to achieve the outcomes. This approach is also supported by House of Lords (2011) report on behaviour change. Such an interchangeable position, may help in identifying impacts of interventions, for example desirable and undesirable outcomes which may in turn ensure greater scope for successful behavioural intervention (Kuijjer and Bakker, 2015). Moreover, Kuijjer and Bakker suggest:

“...both behavioural oriented and practice oriented approaches have their strong and weak points and their parallel existence is valuable...they generate views on the pressing issue of unsustainable consumption and can thus take each other forward.” (p228).

Different models offer alternative framing of issues and insights into the means which can be utilised to reach the ends. Wilson and Chatterton (2011) hold: *“From a pragmatic perspective, therefore, ‘multiple models’ can and do coexist. Perceived competition and contradiction between models can be an artefact of their emphasis on behaviour change at different scales.”* (p.2785).

Wilson and Chatterton (2011) maintain that in order to pragmatically challenge existing theory underpinning policy on behaviour change, alternative approaches must be considered in parallel, demonstrating those different insights which can be generated as opposed to a complete change to different theory and models.

However, this is a highly contested position, and the fundamental epistemological differences and unjustified conflation of methodological individualism and social practice theory are set out vehemently by Shove in her widely cited 2011 paper ‘On the Difference between Chalk and Cheese’.

4.8 Chapter summary

This chapter has presented a discussion of alternative approaches to framing individuals in the context of sustainability and narrowing the performance gap. Systemic approaches including a focus on individual actors, physical and determinism were considered. The systemic paradigm moves focus from individuals to institutional actors such as organisations and local authorities, however may fail to consider the role of end users, their practices and competencies. An overview of socio-technical systems and theories consumption in the context of sustainability were also discussed, including a consideration of limitations.

Social practice theory was presented in some depth, examining the importance of practice trajectories, practices as entities and performance and giving an overview of relevant empirical

work. Whilst there is no universally accepted definition of social practice theory, this thesis draws on Shove *et.al.*'s (2012) three elements, applying this model in the context of the empirical work undertaken. This not only contributes to the empirical body of work around the usefulness of practice theory, but also provides novel insights into the impact of contemporary working practices on the performance gap.

The research aims to contribute to understandings of complex social practices in contemporary offices and provide insights into existing approaches to narrowing the performance gap. In adopting a social practice approach, this research considers the dynamic trajectories of social practices, how and why contemporary working practices have evolved over time and how future directions of practices may be shaped. The wider context in which contemporary working practices must also be understood as practices are situated within this context.

A social practice approach offers novel insights into the performance gap, providing a level of depth and detail surrounding those practices in which building occupants are engaged, which may not be achieved through other approaches. Whilst socio-psychological approaches focus on individual agency, issues of social structures, culture and context may not be considered. Techniques such as questionnaires may fail to draw out complexities. Systemic approaches, take such context into account, however remove individuals from analysis and thus overlook the dynamics of social life. A practice approach takes into account social structures, context and culture but does not remove the individual from analysis. The focus of analysis is reframed. Theories of social practice recognise that people are central to the existence of practice; if practices are not performed, they fail to exist. Therefore, theories of practices provide both balance and analytical depth, reframing the role of occupants within the performance gap.

Much of the literature reviewed in the previous chapters has placed a strong focus on energy efficiency and emissions reductions. This is also reflected in key policy commitments, for example the Kyoto Protocol. Whilst wider issues of achieving sustainability in office buildings

underpin this research, the central focus addresses issues of the performance gap, and in particular, energy use. The research does not seek to measure the performance gap or energy use but aims to understand the resource use implications of contemporary working practices in sustainably designed office buildings more profoundly.

The following chapter sets out the methodological approach undertaken to apply social practice theory and addresses the methodological challenges. Chapter six then develops a conceptualisation of contemporary working practices.

Part Two: Methodology

Part two of this thesis is comprised of two chapters which are concerned with the methodology of the study. Chapter five introduces the methodological approach adopted and justifies its selection. Reflections on the appropriateness of an ethnographic approach form part of the contribution of this research. The chapter then provides an overview of the research process, and presents a consideration of ethical issues and research limitations. The following chapter sets out literature drawn upon to develop a conceptualisation of contemporary working practices which underpin data collection and analysis during the main study period.

Chapter 5: Methodology

5.1 Introduction

Chapter two sought to critically examine existing literature and highlight the gap in knowledge within the field of sustainable building performance and the potential application of social practice theory. This chapter presents and discusses the underpinning epistemological position, qualitative methodological approach and techniques adopted to investigate the central research question. The rationale for the selection of a mixed-method ethnographic approach, considered the most appropriate method to investigate social practices *in situ* (Cunliffe, 2009; Cook and Crang, 2007) will be discussed. This chapter outlines the methodological basis underpinning the thesis and considers the appropriateness of an ethnographic approach.

The second part of the chapter presents data collection methods and analysis techniques and finally, research rigour, ethical considerations and the importance of researcher reflexivity and potential limitations are explored. This chapter, therefore, aims to “...provide sufficient detail and context for the reader to assess our [researcher] interpretation and our trustworthiness” (Pyett, 2003, p. 1171).

5.2 Research aim

The aim of this research is use to use social practice theory as a framework to analyse contemporary working practices in sustainably designed office buildings in order to better understand the performance gap, and in particular, operational energy use.

Four key research questions were developed:

1. How is the performance gap between sustainable building design and operational energy performance considered in literature?
2. How can contemporary office working practices be conceptualised using the lens of social practice theory?

3. What is the relationship between contemporary office working practices and sustainably designed office buildings?
4. What are the implications for practice and for future sustainable office design?

5.3 Research objectives

Key objectives to shape the research design were developed:

1. Define the key terms for the purposes of this research – performance gap, social practice theory, contemporary working practices.
2. Establish the context and background to the research through undertaking a critical review of relevant literature.
3. Set out the theoretical background to the research, which underpins strategy and design.
4. Develop hypothesised relationships between buildings and contemporary working practices.
5. Review established methodological approaches and select appropriate methodology to address research questions.
6. Address practical and ethical implications of data collection methods.
7. Undertake pilot study to evaluate research methods.
8. Undertake empirical research to analyse the buildings through the lens of social practice theory.
9. Identify the observed social practices in relation to operational resource use.
10. Develop analysis of research outcomes using an appropriate framework to deconstruct practices.
11. Critically assess findings and discuss with reference to literature and hypothesised relationships.

Crotty (1998) suggests a four element research process: epistemology; theoretical perspective; methodology and method. Saunders et.al. (2015, p.122) propose the research onion (Figure 5.1) to “...depict the issues underlying the choice of data collection techniques and analysis procedures”. The following sections will follow such research processes, presenting the epistemological approach, followed by methodology and research methods and finally discussing the data collection process.

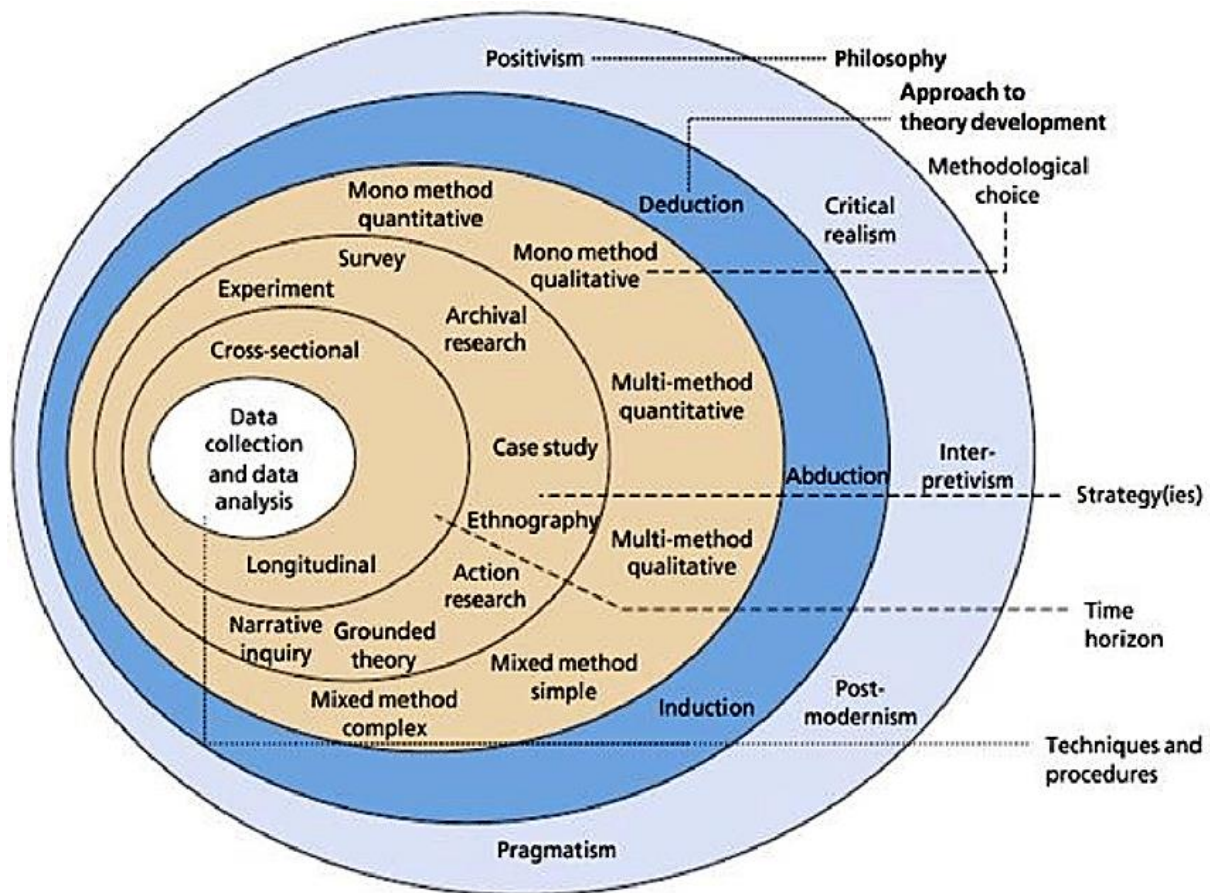


Figure 5.1: The research onion

(Saunders et.al. 2015, p.122)

5.4 Epistemological approach

This research was approached with a moderate social constructivist perspective rather than a positivist or critical realist perspective. This section sets out the rationale for this perspective. A consideration of epistemological underpinning is necessary, not only to set out a transparent

and robust account of the methodological strategy, but also to provide an understanding of what it is considered possible to know (Denzin and Lincoln, 2000).

There is no single coherent definition of social practice theory, as discussed in chapter one. The interpretation of practice theory upon which this thesis is based, is therefore closely linked to the epistemological position underpinning the research. Reckwitz' (2002) widely cited definition of a practice provides a starting point for such philosophical considerations:

“A practice is a routinised type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, things and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice – a way of cooking, of consuming, of working, of investigating, of taking care of oneself or of other etc. – forms so to speak a ‘block’ whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements.” (Reckwitz, 2002, p. 249–50 emphasis added)

Practices in this definition, are the site of dynamic, interconnecting elements, which converge and are established through their everyday, mundane performance. The aims and objectives of this research are bound in understandings not only of contemporary working practices both as entities and performances, but also of the resources consumed as a by-product of practices. Warde (2005) observes the interrelated nature of practice and consumption, *“An individual’s pattern of consumption is the sum of the moments of consumption which occur in the totality of his or her practices.”* (Warde, 2005, p.144). Thus, consumption profiles may be considered embedded in the webs of practices carriers of practice perform. Practice theory considers both the complexities of consumption, and how consumption is implicated in social reproduction and change (Gram-Hanssen, 2008, Halkier, 2011, Shove, 2003, Southerton et al. 2004, Warde, 2005).

Halkier and Jensen (2011) suggest that practice theory provides a novel approach to traditional consumption research which “...typically privilege[s] either individual consumer choices or cultural structures outside the reach of consumers.” (p.102). Thus a social practice approach provides a different perspective to more traditional rational economic and cognitive approaches, from cultural structuralist analyses and from “...symbolic consumer identity choices.” (Giddens, 1991 in Halkier and Jensen, 2011, p.103) as outlined in the first chapter of this thesis. Halkier and Jensen (2011) contend that in the context of empirical consumption research, a moderate social constructivist interpretation of practice theory should be adopted as the focus of analysis is grounded in the social production of knowledge.

This research seeks to evaluate contemporary working practices and subsequent resource consumption, and to understand how practices are implicated in social change and reproduction (Halkier and Jensen, 2011). The research aims and objectives imply a focus on social interaction, that knowledge and ‘reality’ is socially constructed, therefore objective reality does not exist (Anderson and Goolishian, 1988). This contrasts with the positivist perspective, where knowledge is based on observable events grounded in causal relationships (Danermark et. al., 2002). Links between variables, activity and outcomes are established without consideration of the relationships between the variables. Such interrelationships are central to the examination of social practices, not only between the dynamic elements of single practices, but also between multiple practices.

However the premise of socially constructed reality can be considered to imply that anything goes, that all accounts are valid and “...one ‘truth’ or set of ‘facts’ is more or less as good as another.” (Symanski, 1994, in Jones, 2002, p.248). Milton (1996) terms this position “*strict*” or “*extreme*” social constructionism (Milton, 1996, in Jones, 2002). Williams (2003, p.47) cautions against such interpretivist positions, which may lead to an outcome which is “...at best partial and at worst misleading.”

Jones (2002) offers an alternative perspective, differentiating between ontology (what exists) and epistemology (what can be known), contending that whilst constructionists accept

epistemological relativism and reject epistemological realism (in other words, multiple perspectives of reality exist), it does not necessarily follow that ontological realism is rejected. This perspective “...maintains a belief in the physicality of the natural world.” (Jones, 2002, p.248) and is termed moderate or contextual constructionism.

The moderate social constructivist position underpinning this research closely aligns with Jones’ (2002) definition of moderate constructionism. Socially constructed knowledge and practices are framed in this research, by the context of physical buildings and their design. Practices are subsequently interpreted and performed by building occupants, the carriers of practice. Shove et.al. (2012) term this the addition of a “*material dimension*” (p.9) to social and cultural theories. Reckwitz (2002) employs the simple analogy of football, without the material presence of a ball, the game cannot be played, thus the material artefact is “*indispensable*” (Reckwitz, 2002, p. 252). A moderate social constructivist position may be considered to support this interpretation, taking into account contextual social practice understandings of consumption in working environments (Hargreaves, 2012).

A moderate social constructivist position recognises practices as continuously intersecting and evolving rather than static and fixed. Thus this perspective allows the recognition of the wider bundles or clusters of practices in which points of consumption are sited, and that the routinised performance of these practices embeds them in everyday life. The complexities of elements of practice, and the social dynamics of interrelated practices can be analysed, rather than focusing on cognitive decision making processes, the individual is a carrier of practices which are performed in the context of everyday life (Reckwitz, 2002, p.256; Warde, 2005, p.139-45). Thus, a moderate social constructivist approach is considered to conceptualise the social production of dynamic practices (Halkier and Jensen, 2011, p. 104).

5.5 Research questions and methodological approaches

Diverse approaches to empirical practice-based research reflect the contested nature of practice theory (Hargreaves, 2012; Gram-Hanssen, 2010; Halkier, 2006; Christensen and Ropke, 2010; Shove and Pantzar, 2005). Dantsiou (2015) notes that a methodological

framework is influenced by disciplinary bias, resulting in either technical or more sociological approaches (Schweber and Leiringer, 2012). A number of key implications were considered prior to the selection of a methodological approach here.

Firstly, the scope of the research was considered. Halkier *et.al.* (2011) note that practice-based empirical studies are often limited to the study of single practices, contending that this approach may fail to address the wider social webs and networks in which practices are implicated. This is particularly salient to aims of this research which seek to evaluate bundles of overlapping, contemporary working practices. It could be hypothesised, moreover, that such a wide scope of practices in this context is unavoidable, in order to evaluate any single practice, interconnection with other practices must be considered as social networks and webs are untangled. As noted in Chapter three, this has led to an open ended literature review, which is inductive in nature, as concepts arise within the ethnographic period, relevant literature is examined.

Secondly, distinctions between practices as entities and practices as performances were addressed (see Figure 5.2). Spurling *et.al.* (2013) notes the observed performance of a practice does not reveal the embedded social meaning which underpins that practice, that is, the practice as an entity. This research is concerned with practices as entities, taking into account the development and trajectories of practices (see chapter four). However the principal focus of the study is to evaluate the implications for energy use of practices as they are performed by carriers of practice.

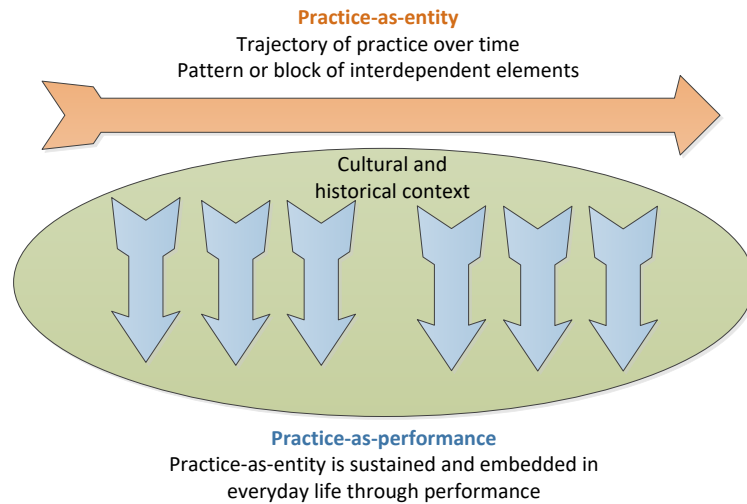


Figure 5.2: Distinctions between practices-as-entities and practices-as-performance

(based on Shove et.al. 2012; Schatzki, 1996; Reckwitz, 2002).

Context is central to the analysis of practices-as-performances, as performances are “...culturally and historically situated.” (Shove et al. 2012, p.123). Empirical research undertaken by Halkier (2011) examining cooking practices, emphasised the importance of the researcher understanding those tacit and explicit procedures and practicalities implicated in the performance of a particular practice. In order to glean such insights, it is necessary for the researcher to experience the practices as they are performed in context. Significantly for this study, it could be held that in analysing practices as performance, practices as entities must be considered in order to ensure the cultural and historical context of the practice are understood. An ethnographic methodology is described by Cunliffe (2009) as “...about temporality rather than a snapshot picture of an organization; about meanings, social processes, continuities, and discontinuities across the past and present.” (p.6). The appropriateness of this approach in examining practices as entities and as performance is thus established.

Having reviewed the above considerations, it was concluded that a qualitative approach was appropriate for this research. The following section explains the rationale for this selection in more depth.

5.6 Rationale for a qualitative approach

The above discussion sets out the requirement for an in-depth study of practices, which allow the researcher to understand wider issues of context. Hammersley and Atkinson (1983) propose that qualitative, interpretivist techniques allow the researcher to “...*learn the culture or subculture of the people we are studying...and interpret the world in the same way as they do.*” (p.7). Research question two concerns the conceptualisation of contemporary working practices, requiring such an understanding of context and culture. Martens and Spaargaren (2005) note that quantitative methods may not fully consider cultural and contextual meanings and understandings associated with practices, whilst Smith (1998) suggests:

“...we know relatively little about how people construct and live their routines, let alone how they use them to challenge, sustain or mediate the structures of society in which they are embedded...subjective understanding will not conform to a priori categories, much less settle comfortably into coding boxes of a questionnaire.” (p.20).

The focus of this research on conceptualisation of practices through understandings of wider culture and context support the appropriateness of a qualitative approach.

Beyond culture and context are the trajectories of practices, as noted above, and the importance of understanding trajectories in order to analyse practices as entities. Research questions two, three and four are concerned with trajectories of practice, to conceptualise current practices (research question two), understand the relationship between practices and sustainably designed office buildings (research question three), and implications for practice and future design (research question four). De Certeau (1984) contends that quantitative methods, such as statistical analysis are inadequate in fully understanding practice trajectories and result in fragmentation and oversimplification. Qualitative approaches, however, allow greater depth for the understanding of practices over time, and moreover, draw out the interdependent and interlinking elements of practice.

Morgan and Smircich (1980) discuss the importance to complex social research of investigating the subject of study “...*from within...and employ[ing] research techniques appropriate to that task.*” (p.498).

Finally, this research does not seek to offer generalisations, where a quantitative approach would be more suitable. The aim of this research is to demonstrate theoretical generalisation with emerging themes and trends, for which a qualitative approach is appropriate.

5.7 Rationale for a case study approach

Having established the appropriateness of a qualitative approach, a number of qualitative techniques were considered. Halkier (2006) submits that in evaluating social practices, the need to collect data on the practicalities and routines of everyday life is compatible with an ethnographic methodology. The researcher is able to spend time with carriers of practice within the cultural context of their everyday lives and understand practices in depth. Atkinson and Hammersley (1994) note that an ethnographic approach permits the researcher to examine the everyday, often mundane aspects of participants’ daily life. Such a methodological approach invites explorative research which is firmly grounded in participants’ daily lives and thus allows the degree of in depth contextualisation required for an examination of practices. Cunliffe (2009) submits that ethnography is “...*not a quick dip into a research site using surveys and interviews, but an extended period time in which the ethnographer immerses herself in the community she is studying: interacting with community members, observing, building relationships and participating in community life.*” (pp.4-5).

Qualitative techniques were considered, including focus groups, interviews and ethnography. Bourdieu (1977) highlights the importance of gathering data, which seeks to understand meanings behind actions. Research designed to gather data from respondents such as questionnaires, focus groups and interviews provide accounts of behaviour, setting out perceptions of socially constructed reality. But such accounts can fail to capture “...*the social conditions of the production of these pre-constructions (of social reality) and of the social agents who produce them.*” (Bourdieu, 2003, p.282). Complex social relations embedded in

contemporary working practices can be explored and understood through ethnographic research (Atkinson and Hammersley, 2007).

Cunliffe (2009), however, suggests that contemporary ethnography is considered subjective, providing “...*a room with a view*” (p.3). This underlines the difficulty of the researcher in adopting an ethnographic approach, where “...*their own community traditions, assumptions, language and expectations.*” (Cunliffe, p.3) are unavoidably brought to bear on the research. The importance of reflexivity is highlighted. Cunliffe (2009) also notes the onerous time requirements of ethnographic methodology, the inherent uncertainty and challenge of translating ethnographic data into robust research accounts present challenges to researchers adopting an ethnographic approach.

Having considered the limitations and challenges of adopting this approach, it was concluded that an ethnographic case study approach incorporating observations, participant observations, informal and formal interviewing was the most appropriate technique to understand actions and underlying meanings, in line with a social practice approach.

Case study approaches provide multi-dimensional perspectives (Remenyi et.al., 2002), resulting in a more holistic understanding of the situation being researched. Cherulnik (1993) argues:

“Case studies can establish actual impacts on environment and behaviour and offer the benefit of local contexts in terms of climate, local resources, infrastructure etc., they apply theory and research in a reciprocal relationship and can have a proselytising function by enhancing impact on target audiences. A detailed case study permits adequate descriptions related to setting, defining problems, programming, design process, use and generation of useful behaviour theory or research.” (p.53).

Moreover, a case study approach allows the researcher to undertake empirical inquiry which both investigates contemporary phenomena within the complex bounds of real life, and draws

upon multiple sources of evidence (Yin, 2009). Such a holistic approach is well suited to the complexities of social practices.

Following a consideration of methodological approaches, a pilot study was undertaken in order to test the proposed approach and to inform the refinement of research methodology.

5.8 Pilot study

The pilot study was conducted in October 2013, prior to the main research period. The study was conducted in an office building where a waste management strategy was being rolled out to engage employees and reduce resource consumption. The pilot study took place within an administrative university office building which the researcher was able to gain access to through social networks. During the pilot study, ethnographic observation and semi-structured interviews were conducted. The study included:

- attendance at sustainability group meetings prior to introduction of a waste management strategy;
- access to university sustainability plan 2013-2020 and sustainability plan annual summary report 2011-12;
- access to resource management plan 2013-2020;
- three days of participant observations within the building; and
- two semi-structured interviews with an expert informant and two office occupants.

During the research period, the researcher gathered observation field notes and audio recordings of interviews. The pilot study informed the main research period in a number of key areas. Firstly, interactions between the researcher and participants were revealed as more complex and requiring significant reflexivity and navigation. Snape and Spencer (2003) observe the distinction between researcher and researched is complex and requires that the researcher is aware of her position. During the pilot research process, the researcher initially attended a sustainability team meeting where the researcher was introduced as a 'sustainability and behavioural expert'. This immediately placed the researcher in a position

of authority, which impacted on rapport with the team, leading to assumptions with regards to the researcher's own views on sustainability in the workplace, and impacted on the researcher's intention to take a non-judgemental stance (Snape and Spencer, 2003). Moreover, this introduction led to the practical implication of the researcher being introduced around the office as a 'sustainability expert looking at how occupants behave' which inevitably impacted on building rapport with participants and the researcher's presence being considered 'natural'. Participants were at times guarded in their responses and socially desirable actions were observed, thus the identification of the researcher as an 'expert' biased the research. It was concluded that during the main research period, the researcher should clarify with gatekeepers how she would be introduced to participants and that a neutral, non-judgemental position should be ensured.

Secondly, access to background material was problematic. Whilst access to publicly available documents, such as annual reports and strategy documents, was obtained, access to relevant meeting minutes was declined due to issues of sensitivity and confidentiality.

Thirdly, during the brief research period, dense observation notes were compiled, however the researcher was not able to spend significant time between observations, reflecting on field notes and using the lens of social practice theory to analyse emerging findings. Analysis was conducted at the end of the research period as it was deemed that given the brevity of the study, interim analysis was unnecessary. However, this led to a lack of iterative progression over the observation period, preventing the researcher from probing more deeply into potential findings derived from theoretical analysis. Moreover, the impact of the researcher's contribution to the creation of knowledge was not fully considered (Hammersley and Atkinson, 1983). It was concluded that reflexivity should be undertaken on a daily basis following observations, to allow the researcher to analyse and reflect on observations through a theoretical lens and to develop an iterative approach to inform future observations, Wakerdine *et.al.* (2001) note that reflexivity seeks to "...construct a more complete, more 'real'

ethnographic picture.” (p.85). It was also concluded that to aid the researchers recall and prompt further reflection, photographs would be taken during the main research period.

Fourthly, findings from observations, once analysed in the pilot research period, were used to develop an interview schedule to guide semi-structured interviews. The schedule was structured to address the theoretical framework of social practice theory and questions examined different elements of social practices. Projective and enabling techniques were utilised to uncover hidden and unconscious symbolic meanings (Burns, 1979 in Leonard et al. 2012). Such techniques generated insights into unconscious understandings and meanings implicated in the performance of waste practices. Projective and enabling techniques also aided in overcoming what Halkier and Jensen (2011) term ‘blocking’, in other words where a respondent is unwilling to answer a question deemed to evoke a socially unacceptable response. In providing a projective scenario, respondents are able to distance themselves from any fear of judgement.

Finally, whilst these techniques provided some insights into unconscious, symbolic meanings, accounts of those habitual routines conducted unconsciously were more problematic to verbalise. Hielscher (2011) observed that difficulties in verbalising subconscious everyday routines, could be overcome by placing informants in the location where practices were performed. Interviews conducted within the main research period were carried out in the case study buildings, where contemporary working practices were performed.

The pilot study therefore informed the refinement of the research methodology in a number of ways, highlighting the need for carefully negotiated access, limitations of access to relevant documents, systematic reflection of observational field notes and consideration of enabling techniques to mitigate difficulties in verbalising subconscious routines. The study also provided an opportunity to assess the appropriateness of research methods selected.

5.9 Refinement of the ethnographic research design

Having undertaken the pilot study, an ethnographic approach was adopted as the underpinning methodology for this research. Watson (in Thorpe and Holt, 2008) defines ethnography as providing a “...*written account of the cultural life of a social group, organisation or community which may focus on a particular aspect of life in that setting.*” (p.100). The adoption of an ethnographic approach allows the researcher to grasp “...*the native’s point of view.*” (Malinowski (1922) in Schwartzman, 1993, p.1) and to “...*understand parts of the world as they are experienced and understood in the everyday lives of people who actually ‘live them out.’*” (Cook and Crang, 2007, p.4), thus ethnography offers the potential to generate insights into everyday life.

Galanti (1999) provides the following definition of ethnography:

1. *“It is an observational method designed to get at the meanings underlying peoples’ behaviours;*
2. *it focuses on everyday life as events unfold naturally;*
3. *Its goal is to understand behaviour from the point of view of those who are being studied.”* (p.20)

This approach fits with the moderate social constructivist epistemology which underpins this research. Moreover, Cunliffe (2009) contends “...*ethnography is not about a method of data collection, but a way of engaging with the world around us, an epistemological stance informed by a particular set of assumptions about the way the world works and how it should be studied.*” (p.10). Thus, in the context of this thesis, that reality is socially constructed. Van Maanen (in Saunders et.al. 2009) views ethnography as particular to each social setting, gaining an understanding of those inhabiting the setting and their interpretation of the setting.

In practice, researchers undertaking ethnographic research are actively immersed in the everyday life of the context under study; watching, listening, engaging with participants and gathering data relevant to the study (Hammersley and Atkinson, 1983). In the context of

organisational ethnographies, Cunliffe (2009) observes “*Good organizational ethnographies can reveal and explore the intricacies, challenges, tensions, and choices of life in organizations.*” (p.4). Ethnographers, therefore, have the opportunity to gather data which may disentangle “messy” social life (Morgan and Smircich, 1980) through observation and experience *in situ*. Pettigrew (1973) submits that “...*the best way to understand the process is to be part of it.*” (p.275).

Central to this research is the importance of a focus on the everyday, mundane practices being undertaken in context. Ethnography provides a means of observing and engaging, first hand, with the everyday. From a social practice perspective, the central contention is that the mundane activities which form everyday social life are carried out continuously and organised through bundles of shared collective practices (Halkier, 2011). In undertaking ethnographic observations, the researcher may disentangle such networks of collective practices and in the context of this study, better understand resource consumption outcomes. Watson (2011) contends that ethnography enables the numerous aspects of everyday organisational life to be captured, such as “...*the nature of managerial work or the identity work of strategy-makers, within broader attention to the ‘construction of cultural norms, expressions of organizational values, and patterns of workplace behaviour.*” (Bryman and Bell, 2003, p.317). Whilst this research does not seek to undertake an organisational ethnography, contemporary working practices are bound up with issues such as meanings and understandings of practices.

Craig (2010) notes that the physical environments and material artefacts utilised by workers to achieve tasks varies both over time and between individuals. Davis et.al. (2011) argue:

“*Capturing the temporality of such interactions, and the potentially changing experiences, requires techniques that are more sophisticated than those generally employed in the domain of workspace evaluation and employee-environment interaction: cross-sectional surveys or questionnaires administered months apart.*” (p.225)

An ethnographic approach allows such temporal challenges to be addressed, providing the opportunity to both observe and engage with participants over a significant period of time. Moreover, ethnography, seeks to uncover the complex meanings behind actions, to move beyond accounts of behaviour and reveal what was termed by Goffman (1959) “...*vital secrets of a show* [which are] *visible backstage*” (p.54). Thus participants in an ethnography can be observed, those observations can be explored more deeply by the ethnographer through subtle questioning and, as described above, enhance an iterative development of research and analysis. However, Hammersley (1992) contends that observation and participant observation alone brings limitations “...*to rely on observation without also talking with people in order to understand their perspectives is to risk misinterpreting their actions.*” (p.12)

Thus for this study, interviews were undertaken following participant observations to take into account participant perspectives. Within organisational context, Robinson et.al. (2016) suggest that interviews permit discussion of “*the nuanced and subtle relationships and values to emerge...within the overriding structure*” (p.33).

As is discussed in the methodology chapter, the selection of multiple sources of data, collected through documentary analysis, observations and interviews allowed multiple perceptions to be collated, aiding in the verification and identification of differing realities (Stake, 2013). Rowley (2002) notes that such data triangulation is an inherent strength of a case study approach. For example, interviews, whilst providing valuable information, were limited by the conscious or unconscious selective responses provided by participants. Observations and documentary analysis provided the opportunity to develop a more complete understanding.

Limitations and implications for this research in undertaking an ethnographic approach were also considered. Two key implications for data collection and analysis are discussed in the following two sections: the role of theory and researcher reflexivity.

5.10 Ethnography and theory

Agar (1982, in Hammersley, 1990) notes that ethnographic studies have been criticised for their focus on observed events whilst failing to fully address theoretical considerations. This research is underpinned by the application of SPT to understand contemporary working practices. The application of SPT, provides a framework for analysis and interpretation of data through the deconstruction of practices. The application of such a theoretical framework aims to form a coherent thread throughout the ethnography, providing a means of interpreting data and clarifying reasoning. This study builds on existing empirical research such as Spotswood *et.al.*'s (2015) analysis of cycling as a social practice. Existing empirical data was re-examined through the lens of SPT, employing the three elements model (figure 5.3) to explore the elements converging to form the practice.

Watson's (2015) account of passive house ventilation in an office building describes a hierarchical strategy "*...top-down flow of information from the project team to the building managers to the building users. The confidence of the project team in this strategy is an example of typical industry expectations that providing knowledge is the single most important factor in establishing user behaviour.*" (Watson, 2015, p.1007).

Watson (2015) also discusses engagement in practices as linked to the 'motivation' to continue to maintain engagement in practices. Whilst this is then linked to other elements, such as information provided by building management, it could be contended that the focus on motivation draws analysis and focus back to the individual as an agent of change. From a social practice perspective, it may be more useful to avoid this approach.

In the selection of the three elements model, or framework, as a tool for analysis, a number of approaches were considered, including Gram-Hanssen's (2010) identification of four elements: technologies; know-how or embodied habits; institutionalised knowledge; and engagements. Whilst many of the frameworks considered share common features, it was concluded that the three elements model, or framework not only provided a basis for the deconstruction of the practice elements, but crucially represented the interconnection and

interrelation of elements which converge to form practices. This approach facilitated the deep analysis of practices, whilst ensuring the focus of the overall 'practice' rather than separate elements remained the focus of analysis. The critique levelled at empirical work often focuses around this distinction, which it could be posited, may lead the author towards a cognitive approach.

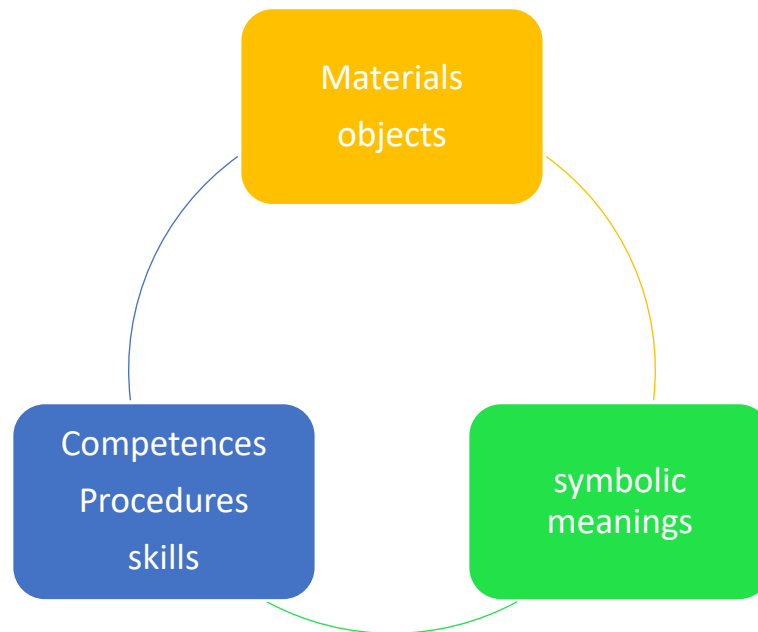


Figure 5.3: The three elements model

(Adapted from: Shove et.al., 2012). Used with permission of SAGE Publications Ltd.

Data collected during the ethnographic research period and subsequent interviews findings will provide 'thick description' of contemporary working practices in sustainable office buildings. The three element model, or framework will provide a starting point for analysis. Theoretical underpinning also informs the iterative and generative aspects of ethnography, as Hammersley (1983) notes "...over time the ethnographer has the opportunity to check out his or her understanding of the phenomena under study." (pp.23-24). Thus, understandings and interpretations can be verified and tested in the field. This research will build upon existing empirical studies (Couldry, 2004; Warde, 2005; Halkier, et. al., 2011; Spotswood et. al. 2015) and will evaluate the utility of SPT in understanding contemporary working practices and their

implications for the performance gap, and in particular, energy use in sustainably designed office buildings.

5.11 Refinement of case study approach

As noted in section 5.7, a case study approach was deemed appropriate to undertake this research, providing the in-depth study of specific contexts (Stake, 2013) and offering multiple perspectives on the mundane, routine, “...*little things*.” (Flyvbjerg 2006, p.238) of everyday life.

A case study approach permits the study of participants in their natural setting, a contextual significance required in the study of social practices. The performance of practices can be observed within the bounds of case studies, uncovering the complexity of practice elements. Such an approach is also well suited to ethnographic methods within organisations, providing “*a means of grasping the complexity, intricacy, and mundanity... of organizational life*” (Cunliffe, 2009). Case studies provide in-depth analysis and triangulation of data collected in case studies which is central to validity of data.

Yin (1994) contends that a case study provides the potential to “...*shed empirical light about some theoretical concepts or principles*” (p.40), thus a case study approach supports the endeavour of this research to undertake an empirical study through the lens of SPT, applying practice theory to the study of everyday contemporary working practices.

Case study office buildings were selected for this empirical study through purposive sampling. This sampling approach requires that units of analysis should be selected on the basis of characteristics or attributes central to the evaluation (Yin, 2000). Fifteen case study buildings were considered at research design stage based on key criteria below:

1. The building has achieved BREEAM ‘Excellent’, buildings which are considered to minimise operational energy consumption through good design (BREEAM, 2018);
2. The building fits in office typology;

3. The building is in sufficiently close proximity to the researcher's base location (South West England) to practicably enable ethnographic research;
4. Access to the building is available;
5. Access to background documentary evidence is available, subject to confidentiality constraints; and
6. Access to building occupants is sufficient for observation and interview purposes.

It is not the intention of this research to measure either the performance gap or the energy use of case study buildings, rather to understand contemporary working practices and their implications for energy use, providing novel insights which may inform future office design and improve the efficiency of current sustainably designed office buildings.

Potential case study buildings were researched based on the above purposive sampling criteria. Buildings were identified using the Building Research Establishment website, the researchers' networks within the Royal Institution of Chartered Surveyors and the university social network as starting points. A long list of fifteen office buildings was drawn up and further research undertaken to establish key 'gatekeepers'. This involved identifying building or facilities managers, most likely to have an interest in the research and authority to advise regarding access. Gatekeepers of potential case study buildings were contacted by email, with the researcher proposing an initial meeting to explain the study in detail. Five positive responses were received from buildings targeted and three case study buildings were confirmed as appropriate for the research (see Table 5.1 - it is important to note that EPC ratings and BCO compliance are also included in the descriptive sections of each case study. This is of particular relevance in evaluating elements of competency in relation to Grade A office specifications and standardisations).

Initial investigations concluded that a number of buildings were not suitable for study due to factors including inadequate access to participants and background documentary evidence confidentiality. Following a narrowing down of potential case studies, three case study buildings were selected for the study. The number of case studies selected was deemed

manageable in terms of time, resources and the in-depth methodological approach. It was concluded that three case studies would allow the researcher sufficient time to travel to sites on a regular basis in order to undertake the in-depth observations, over time, required of ethnographic research. Moreover, three case studies provide both generalised and specific insights into contemporary working practices in sustainably designed office buildings. This allows the opportunity to examine multiple elements and dimensions in context (Yin, 2000; Bryman, 2012). The research aim and objectives require a contextual analysis of such multiple elements and dimensions *in situ*.

Case study buildings were researched over an eight-month period, enabling the researcher to “...become an expected participant in group life, and not an ethnographic tourist” (Fine, 2003, p.53). As is discussed in section 5.7 the researcher is bound by constraints of case study organisations and negotiated access, however Eriksen (2001) suggests that that the research period should be sufficient to ensure the ethnographer becomes a ‘natural’ presence, which became the case after recurrent visits to the case study organisations over the eight-month period. The research period also allowed the researcher to take into account seasonal variations within case study buildings.

The selection of three case studies, therefore, provided the opportunity to experience life in the sustainable office *in situ* and to disentangle complex webs of social practices performed by the carriers of practice. Specific process and practical considerations during the research period are discussed in section 5.13.

The case study approach undertaken in this research supports the examination of social practices within the scope of sustainably designed offices. All case study organisations have been in occupation for varying periods, as is discussed in more depth below, however the occupation of sustainably designed buildings has represented a destabilisation of existing practices for each.

Central to social practice theory, is the understanding that practices themselves are dynamic, constantly changing entities (Shove et al., 2012). Whilst this research aims to evaluate contemporary working practices and implications for energy use, the materiality of the sustainable office buildings in which practices are performed, it is suggested, is central to their dynamic trajectories.

Having discussed the refinement of the case study approach and the selection of three case study buildings, it is important to consider a second key implication following the pilot study; that of the role of researcher reflexivity.

5.12 Researcher reflexivity

During the pilot study, it was noted that researcher reflexivity was insufficient and impeded analysis. Goodall (2000) identifies four fundamental steps in becoming an ethnographer “...*learning how to do fieldwork, learning how to write, figuring out who you are as a person/fieldworker/writer, and knowing how, where, and when these all connect.*” (p.7 in Cunliffe, 2009). Reflexivity, holds Cunliffe (2009) is central to each step.

Reflexivity provides an opportunity for “...*continual evaluation of the subjective responses, inter-subjective dynamics and the research process itself.*” (Finlay, 2002, p.532). A researcher’s subjective responses and perspectives are implicated throughout the research process from research design to data collection and the translation of accounts to text (Finlay, 2002; Pyett, 2003; Bryman, 2012). The researcher may then be considered a constructor of knowledge generated from data (Pink, 2007 in Bryman, 2012). Cunliffe (2009) emphasises that the role of the researcher may be more fluid and flexible, and should be reconciled through an ongoing reflexive process “...*whether you see yourself as absent or as a character in the narrative, as a co-constructor or the main storyteller, will influence not only your position in the text but also your relationship with people in the field and with your ‘data.’*” (p.9 Cunliffe, 2009). Wadsworth (1997 in Pyett, 2003) suggests that the process of reflexivity can encompass a critical reflection of methods, analysis and interpretation through both academic literature and research participants. Crucially, a reflexive ethnographic approach, suggests Pyett (2003) will

enhance validity of the research process. However, Pyett (2003) notes that the very nature of qualitative research is often ambiguous and uncertain.

Reflexivity was therefore considered to be one of the challenges and advantages of undertaking an ethnographic study, as noted in the pilot study. Importantly reflexivity must be continuous and enhance the validity of the research process. A pragmatic approach to reflexivity was central throughout this research, which is discussed in greater depth in section 5.15.

Having examined the selection of an ethnographic methodology and implications for the study, the following sections set out a discussion of the main research period, research methods selected and underpinning rationale, together with an overview of the sample strategy and ethical considerations.

5.13 Research process

5.13.1 Main research period

Following the pilot study, research methodology was refined, and a research plan was developed (Figure 5.4). The plan sets out the research process over five key stages. Firstly, case studies are selected according to criteria discussed in section 5.11. Background documents are then analysed, providing initial insights into material elements shared across different contemporary working practices. As identified in the literature review, practice theorists observe that practices are interconnected through shared elements, therefore to guide practices in more sustainable directions and narrow the performance gap, suites of practices which share the same elements should be analysed (Southerton, 2013).

Field work is then undertaken over an eight month observation period, followed by the development of semi-structured interviews. The final stage of the research plan sets out data analysis, however, as discussed, data is analysed on a reflective and flexible basis.

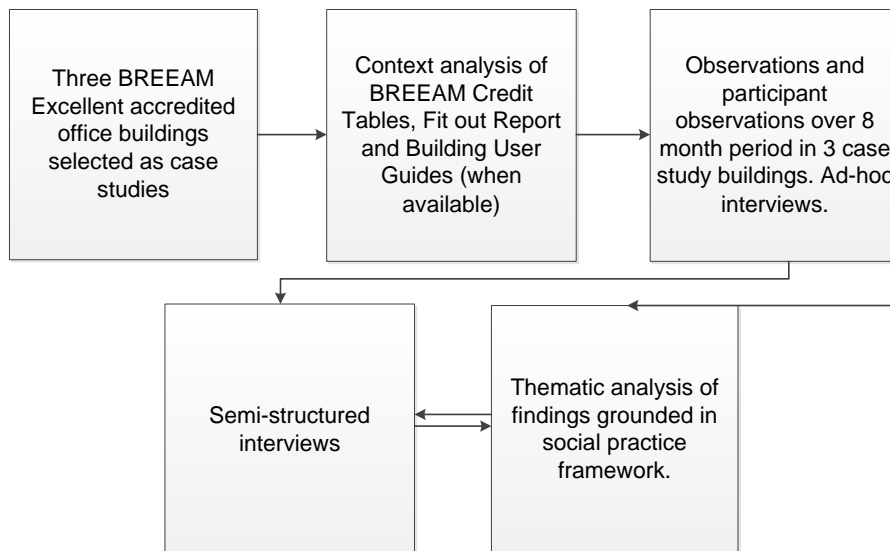


Figure 5.4: Research Plan

5.13.2 Case study selection

As discussed above, a case study approach was selected as the main method for collecting primary research data. Three case study office buildings were selected for this empirical study through purposive sampling as set out in section 5.11. Case study buildings were researched over an eight-month period to permit a natural presence to be established (Erikson, 2001; Fine, 2003). Time and access constraints led to a routine arrangement of a monthly visit to case study buildings, where the researcher spent a working day within the organisation, as part of the office. Relevant meetings and events were also attended such as sustainability and facility management meetings, and social events held in the case study buildings, for example a monthly tenant drinks event for a multi-tenanted building.

Whilst the immersion of the researcher in the office environment was bound by time and organisational restriction, the researcher sought to ensure that the approach avoided “...*jet plane ethnography*.” (Watson, 2011, p.206; Van Maanen, 1988), a short duration, tourist-like study. The researcher was able to quickly establish rapport with the participants and a natural presence in the building. Office routines and conventions were observed and the researcher adapted clothing, conversation and comportment in order to ‘blend in’ to the office environment (Bassett et al. 2008). Bassett et al. (2008) also suggest that revealing some personal details

can aid in building rapport and trust with participants. The researcher revealed some details about her personal life, for example, having a young family, however the researcher chose not to share details of her previous position as a surveyor. The researcher was overt in her study, although the explicit details of the study were not disclosed unless participants specifically requested details.

Table 5.1: Case Study Buildings

Building	Sector	Location	BREEAM Certification	Duration of occupation	Tenancy arrangements	Floor area (sqft)	Single/Multi-Tenanted
Building A	Commercial Offices	City centre	Excellent	18 months	15 year lease with 10 year break clause. Tenant assumes fit out design and costs.	26,000(over 3 floors)	Single-tenant
Building B	Public Offices	Town centre	Excellent	8 years	25 year lease Tenant assumes fit out design and costs.	76,500(over 2 floors)	Single-tenant
Building C	Commercial and Public Offices	City fringe	Excellent	2 months- 3 years (varies according to tenant)	Leasing arrangements variable by tenant. Serviced office space and 'grow on' area with tenant assuming fit out design and costs.	61,000 (over 2 floors)	Multi-tenanted

5.13.3 Data collection methods

This research is concerned with what is termed by Cunliffe (2009, p.9) as “...*micro interactions in the field*” to achieve ‘thick description’ and invites a range of methods. Widely accepted ethnographic methods include participant observation, interviews and documentary analysis, (Bryman, 2012; Cunliffe, 2009; Atkinson and Hammersley 1994).

Ethnographic process

As discussed above, ethnography encompasses a range of methods and data collection techniques. Participant observation is a widely accepted and practiced ethnographic approach. The main research was conducted over an eight month period, with interviews undertaken over the following three months, thus taking into account seasonal variations. Each case study building was visited on a regular monthly basis, and the researcher remained in each setting during 'working hours', which varied between buildings.

Having entered the field, multiple techniques should be utilised in conducting ethnographic research (Hammersley, 1990). Cunliffe (2009) notes that:

"Ethnographers do what it takes to understand meaning-making: spending month's onsite talking to employees, managers and union representatives, hanging out at the cafeteria, attending meetings, and so on - to get a sense of their everyday lives. It is this type of fieldwork that generates thick description." (Cunliffe, 2009, p.8).

Observations, participant observations, formal and informal interviews were undertaken to ensure crucial thick description was generated from fieldwork. This approach enables the researcher to ensure research rigor, minimising any potential for misinterpretation by means of validation.

Firstly, observations were undertaken where the researcher engaged minimally with occupants, simply observing participants in their everyday routines and process within the office. Following an introductory meeting with gatekeepers of the case study buildings, guided building tours were carried out in each case study in order to familiarise the researcher with the setting, enabling not only practical orientation around each building, but also providing an opportunity to undertake initial observations and aid integration into the field.

Following findings from the pilot study, the researcher ensured that whilst her presence was overt in nature, participants were aware that a doctoral study was being conducted, the explicit details of research were not revealed, in order to avoid potential bias and socially desirable

responding (Burgess et.al., 2003). Following discussion and confirmation with gatekeepers, the researcher was introduced to building occupants as undertaking a study of the building and how occupants experienced a sustainably designed office.

Secondly, participant observations were undertaken, whereby the researcher became an active participant in office life whilst continuing to undertake and record observations, for example the researcher attended meetings, social events and ate lunch with participants where possible. Agafonoff (2006) notes that in participating in everyday life, the ethnographer “...actively seeks to discover what it means to belong to a social group.” (p.115). The researcher requested and was provided with desk space in the research settings to assist the process of integration and participation. This varied between case study organisations, in Building A, the researcher was provided with a desk in different departments on a cyclical basis so the researcher was able to engage with a wide range of participants. In Buildings B and C the researcher was able to occupy a variety of settings including hot-desking areas and central shared atrium areas. The researcher also offered to assist with everyday tasks, stuffing envelopes, carrying files, in order to experience everyday life as it is experienced by participants.

Thirdly, participant observations presented opportunities to conduct informal interviews, probing participants to uncover their perceptions of events as they happened. The researcher sought to record significant comments and events within field notes, whilst there was no suggestion of a formal interview. This technique sought not only to understand individual interpretations of events and thus to reduce researcher misinterpretation (Hammersley, 1992) but also to reduce instances of socially desirable responding (Burgess et.al., 2003). As Hammersley and Atkinson note (2007), a highly structured approach within ethnographic research is incompatible with the more flexible, exploratory aims of ethnography. Both research questions and proposed working practices drawn from the literature review were therefore used as to guide informal interviews. A more defined approach was taken in semi-

structured interviews. Formal interviews were undertaken once the researcher had left the field as will be discussed in greater depth in section 5.10.4.

Detailed field notes were kept, recording observations and informal interviews. Bryman (2012) suggests a number of key considerations when recording ethnographic field notes:

1. Notes should be written up as quickly as possible following observations;
2. Full field notes should be written up at the end of each day, including details such as location, participants, date, time and prompts;
3. Notes should clarify the researchers thinking;
4. Personal reflections should be included; and
5. Initial analytic reflections should be included.

(adapted from Bryman, 2012, p.449).

As identified in the pilot study, the researcher allowed time for reflexivity and theoretical analysis of field notes at the end of each observation episode. Hoffman and Henn (2007) note the rich descriptive quality of field notes, which would otherwise be lost in interview alone. Initially field notes were recorded in a small notebook, however, it became clear that the presence of such a research tool marked the researcher as separate from the participants. The researcher therefore also used a laptop, which was used to record observations when desk space was occupied. When the researcher attended meetings, a notebook was used, however when the researcher attended social events, it was necessary to adopt a more covert approach, where notes were taken as soon as was convenient following events.

5.13.4 Semi-structured interviews

Following exit from the field, semi-structured interviews were undertaken with a sample of five participants in each case study. As discussed above, the central aims of interviews was to ensure a balanced account was gathered, understanding participant's perceptions and interpretations of events (Hammersley, 1990). In-depth interviews, moreover, aimed to provide:

“...insights that would not otherwise be available to the researcher...it is the quality of the insight that is important, rather than the number of respondents that share it.” (Wainwright (1997) in Pyett, 2003, p.1174.)

A semi-structured technique was selected to allow the researcher to guide the interview with a flexible structure, allowing a natural conversation to develop and a freedom to probe more deeply or redirect the interview where deemed appropriate. Peterson (2000) suggests that qualitative research questions should be sensible, derived from knowledge and experience, brief, relevant, unambiguous, specific and objective.

Interviews were therefore designed following analysis of field notes in order to ask relevant and knowledgeable questions. Projective and enabling techniques were employed to explore underlying or hidden constructs such as the self-concept (Leonard et al., 2012). These techniques will allow a deeper exploration of “*unconscious*” or “*subconscious*” behaviours (Gordon and Langmaid, 1988). An interview schedule (see Appendix C) was designed and used in all interviews. Interviews were recorded, transcribed and subsequently analysed using qualitative data software (Nvivo) to disentangle elements of practice.

5.13.5 *Sample frame*

A sample frame was compiled for formal interviews. The sample extended to all users of each case study building directly employed by case study organisations. This included transient, roaming, employees, but did not include visitors to the buildings. A purposive sampling strategy was implemented to provide a strategic sample of participants (Bryman, 2012). The aim of the sampling strategy is to represent individuals engaged in contemporary working practices, based on the research objectives and findings drawn from participant observations. The sample strategy is set out in Table 5.2. Two participants employed by the organisation for more than one year (managerial level and non-managerial level), and three participants employed by the organisation for less than one year (managerial level and non-managerial level) were recruited for each case study. Within the established and new employees, contractual arrangements then varied (full/part-time) as did the type of work undertaken (desk-

based/roaming). A range of genders, age and ethnicity were reflected across the whole sample, although did not form the basis of selection criteria. Participants were recruited through collaboration with gatekeepers.

Table 5.2: Interview sampling strategy

Established employee (>1 year)	Mix of participants determined by:	New employee (<1 year)	Mix of participants determined by:
Managerial Non-managerial	<ul style="list-style-type: none"> - Contractual arrangements (full/part-time) - Type of working (desk-based/roaming) 	Managerial Non-managerial	<ul style="list-style-type: none"> - Contractual arrangements (full/part-time) - Type of working (desk-based/roaming)

Table 5.3: Interviewee schedule

Organisation	Name	Role	Period of employment	Desk based/roaming work
A	Carol	Facilities/office manager	8 years (FT)	Roaming work with permanent desk in FM team.
A	Tracey	HR Director	10 months (FT)	Desk based/meetings.
A	John	Receptionist	8 months (FT)	Desk based.
A	Kate	Senior Manager	2 years (PT)	Roaming work – hot desk.
A	Sue	Administrative support	3 years (PT)	Desk based.
B	Jim	Facilities and office manager	2 years (FT)	Roaming work with permanent desk in FM team.
B	Dan	Business development	6 months (FT)	Desk based.
B	Mike	HR	3 years (FT)	Desk based.
B	Susie	Call centre	12 months (PT)	Desk based.
B	Jane	Marketing team member	10 months (FT)	Roaming work with permanent desk in marketing team.
C	Jules	Marketing director	1 year (FT)	Desk based.
C	Lawrence	IT, self employed	1 year (PT)	Hot desk based/roaming.
C	Julie	HR	2 years (PT)	Desk based.
C	Rodney	Building manager	3 years (FT)	Roaming work with permanent desk in FM team.
C	Fran	Receptionist	8 months (FT)	Desk based.

5.14 Ethical considerations

Ethical considerations were central to this study and were considered and reconsidered throughout the research process. Approval from UWE Faculty Research Ethics Committee was provided prior to the pilot and main research periods. Ethical issues in ethnographic research have been widely discussed (Bryman, 2012) however literature surrounding the challenges of undertaking organisational ethnography is more limited.

A key ethical consideration of this study was obtaining informed consent from not only the gatekeepers, providing initial access to the organisation, but importantly from those individual participants under observation. Johl and Sumanti (2010) posit that researchers undertaking organisational ethnography must from the outset, seek to develop a reputation for consistency and integrity. Therefore, a four stage process was undertaken:

1. Initial email to gatekeepers of shortlisted case study organisations (Appendix A) providing an overview of research, ethical implications and an assurance that research would have approval from the UWE Faculty Research Ethics Committee;
2. Meeting with gatekeepers and presentation of research proposal;
3. Provision of copy of UWE Faculty Research Ethics Committee approval to undertake research to organisations; and
4. Distribution of participant information and consent forms.

This systematic process enabled the gaining of trust and acceptance of both gatekeepers and participants prior to commencing data collection, a crucial consideration in undertaking organisational ethnography (Clair and Wasserman, 2007). Reflecting on this process, the active demonstration of a rigorous and ethical commitment to both research and the community being researched, assisted in building trust and allowing access to the information sought, and also presented a reassuringly professional approach to organisations which assisted in gaining access to case studies. Moreover, gaining informed consent, to some extent mitigates risk in the study.

However as Bryman (2012) notes, organisational ethnographies are bound by rules, hierarchical structures and formal and informal codes of those institutions they are researching. Authorisation to undertake this study was provided by senior management and gatekeepers, however Plankey-Videla (2012) queries, "*How does access through elites shape the ability of others to interact with and consent to an ethical research relationship?*" (Plankey-Videla, 2012, p.2). For example, any underlying implication that gatekeeper and senior management consent, implies consent of all participants must be mitigated against. It was central to the ethical considerations of this study that all participants were fully informed and consenting and under no duress to participate in the research. Throughout the study participants were also encouraged to raise any questions or concerns and it was impressed on participants that they were in no way obligated to discuss any aspect of their working or personal lives which they did not wish to. Participant information and consent forms were distributed electronically throughout organisations to all staff members, with the option to decline to take part, or to withdraw from the study at any time with no negative impact. This was of particular significance, given that the study evaluates the impact of employees occupying flagship organisational buildings, often company headquarters, developed at great cost to the organisation, embodying vast reputational value, and therefore with potentially contentious implications (Fuerst and McAllister, 2011; van der Wetering and Wyatt, 2011). The participant information and consent form are set out in Appendix B.

Participants were assured that anonymity and confidentiality were protected. This was preserved through the use of pseudonym names for organisations, locations and individual participants in all written material, including field notes. It was however, explained to participants that roles in organisations would be named, as the research required the understanding of meanings and competencies within social practices. Images taken did not identify subject buildings or locations, nor any individual participant. Floorplans were redrawn to ensure buildings were not identifiable.

Field notes were held on a password protected computer on a secure network, accessible only to the researcher. Consent forms were secured in a locked filing cabinet again, accessible only to the researcher.

The pilot study uncovered the tension between explicitly detailing the purpose of the study to participants and influencing outcomes. Bourdieu (1999) addresses the importance of providing full details of research aims given the sensitive nature of “...*making private worlds public.*” (p.1). Further to the pilot study, it was concluded that a balanced approach should be sought, thus research aims were presented to participants as a study on ‘sustainably designed buildings and realities of occupancy’ in order to reduce socially desirable responding (Burgess *et.al.* 2013). However, should any participant seek a more detailed explanation of research aims, this was provided without hesitation.

Ethnographic literature also underlines the issue of power in relation to the ethnographer (Hammersley, 1990), influencing purpose and direction of research. As discussed above, the researchers own perceptions and interpretations also impact on research. In order to address these considerations, firstly, systematic reflexivity was undertaken. Hoffman and Henn (2008) suggest that such reflexivity may guard against the researcher inadvertently influencing participants through her own perceptions and beliefs. Secondly, Agafonoff (2006) proposes that researchers empower participants through, for example, deferring to participant status. Throughout the study, the researcher ensured participants were aware that their contribution was valued and appreciated and that anonymity would be preserved throughout.

5.15 Research validity

Hammersley (1990) suggests a systematic approach to ensuring validity in ethnography: all findings should be plausible, credible, supported by evidence.

1. Research findings should be plausible

The inherent uncertainty within qualitative research requires both rigour (Lincoln 1995) and “*critical compromise*” (Pyett, 2003, p.1172). In order to address issues of uncertainty,

triangulation was employed throughout data collection and analysis. Braun and Clarke (2013) define traditional triangulation as “...*the process whereby two or more methods of data collection or sources of data are used to examine the same phenomenon, with the aim of getting as close to the ‘truth’ of the object of study as possible.*” (Braun and Clarke, 2013, p.285). They go on to discuss the difficult reconciliation of this settled definition with qualitative research which in its very essence, refutes the notion of one single truth. This research, therefore, undertakes triangulation within the scope of Silverman’s (1993) view that triangulation provides multiple perspectives and truths, and not a single irrefutable ‘truth’.

During the main research period, assumptions and initial findings were also questioned and revised as part of an iterative process, which in turn, was integrated into interview design, and process.

2. Research findings should be credible

Embedding reflexivity into the research process is central to the credibility of the research. Pyett (2003) holds that revising and revisiting data throughout the research process will render findings more robust:

“Is my interpretation true to the data? Does this apply to other individuals in my study? Was this topic raised in all the interviews? ...How might my knowledge, position, and experience be shaping my analysis?” (p.1171).

Thus systematic reflexivity throughout the research process is required.

3. Findings should be supported by evidence

Triangulation techniques aim to provide supporting evidence (Handwerker, 2001) and support validity of findings. Literature was also used to support triangulation, however, as Pyett (2003) notes the most accurate means of evidencing findings is to “...*test them in the real world.*” Whilst this was not possible in the scope and bounds of this research, it is hoped that findings could lead to future research.

5.16 Data analysis

A number of approaches were considered to analyse data. Data analysis is defined by Manson (1996) as “...a range of techniques for sorting, organising and indexing qualitative data.” (p.7).

An ethnographic approach, however, may not be compatible with such a systematic approach to data analysis, as Atkinson and Hammersley (2007) note:

“In ethnography, the analysis of data is not a distinct stage of the research. Formally, it starts to take shape in analytic notes and memoranda; informally, it is embodied in the ethnographer’s ideas and hunches. And in these ways, to one degree or another, the analysis of data feeds into research design and data collection.” (p.3)

This contention was reflected in the process of writing up field notes. The process was iterative in nature, informal analysis linked to literature reviewed, contemporary working practices conceptualised the researchers own experience. This informal analysis provoked further questions, which were integrated into the main research period. Riessman (2008) contends that methodological and analytical techniques should not become disciplinary practices rather they should embody creative processes.

Such a creative approach resonates with grounded theory. One criticism of this approach relates to the participants, Halkier (2011) notes that grounded theory analysis may be limited by the participants’ and researcher interpretation and understandings. Strauss (1987) suggests:

“...the researcher’s will not be the only possible interpretation of the data (only God’s interpretation can make the claim of ‘full completeness’), but it will be plausible, useful, and allow its own further elaboration and verification.” (p. 11)

In order to avoid such limitations, data was interpreted using techniques of thematic analysis as detailed in the next section.

5.16.1 Thematic analysis

Braun and Clarke define thematic analysis as a “...*method for identifying themes and patterns of meaning across a dataset in relation to a research question; possibly the most widely used qualitative method for data analysis.*” (Braun and Clarke, 2013, p.178). Guest et.al. (2012, p.15) contend that thematic analysis provides a “*rigorous, yet inductive, set of procedures designed to identify and examine themes from textual data in a way that is transparent and credible*” (Guest et. al., 2012, p.15). Key themes, both explicit and implicit, suggest Corbin and Strauss (2008), may be identified in the data and linked to existing theory. Guest et.al. (2012) submit that in undertaking thematic analysis understandings of participant assumptions and behaviour in particular contexts relative to specific research questions allows findings to be presented in a compelling and articulate narrative.

Braun and Clarke (2013, p.175) describe Thematic Analysis (TA) as “*guided by an existing theory and theoretical concepts (as well as by the researcher’s standpoint, disciplinary knowledge and epistemology)*”. Moreover, they propose a detailed 15 point procedural checklist (Braun and Clark, 2013, p287) for good thematic analysis. This checklist (Table 5.4) was employed to guide the researcher in ensuring robust thematic analysis.

Table 5.4: Thematic analysis checklist
(adapted from Braun and Clark, 2013)

No.	Process	Criteria
1	Transcription Observational field diary and interview recordings were transcribed.	The data have been transcribed to an appropriate level of detail, and the transcripts have been checked against the tapes for accuracy.
2	Coding Critical review of all data in full. Consider assumptions and understandings that participants reveal, which may contrast with researchers own experience.	Each data item has been given equal attention in the coding process.
3	Following a total immersion in data, noting key emerging aspects. Comprehensive and systematic coding of each data item, using conceptualised practices and the social practice three elements model as underpinning structure.	Themes have not been generated from a few vivid examples (an anecdotal approach) but instead the coding process has been thorough, inclusive and comprehensive.
4	Coding software (QRS NVivo 10) was utilised to code extracts of text.	All relevant extract for each theme have been collated.
5	Following initial immersion and complete coding, themes refined and data revisited.	Themes have been checked against each other and back to the original data.
6	Overlapping codes combined; nuances added to distinguish between codes. Review of coding structure to ensure coherence.	Themes are internally coherent, consistent and distinctive.
7	Analysis The use of social practice three elements model and conceptualised practices aids analysis.	Data have been analysed – interpreted, made sense of – rather than just paraphrased or described.
8	Consistency of coding ensured by process of multiple review.	Analysis and data match each other – the extracts illustrate the analytic claims.
9	Regular supervisory meetings to support development of thesis.	Analysis tells a convincing and well-organised story about the data and topic.
10	Integration of data from field notes and data to aid in illustration of analysis.	A good balance between analytic narrative and illustrative extracts should be provided.
11	Detailed timeline developed to support and manage process of analysis, discussed with supervisory team.	Enough time allocated to complete all phases of the analysis adequately, without rushing a phase or giving it a once-over-lightly
12	Written Report Use of Braun and Clarke (2013) checklist and discussion of key considerations within methodology chapter.	The assumptions about, and specific approach to, thematic analysis are clearly explicated.
13	Systematic process of review.	There is a good fit between what you claim you do, and what you show you have done – i.e. described method and reported analysis are consistent.
14	Epistemological position considered throughout research process.	The language and concepts used in the report are consistent with the epistemological position of the analysis.
15	Critical review.	The researcher is positioned as active in the research process; themes do not just 'emerge'.

Throughout the process of thematic analysis it is important that the researcher demonstrates active reflection. Braun and Clarke (2013) suggest that initial immersion in data inherently reflects the researchers own experience and bias, noting those “*obvious and salient*” (p.205) aspects of the data.

During the main research period extensive field notes were taken. Field notes included details of observations, informal discussions and researcher interpretations. Informal interviews were not recorded, thus are quoted as noted by the researcher. Hoffman and Henn (2008) note the importance of field notes within the ethnographic process, drawing out additional interpretation and detail which may not be revealed by recordings alone. Moreover, the depth of detail in field notes extends to descriptions of body language, emotions, atmosphere and the role of the researcher in the observation process and as such, “*cover the totality of the objective, including the observer in the act of observing*” (Highmore, 2002, p.155). The data from observations formed the basis for detailed field notes. Semi-structured interviews recorded and transcribed. Data was then coded and analysed using NVivo software. Bazeley and Jackson (2013) outline an implied structure of coding based on research methodology and the nature of data collected.

For the purposes of this study, Braun and Clarke’s (2013) checklist was used to guide the analysis process. Coding data involved a number of stages. Firstly, initial and focused coding was undertaken (Charmaz, 2006). Whilst underpinned by conceptualised practices (chapter six) and the deconstructed practice framework. Halkier et.al. (2011) suggests that in deconstructing practices, reducing the study of practice to individual elements a complex analysis of the elements and their subsequent dynamics is permitted. Thus, data was coded according to deconstructed conceptualised practices, with sub codes emerging from the data.

Emerging themes were openly coded, as is demonstrated in figure 5.5 below which illustrates initial coding for the practice of flexible working. Researcher-derived codes were thus developed within this framework. This allowed implicit meanings in data to be revealed, for example differences between what participants reported and observed actions. Braun and

Clark (2013) note that the process of coding should be inclusive, systematic and thorough in order to develop a comprehensive set of codes which have been applied consistently.

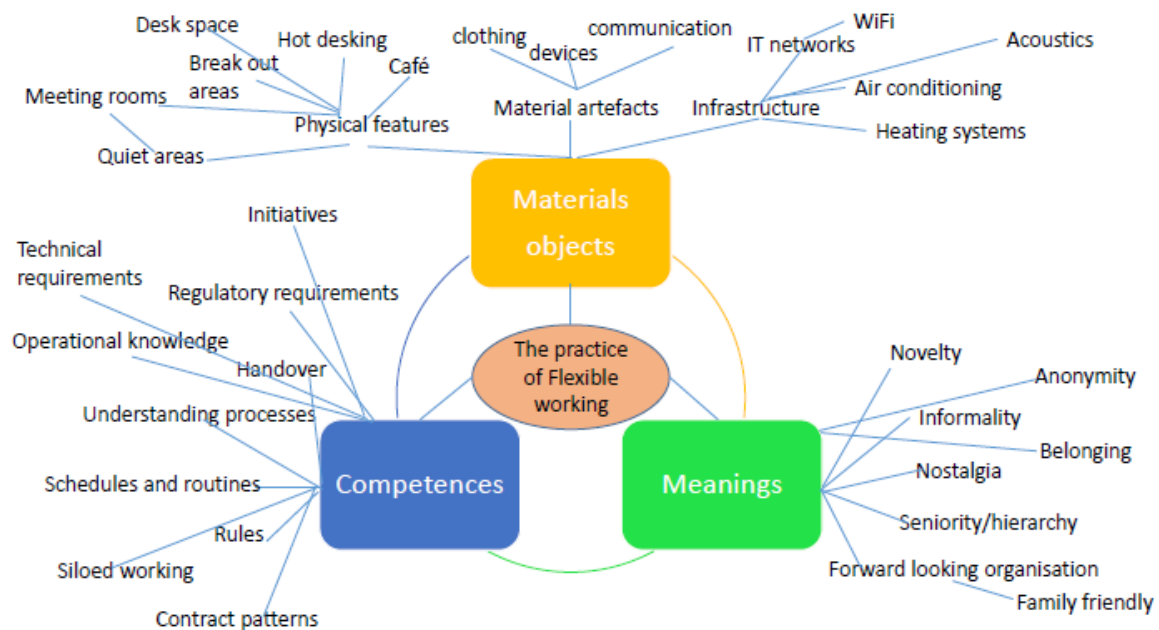


Figure 5.5: The practice of flexible working: initial coding structure

The second stage of coding was undertaken using QRS NVivo 10 software to create codes which were identified from the initial data analysis as significant and frequent. As noted in table 5.4 above, the data was then revisited and reviewed on multiple occasions to ensure a systematic and thorough analysis.

This process of analysis allowed wider implications to be drawn from the data, and sequencing, synchronisation and interconnections between practices to be evaluated (see chapter eight).

5.17 Reflexivity

As discussed, reflexivity was a central approach used within this research. Reflexivity was incorporated into all data collection, taking into account researcher perspectives and subsequent influence on the entire research process (Finlay, 2002). The researcher included her own interpretation and reaction to situations as they unfolded, taking into account cultural bias (Hammersley and Atkinson, 1983).

Accounts of how more problematic situations, such as difficulties in gaining access to interviewees are included. The numerous layers of interpretation, on the part of participant and researcher within particular context are uncovered aiming to provide robust research. The researchers own bias must be constantly critically examined to produce a balanced account where the role of the researcher is explicitly considered.

5.18 Generalisability

The nature of small, focused samples, which characterise ethnographic research, leads to issues of generalisability (Hammersley, 1990). Silverman (1985, in Pyett, 2003) notes that readers can be “...forced to ponder whether the researcher has selected only those fragments of data which support his (sic) argument.” (p.1174).

This study does not seek to present findings which are broadly representative of all sustainably designed office buildings, but seeks to position itself in the broader field of sustainable design. In offering a rich, indicative insight into the issue at its core, this thesis aims to draw logical, retroductive conclusions which may inform future studies.

5.19 Methodological considerations and limitations

The ethnographic approach undertaken in this research seeks to contribute to and build upon existing literature (Atkinson and Hammersley, 1994), aiming to present a rich and detailed description of contemporary working practices in sustainable office buildings. However, it is important to demonstrate an awareness of the limitations of this methodological approach.

One criticism levelled at an ethnographic approach is one of researcher bias, that the researcher will note observed events and actions which they find most compelling (Porter, 1993). Moreover, Hammersley (1990) suggests that theoretical underpinnings may be lost in rich description generated by ethnography. However, the initial conceptualisation of practices and the focus on a deconstructive framework guide both observations and interviews, thus connecting data collection intimately to theory. Moreover, the inductive nature of this study is

facilitated by an ethnographic approach which allows ideas and interpretations to be swiftly tested in the field. Issues of generalisability and reliability have been discussed above.

The overarching aim of this research is not to generalise, but to demonstrate meaning and relevance of findings in the understanding of other individuals, contexts and situations.

5.20 Chapter summary

This chapter has sought to clarify the epistemological and methodological approach underpinning this research. A rationale for the adoption of a moderate social constructivist approach has been presented. A mixed-method ethnographic case study approach has been selected as it has been considered the most appropriate means of evaluating social practices in context.

The chapter has highlighted conclusions drawn from the pilot study and their subsequent application in the main research period. Ethnographic techniques and their limitations have been discussed and the importance of reflexivity throughout this research has been considered. The following chapter sets out literature drawn upon to develop a conceptualisation of contemporary working practices which underpin data collection and analysis presented in the third part of this thesis.

Chapter 6: Conceptualising contemporary working practices

6.1 Introduction

The first five chapters of this thesis have provided context and background to the research undertaken together with a discussion of the methodological approach undertaken. This chapter presents a review of key literature in order to conceptualise contemporary office working practices. A discussion of 'the office' and office working within daily working life is presented, together with an overview of relevant guidance. Having set out key contextual details, the remainder of the chapter is organised around five key practices identified through literature surrounding office working and sustainable office buildings. These practices may have implications for energy use and therefore contribute to issues of the performance gap and the achievement of sustainability in office buildings.

As discussed in chapter four, the application of social practice theory informs the literature reviewed in this chapter, that is, literature will extend to consider the trajectories of practice. The contemporary working practices conceptualised in this chapter provide a framework for the ethnographic study undertaken. It should be noted however, that the development of key practices through literature is not intended to confine the scope of the study, as an inductive approach is adopted as discussed in chapter five.

6.2 The office

The office has become a ubiquitous feature of working life (Duffy, 2007). The late twentieth century saw the advent of globalisation and increasingly rapid technological innovation, together shaping the nature of business activity (Lockwood, 1999). The UK moved from an industrial to service economy in the 1990s reflected in the growth of the office working population from 21% to 30% (BCO, 2016) and to the development of a knowledge-based economy (Worthington, 2006). At a European level, this resulted in 60% of workers in developed Europe employed in white collar work (Worthington, 2006).

Globalisation has been a catalyst for increased competition, driving organisations to operate in more efficient, flexible and innovative ways. Structural and strategic shifts have impacted on the nature of work undertaken in offices, for example the move towards a more knowledge-based economy impacted on the physical characteristics required from office buildings.

Further change in the UK was driven by the deregulation of financial services, which holds Harris (2015) resulted in increased demand for a new breed of offices characterised by *"...deep plan structures, raised floors, drop ceilings, large riser capacity and dealing floors the size of football pitches."* (p.3).

The BCO (2016) suggest that office specification in the early 1990s was market driven, with design and specification focused on attracting institutional investment.

As with homes, offices can be considered to have succumbed to the inexorable diffusion of technology, the advent of appliances in the workplace has transformed the way working practices are undertaken and the energy consumed (Chappells and Trentmann, 2014). Developments in information and communication technology have led to greater locational flexibility of work. In his seminal work on offices, Duffy (1997) advanced that:

"...offices will become more saturated by information technology, more obviously places for meeting and interaction, less hierarchical, more diverse in style and structure and able to be changed more rapidly; they will tend to become smaller and be in less centralised, less predictable and more dispersed locations; above all, they will come under the increasing control of, and be more responsive to, ever changing teams of intelligent and demanding end-users" (p. 51)

The rise of the personal computer in the 1990s led to the emergence of concepts such as 'hot desking' and 'hoteling' (BCO, 2016). Such concepts altered perceptions of office functionality and understandings of the work place. In the late 1990s, Duffy, suggested that office buildings supported outdated understandings of employees as commodities to be organised for efficiency (Duffy, 1997) and could hinder organisational growth. The issue of investor rather

than occupier as consumer was highlighted, resulting in a standardisation of 'product' to maximise investment potential. The publication of *New Environments for Working* (Laing et.al.1998) concluded that technological and organisational change would necessitate the provision of diverse working environments within offices to facilitate the variety of work activities employees would be engaged in on a daily basis. The BCO (2016) suggest that in the early 2000s this shift in focus extended to office design.

The focus on work-life balance and provision of greater amenity within offices, has developed alongside a rise in occupational densities. The BCO (2016) note the rise in density from 16m² person to 8m² per person, noting that "...*the core focus of many real-estate executives remains one of reducing property costs.*" (p.19).

Strelitz (2011) suggests that the rise of agile workforce is linked to a decline in demand for office space. This, argues Strelitz (2011) is a consequence of demographic change, for example the ageing population and the decrease in traditional work gender divisions. Moreover, she contends that conventional understandings of a 'nine to five' working day are no longer compatible with the demands of contemporary life and in this context, distributed, smaller workspaces will engender the offices of the future.

Chappells and Trentmann (2014) note the convergence of levels of energy consumption across Western Europe, in line with the convergence of living and working practices. From a practice perspective, the "*dynamics of consumption*" (p.62) reflect the understanding that energy is not consumed in itself, but as a means to accomplish particular practices. As such the rising price of energy which Chappells and Trentmann (2014) note is unrelated to the rise in energy consumption, it is the "...*meanings and functions of what people do, as well [as]... prices and regulations*" which should be considered in understanding trajectories of energy consumption (Chappells and Trentmann, 2014, p. 62). For example, energy consumption has emerged as a result not only of the use of devices such as personal computers, not only in use but as an outcome of sleep or standby modes.

There is a significant body of literature around such issues of design and operational use of office buildings, which in turn have implications for energy use and may contribute to the performance gap. In their 'Building Quality of Life' report, Development Securities (2010) assert:

"...while the nature of office work has clearly changed dramatically, the office environment itself has, in many cases, failed to progress at the same rate... the focus for improvements...should be the four cornerstones of good working conditions: light, air quality, temperature and noise." (Development Securities, 2010, p.14).

Duffy (2000) suggests that:

"...new values and characteristics – egalitarianism, transparency, stimulus, lateral thinking, creativity, accelerated responsiveness – each have an exact physical correlate in the language of design ... The challenge is to unlock the enormously persuasive and eloquent capacity of design to reinforce business performance by expressing business ideas for business purposes." (p. 373).

Korn (2000) proposed features and characteristics of a modern workplace and a comparative overview of 'modern and old' understandings of management, work and the workplace as is presented below:

- *"Equality: egalitarian not hierarchical"*
- *Open plan: everyone is part of the team*
- *Feedback: regular, informal chats*
- *Praise: so they know they are doing okay*
- *Listen: to input*
- *Teach: provide news skills and courses*
- *Atmosphere: relaxed and sociable, where you can be yourself*

Modern Views on Management, Work and the Workplace

New

Mentoring and support

Flexible

Open and strong communication

Personal

Lateral

Rotation of duties

Less hierarchy

Dynamic

Old

Little recognition

Not understanding

Removed, behind closed doors

Bureaucratic

Expects the impossible

Dominating

No personal contact

Stagnant” (Korn, 2000, p. 41-42).

Harris (2015) illustrates the ‘changing palette’ of the workplace in figure 6.1 below. The shift from desk space as the dominant workstyle is well illustrated.

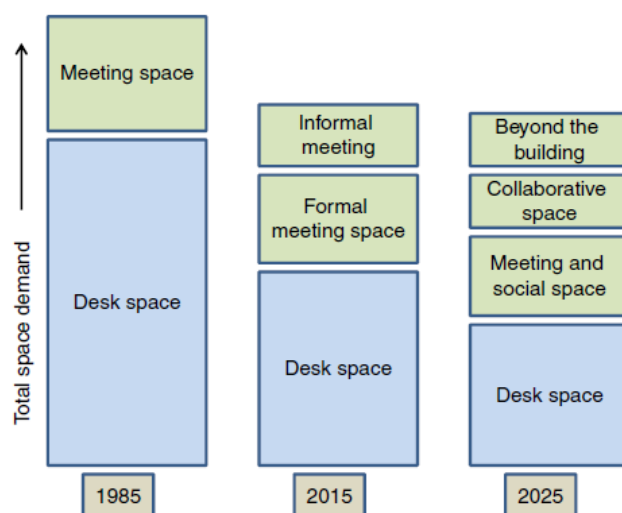


Figure 6.1: The changing palette of workplace settings

(Harris 2015, p.432¹⁸)

Office work was traditionally repetitive, predictable and as such, early offices were modelled on factory layouts. The workplace required to meet current workstyles is quite different and is characterised by its unpredictability.

¹⁸ Reprinted from Journal of Property Investment and Finance, 33(5), Harris, R. The changing nature of the workplace and the future of office space, Copyright 2015 with permission from Emerald Publishing.

More recently, work undertaken by consultancy Ramidus for the City of London Corporation suggested that office work of the future would be characterised by the integration of the key sectors for growth: financial services; professional services; and technology, media and telecom sector (TMT) (Ramidus, 2014). Key future considerations, common to these sectors are proposed:

- *“A shift from fixed, long term leased space to flexible and on-demand space;*
- *Less space, used more efficiently and more effectively;*
- *Space being a medium for expressing corporate culture and values;*
- *Design for continuous adaptability and diverse usage patterns;*
- *Activity-based workspaces providing for collaboration, concentration, communication, creativity, confidentiality and contemplation.*
- *Use of shared spaces as a means to facilitate collaboration;*
- *Provision of amenities and services (food, wellbeing, events, etc.)*
- *Creating and managing memorable experiences to attract talent.”* (Ramidus, 2014, p.55)

How such considerations are translated into future office design is also examined. Ramidus (2014) suggest that the role of offices is that of a central hub, providing space for formal and informal meeting and collaboration. Moreover, they propose that the office offers a social space for new employees to integrate into the organisation, consequently the office becomes commensurate with organisational identity and belonging. Whilst a focus on effectiveness in terms of productivity is recognised, emphasis of workplace management has shifted from a focus on building efficiency to the provision of “...*environment, tools and support services*” required by employees to ensure efficient working. This resonates with the characterisation of a typical working day and the required office design in the grey literature.

Campbell (2015) holds that offices are required to facilitate a number of diverse tasks: collaboration space; quiet zones; presentation and meeting areas; rest and relaxation space.

Gillen (2014) notes the increasing socialisation and domestication of the workplace. The link between office 'life' and types of space, redefine the office as:

"...both a building and a particular form of work culture, and the two are increasingly interrelated..." (Moran, 2005, p.36).

Ross (2003) and Moran (2005) note the emergence of 'no-collar' work, for example, flexible working, first-name etiquette and relaxed dress codes which *"...tend to blur the distinctions between the office and other areas of social life, reframing work as an 'existential challenge'.... [leading to] the search for quality is 'total', and improvement is always 'continuous', work is potentially endless."* (Moran, 2005, p.39).

Shifts in organisational structure and strategy are linked to more strategic design of offices. Gleeson (2001) suggests that office design aims to move beyond functionality *"...to add value to business by stimulating more effective ways of working."* (p.46). Both strategic and everyday working requirements of organisations should therefore be integrated into the physical characteristics of office buildings. Armitage and Irons (2003) posit that in this context, the value of property will be driven *"...more by function and less by form or location."* (p.8)

Harris (2015) proposes an increasing property 'product range' responding to changing requirements (Figure 6.2 below). As such, property is regarded less as an asset and rather as a resource.

Figure 3.
A growing range of property products



Figure 6.2: A growing range of property products

(Harris, 2015, p.430¹⁹)

O'Neill and McGuirk (2003) suggest that the economic development of the office market has impacted on the nature of marketable office space. The emergence of the office investment sector has driven demand for Grade A office space (see section 6.3). Understandings of what constitutes Grade A have been enshrined by the BCO. The marketability of office space in this context, has resulted in a further distance between the office occupants and their everyday design and resource requirements, and the requirements for a marketable investment deemed flexible, re-lettable and high yielding.

¹⁹ Reprinted from Journal of Property Investment and Finance, 33(5), Harris, R. The changing nature of the workplace and the future of office space, Copyright 2015 with permission from Emerald Publishing.

Harris (2014) contends the influence of generational progression; younger workers may arrive in the workplace with existing technological and social expectations “...generations Y and Z will ensure that mobile devices will become an integral part of the workplace.” The growth in what is termed the technology media and telecom (TMT) sector and its requirement for highly technologized working environments is widely cited as influencing office development. Falconbridge et.al. (2018) however, suggest that much of the grey literature in this area, forecasting the rise for TMT workstyles is embedded in corporate, promotional contexts and there is a requirement for empirical research to support such assertions.

This section has provided an overview of key literature around office design and use. The following section presents guidance influencing the design and development of offices.

6.3 Guidance overview

Established in 1990, the British Council for Offices (BCO) state their aim is:

“To promote quality office accommodation and business space as an integral part of the community to advance their development...to promote international exchange of information, ideas and experience relating to office accommodation and business space...to encourage research into the architecture, planning, design, engineering, development, operation, management and maintenance and use of office accommodation and business space.” (BCO, 2016).

The BCO in its 2009 Offices Guidance, set out a ‘norm’ for flexible and collaborative working practices which are translated to the design of floor plates and also form part of the practice of office life:

“...work practices have moved away from a hierarchical structure – where bosses sat in offices and workers sat in cubicles toiling away – to more open plan structures. This is even true for the more traditional firms such as accountants, financial services firms and lawyers.” (Shepherd, 2009).

Van de Wetering and Wyatt (2011) note the significant changes in the legal nature of office occupation, contending that “*With more breakable and shorter leases, the possibility exists that tenants become less inclined to invest in sustainable attributes, for example via a higher rent as payback periods might be longer than their short-term leases and this makes them less committed to the office space.*” (p.32). The rise of short-term requirements has also led to the rise in serviced offices (Harris, 2002).

Guertler et.al. (2005) considered the issue of over-specification of office buildings as one related to understandings of investment quality. This terminology is tied up with the structure of the property investment market and meanings of Grade A or prime office buildings. The expectation of certain specifications as minimum (see section on BCO), for example energy intensive air conditioning, is considered an asset in the lettable of the building and thus its attraction as a potential investment.

The BCO (2016) contend that the overarching challenge which the organisation has faced over its 25 year existence is “...*an increasing acceptance that the office has to work for people, because for many modern knowledge-based businesses their staff are their only asset.*” (p.4).

The conflation of sustainably designed office buildings and what is termed ‘Grade A’ space has also emerged within the office market (source). Whilst there is not set definition of Grade A space, Cass (2017) suggests that the phrase is “...*a heuristic understanding of high-rental-value office space that has no strictly formal or institutional foundation.*”. Cass’s (2017) study of speculative London based offices, concluded a number of characteristics and features associated with Grade A offices including: air conditioning; suspended ceilings; raised floors; LED lighting compliant with BCO guidance; imposing reception area or atrium; clear open plan floorplates; provision of showers and lockers (Cass, 2017; West End Office Agents Society in Cass, 2017). Albrecht and Broikos (2000) suggest that requirements for deep floorplates is a result of the historical drive towards a maximisation of net internal area (NIA), which is relevant in the marketing and rentalisation of office space. This maximisation has also led to trends towards central service cores to drive efficiency of floorplates. With reference to certification

or accreditation schemes and standards, Cass (2017) concludes that Grade A offices demonstrate: EPC rating of A or B; BCO guidance compliance; BREEAM Excellent rating.

The evolving requirements of Grade A office space, may also be understood as part of the wider trajectory of office life; the evolution of organisations; reduction in lease length; evolution of working practices. Such an evolution, suggest Faulconbridge et.al. (2018) converge to form 'market standards'. Cass et.al. (2016) contend:

“Grade A office buildings are driven by ‘the market’ to an energy-demanding one-size-fits-all model: highly standardized offices brightly lit and air conditioned with suspended ceilings and raised floors, and provided with small power capacity well above average needs.” (p.12)

The so-called 'uberisation' of the workforce is also important to note. The increased precarious nature of work due to zero hours contracts and contracted out piece work will have an impact on office work in the future and on levels of equality. However, it is beyond the scope of this thesis to investigate the ramifications of this shift in security of work.

6.4 Flexible working

“...the old conception of the office is dead. Globalisation, the telecoms revolution and the inflation of consumer demands have ganged up to do away with it. A wasted hour commuting each way every day, one-person-one-desk, telephones tethered to desks, a heavy reliance on face-to-face meetings, territoriality, status hierarchies and an obsession with presenteeism: all have been jettisoned. The sacred cows of 150 years of management practice have been un sentimentally culled.” (McNestrie, 2013).

The changing nature of work and the workplace is undeniable. McNestrie (2013) implies that office work is no longer contingent on the physical office space. This, argues Smith (2016) has led to rationalised property requirements and the emergence of 'virtual organisations' (Cass et.al., 2016). Moreover, Ramidus (2014) suggest that organisations are now growing *without* expanding their property requirements. This changing nature of work may be a means to decrease energy use (FM World, 2014), however managing occupational densities and

external working environments is a challenging task. Mawson (2010) suggests that any efficiencies are negligible as offices are designed and constructed to provide for high levels of occupation.

Two key concepts and terms have emerged around this shift in the nature of office work, flexible working and agile working. Flexible working is defined as work which moves beyond the bounds of the office, for example working from home. Agile working is more localised in nature and is defined as work within the office *but* no longer tied to a desk. The Work Foundation (Garner et.al., 2016) employ the term, mobile working, defined as:

“...the conduct of duties which could be carried out at a designated or contractual place of work, away from that location. For example, a visit to customer premises is not mobile working but dealing with the outcome of such visits without visiting the usual place of work would be.”

(Work Foundation, Garner et.al. 2016, p.3).

Agile working is widely framed in terms of productivity, however the RICS (Winter, 2009) contend:

“...in an ideal world property and workplaces anticipate business needs...[however] the rate of organisational change required to remain competitive has accelerated ahead of the rate of change in the UK property industry.” (RICS, Winter, 2009, p.5-6).

The ability to maximise on the productive potential of agile working is therefore argued to lie in the ability of the organisation and building to respond (Zheltoukhovva, 2014).

The distinction is also drawn between flexible arrangements which employees are engaged in and flexible practices which are driven by management (Brinkley 2013; Workplace Employment Relations Survey, 2011), with flexible arrangements including *“...part-time work, flexitime, job sharing and term-time working.”* (Brinkley, 2013, p.11) and the more strategic flexible practices including *“...manage[ing] the workforce size and hours...zero hours alongside shift-working, annualised hours, temporary staff, freelancers and contracting in and out.”* (Brinkley, 2013, p.11).

This distinction draws attention to some of the criticisms levelled at flexible working, namely that the practice is of greater benefit to employers than employees and may increase the precarious nature of work through for example, zero hours contracts (Zumbrun, 2016).

The term 'remote working' is also employed in the context of flexible working, relating to work which is undertaken in a space other than the office building, for example, a third space or at home (Harris, 2015; Garner et.al. 2016). Third spaces are defined by Cherry (in Markowitz and Lagorio-Chafkin, 2012) as neither desk based nor within conference rooms but "*in-between areas that are quiet...focus without being locked away.*" The distinction between those third spaces which are 'authentic' and those which are provided by the organisation is made by Strelitz (2013).

As the energy use evaluated in this thesis is a by-product of both agile and flexible working (according to the above definition), for the purposes of this research the overarching term flexible working is applied.

Flexible working is defined by Kelliher and Anderson (2010) as a term "*...used in a broad sense to cover a range of working patterns, including reduced hours, non-standard hours, various forms of remote working, and compressed working time.*" (p.84). The literature around the increase in organisations offering flexible working suggests a number of catalysts. Increasing concern with well-being and the pursuit of the so-called 'work-life balance' is recognised as a driver of flexible working (Bailyn et.al. 2001). Rau and Hyland (2002) suggest that the rise is a feature of competition in the labour market and a response to legislation giving parents and carers rights around flexible working. Kelliher and Anderson (2010) argue that work intensification is accepted in exchange for flexible working arrangements, an arguably paradoxical exchange.

Changes in working practices are framed in the context of providing greater choice and work-life balance for employees, however this is a contentious issue. Gilbert (2015) suggests that whilst flexible working may have negative health related implications, with employees unable

to 'escape' the workplace. Moreover, the issue of presenteeism, is perhaps merely transferred to email presenteeism.

A number of studies considering the selection of office accommodation have identified occupant requirements for building flexibility to be a key factor (Lizieri, 2003; Gibson, 2003). Dettwiler (2008) suggests that the requirement for flexibility reflects the need for strategic space management within changing economic environments. Levy and Peterson (2013) in their study of Auckland workplaces, found the flexibility of the physical office space was considered "*imperative to...building choice*" (p.275), market structure supported occupant influence on building design to reflect this, for example signing pre-let leases with developers permitting a greater influence on development processes. A number of factors contributed to this imperative:

- Demand for organisation-specific fit out;
- Transition to open plan working environments;
- Open plan supporting increased communication and collaboration;
- Desire to establish 'campus style' workplaces;
- Efficiency purposes with real estate 'adding value' to organisations.

Viewed in purely economic terms, there is some evidence linking reduced building obsolescence and designing in long-term flexibility (World Green Building Council, 2013; Eicholtz et.al. (2010); Parker 2008). Ellison and Sayce (2007) submit:

"A building that is less capable of adapting to the changing needs of its users, compared with other buildings within its class, will suffer relatively rapid functional depreciation; as utility falls, the willingness/ability to pay rent will also fall." (p.297).

The development of mobile technology has facilitated the development of flexible working. Van de Wetering and Wyatt (2011) note that unpredictable occupancy levels resulting from unpredictable working patterns, results in the inefficient use of office space. Such detached

styles of working, that is detached from traditional desk and paper-based working are supported by mobile devices and wireless networks.

Moreover, flexible working may also encompass multitasking, for example undertaking multiple roles enabled by technology. Jones (2016) suggests that employees may have multiple presences, for example in a meeting and working on mobile devices at the same time.

Whilst technological development to support flexible working practices has arguably been in place since the 1950s (BCO, 2016), the Office for National Statistics report that 13.7% of the UK workforce work from home (ONS, 2015). The BCO (2016) suggests that this figure remains relatively low, due to both behavioural and technological limitations; inadequate technological networks and mistrust between employer and employee.

The 2011 CBI Employment Trends Survey noted that at least one flexible working practice existed within 96% of UK organisations (Mitie, 2013). Brinkley (2013) however, contends that the proportion of employees engaged in flexible working arrangements has not significantly increased since the early 2000s. Figure 6.3 below demonstrates findings from the Work Foundation's 2016 workplace survey of managerial and employees adopting mobile working practices (see above for definition of mobile working practices), which highlighted "*...the most interesting finding...that the cumulative adoption of mobile working for both managers and organisations was anticipated to reach an adoption level of over 70 per cent by 2020.*" (Work Foundation, Garner et.al. 2016). The report goes on to argue that the adoption of such practices has reached a tipping point, in other words, this style of working is unstoppable. However, Cass et.al. (2016) suggest the findings may be constrained by participants who were at managerial level and by the medium to large size of participating organisations. By implication, flexible working may be considered as almost an elite activity, engaged in only by more senior staff members with lower grade employees who are static (Cass et.al. 2016).

Adoption of Mobile Working by Managers and Organisations

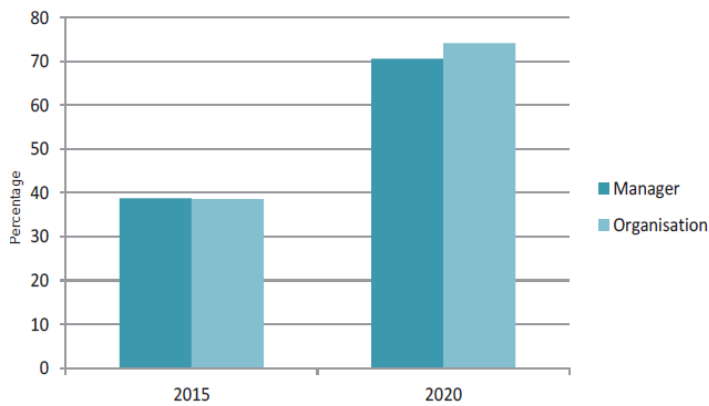


Figure 6.3: Workplace survey of managerial and employees adopting mobile working practices

(Work Foundation, Garner et.al. 2016)

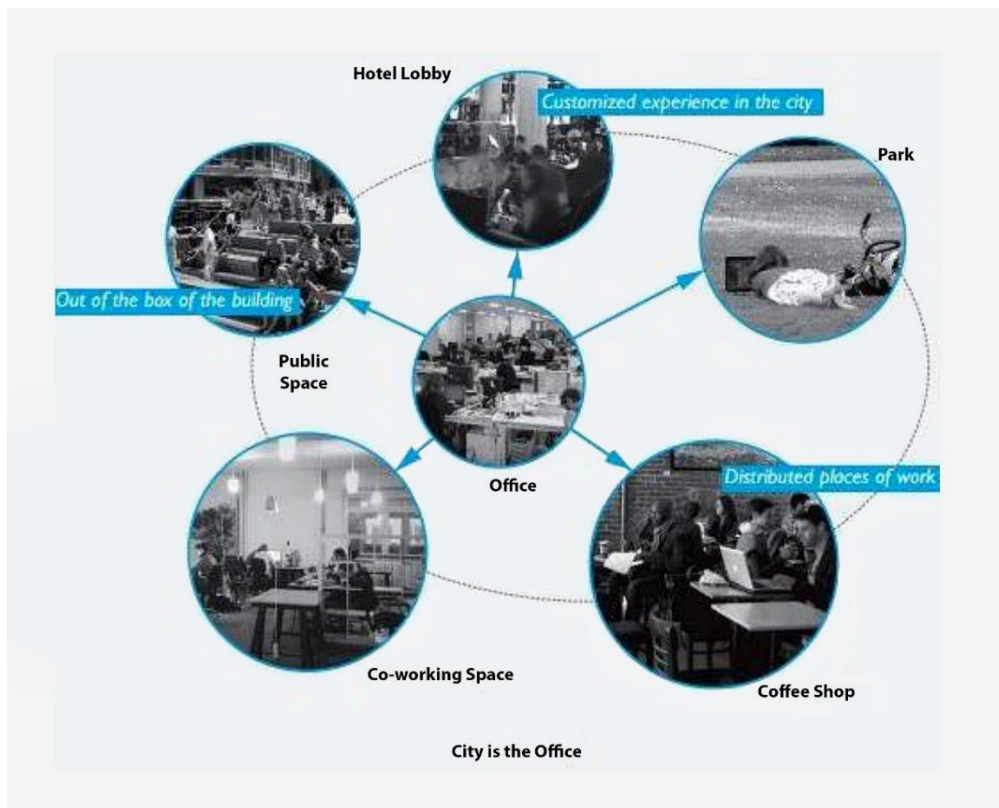


Figure 6.4: Network of offices

(Work Foundation, Gillen, 2014)

Gillen (2014) proposed a 'network of offices' (Figure 6.4 above), placing the physical office as a central hub, principally a base for collaborative working and providing organisational identity.

The office building ceases to provide a confined or restricted working environment, with technology supporting work across a diverse network, from park to hotel lobby. The change in the very nature of work, holds Gillen (2014), has flowed from the technology, media and communication (TMT) sector, citing three central trends which have cascaded to the wider commercial sector:

- Digitisation and mobility of work;
- Consumerisation of IT; bring your own device; and
- Socialisation and domestication of the workplace (Gillen, 2014).

The ability to work flexibly, as noted above, may encapsulate the opportunity to work within the office, outside what are traditionally considered working hours, i.e. nine am to five pm. Evidently this has implications for energy use, not only due to increased occupancy from employees but also due to constraints on, for example, cleaning staff who undertake their duties later in the evening, when the office is no longer occupied. It should be noted that the scope of this research does not extend to cleaning practices.

Garner *et.al.* note that remote working provides a means to escape the unhealthy daily commute. Moreover, Garner *et.al.* (2016) contend that the practice is in part a result of wider change, where standard 'nine to five' working days in an office environment are no longer compatible with the increased responsibility of home lives, for example, the implications of an ageing population.

Issues of trust are also noted by Garner *et.al.* (2016) who argue that face-to-face communication is still considered to be a more reliable and perhaps professional approach than remote working. The challenge of supervision and management of employees working remotely or flexibly is also important to note. Garner *et.al.* (2016) suggest that a shift to a focus on productivity or output may be likely, to secure productive employees, however the counter argument of time spent by managers monitoring such activity may negate overall productivity.

The issue of presenteeism may be visible virtually here, where employees feel pressure to demonstrate email presenteeism.

The practice of flexible working is of key importance to office work and physical workplaces. This overview of literature aims to provide a conceptual underpinning to the practice and to draw attention to the implications for energy use. Underpinned by this conceptualisation, case study research will allow an analysis and deconstruction of the practice in order to fully understand energy implications which may contribute to the performance gap.

6.5 Collaborative working

Closely connected to the practice of flexible working is that of collaborative working. This section will conceptualise this practice, both in the design and functioning of sustainable office buildings.

The focus on design of offices, has been linked to concepts of productivity and worker health. The physical design of offices has been widely researched, including studies around the impact of environmental conditions on workers and productivity (Baron, 1994; Oldham et.al., 1995; Brennan et.al.2002). Connections between employee health, productivity and noise have been established Baron (1994). Contrasting work such as the Hawthorne experiments, however, failed to find connections between productivity and changes in physical environment in their longitudinal study (Hodgkinson, 2010).

Changing design and fit out of office buildings reflects changing organisational values. Duffy (2000) argues a shift from organisational management grounded in the principles of “...*scientific management* [which reflected] *the dominant values of machine-like organisations – order and discipline, supervision and hierarchy, command and control...*” (Duffy, 2000, p.371) to modern organisations in the knowledge economy with “...*new values – egalitarianism, transparency, stimulus, creativity, lateral thinking, accelerated responsiveness – each has an exact physical correlate in the language of design.*” (Duffy, 2002, p.374)

Thus office buildings have been designed and organised to reflect modern working practices and organisational values. Perhaps one of the most common manifestations of values lies in open plan workplaces. Proponents of this style of working argue open plan design is means to facilitate the practice of collaborative working. Often grounded in concepts of efficiency and productivity, private space is reduced in open plan working, with fewer walls and divisions resulting in increased density (Laing, 2006). Moreover, open plan office environments may reduce space-related costs through increased density, service costs (heating and ventilation) and security charges (Duffy, 2000; Veitch et.al. 2007). A lack of physical rigidity also enables more flexible layouts, reorganising workflows and departments without any structural restrictions.

Exponents of this work style, argue, that the design leads to increased communication within and between teams. Collaborative working is held to enable increased innovation and the value of such collaborative spaces is greater than individual desk space, which can be easily replicated in, for example, coffee shops. There is a widely shared emphasis on “...*openness, sharing and co-creation*” within modern organisations (Magnolfi, 2015) whilst studies have found open plan environments encourage higher levels of social interaction and develop positive working relationships, increasing informal communication and decreasing formal meetings (Brennan et.al. 2002).

Open plan environments have been found to reduce hierarchical segregation, and support collaborative working (Brennan et.al. 2002). In their 2010 study, McElroy and Morrow found employees in refurbished open plan office environments reported increased levels of innovation, collaboration and professional control, although dissatisfaction concerning personal space was reported.

A number of studies have raised criticisms of open plan office design. Key criticisms include:

- Cognitive overload resulting in withdrawal from the workplace, reduced satisfaction and decreased task performance;

- Overstimulation resulting from excessive social interactions or distraction;
- Reduced levels of concentration and motivation;
- Reduced productivity;
- Lack of privacy and control of the environment;

(adapted from Hodgkinson, 2010)

However, in spite of such shortcomings, the pursuit of flexible and collaborative working environments has arguably shaped design:

“...it is the rich and varied setting of the ‘Club’ [defined as the provision of multiple task space and diverse, manipulable spaces] which best illustrates the way the new office is going, with its high levels of both autonomy and interaction.” (Turner and Myerson, 1998, p.73).

Hodgkinson, invokes the example of the UK’s HM Treasury office refurbishment to illustrate this point, which incorporated the development of informal meeting areas, hot desking, project areas, quiet spaces and a café to support the practices of flexible and collaborative working (2010).

In order to conceptualise the practice of collaborative working, it is also useful to consider the trajectory of the practice. For example, the Larkin Administration Building designed by architect Frank Lloyd Wright, was constructed in 1906 in New York. The scientific management approach noted above was very much in evidence in the Larkin Building. The building comprised an open plan layout which suggested flexibility and collaboration. However, space was organised rigidly and the design aimed to reconstruct the atmosphere of an open factory floor (Workplace Insight, 2017). Criticism around impact on productivity and lack of privacy led to the introduction of the ‘Action Office’.

The ‘Action Office’ was developed by Robert Propst in 1964. Propst’s plan aim to create a space which provided individuals with privacy within an open plan office environment (Budd, 2001). The second iteration of his Action Office was engendered in the development of the cubicle, though this was not the intention of Propst, who envisioned a flexible space to allow

privacy and flexibility to accommodate different types of work task. Though the action office was widely adopted, it did not reflect Propst's vision, and generated seas of cubicles which became synonymous with economic decline and uncertainty in the 1970s. Energy efficiency was also recognised as relevant to organisations, with the emergence of design features such as sealed windows (Gyford, 2004).

However the popularity of open plan working re-emerged in the 1990s, concurrent with the rise of the TMT sector. The criticism directed at early open plan offices, of noisy, chaotic, distraction filled working environments were reframed as enabling vibrant, creative offices which would encourage collaboration and communication and ultimately greater levels of innovation and productivity (Campbell, 2015).

It is also useful to note wider collaborative working concepts such as co-working, which is the sharing of a non-organisational specific office (Cass *et. al.*, 2016). Such environments formalise the 'third spaces' which many organisations of varying size favour. This environment has evolved to include not only the provision of office space, but the amenities widely associated with office environments (Disney, 2016; Campbell, 2015). Such spaces aim to create environments for collaboration with other, likeminded organisations. Worthington (2016) suggests that organisations may occupy a number of diverse office spaces to accommodate different styles of working, for example: a central organisational office building, embodying organisational identity; flexible space which is highly adaptable to a variety of tasks; and external co-working space which can be utilised on demand.

The role undertaken by facilities managers has evolved to include the management of diverse workforce needs, and the translation of these needs to physical features of the building (Cass *et. al.*, 2016). There is a requirement to balance the nature of work undertaken, providing suitable space to facilitate tasks, for example, sufficient yet efficient desk space, collaborative areas and quiet zones (Markowitz and Lagorio-Chafkin, 2012). Diverse material elements used in the establishment of different work areas alter and contribute to different meanings which become part of the workplace (Waber *et. al.* 2014). In this context, collaborative areas

may be designed, for example, to support multiple functions as discussed above, including eating and relaxation. This has implications for health and wellbeing, social provisions, domesticity of the workplace and collaboration. Framing this multifunctionality in the context of social practice theory, collaborative areas are the sites of multiple bundles of practice, which rely and influence each other. Implications for energy use may be hypothesised on this basis. Energy consumption may be increased through the use of a café, for example, as a collaborative space within the office.

The practice of collaborative working is of key importance to office work and the physical design of office buildings. This section has aimed to review relevant literature and conceptualise the practice. The case study research will enable a fuller understanding of implications for the performance gap, and in particular, energy use.

6.6 Effective working

The conceptualisation of the practice of effective working may be framed in terms of the development of the knowledge economy. This section will consider key issues contributing to the practice of effective working: technology; infrastructure; comfort; and noise.

A number of key features are identified by Nunnington and Haynes (2011) as required for effective, functional workplaces: lift capacity; reception facilities; access control and security; toilet capacity; appropriate desk configurations; and meeting and conference rooms. Material elements of technological devices and infrastructure enable employees to engage in the practice. The physical office must support technological advances and subsequent demand from occupants, for example providing wireless IT, thus negating the necessity for raised floors and ceilings, a common feature of previous versions of a Grade A office (BCO, 2018).

Harris (2014) contends that in order to work effectively, the average knowledge worker is armed with “...*mobile phones, tablets, laptops, desktop computers...an average of 3.3 devices each.*” (Harris, 2014). Cass *et.al.* (2016) note a number of key technological changes

particular to offices which have implications for energy consumption and theoretically improve efficiency:

- Personal computers to laptops and tablets;
- Landlines to WAP then online phone/mobiles;
- VDUs to flat-screens; and
- Creating space for under-floor ventilation and cooling.

Effective working is facilitated through a number of key issues. In order to engage in this practice, employees of sustainable office buildings must find working conditions satisfactory and comfort expectations must be met. Well established connections have been drawn between perceptions of comfort and productivity (Leaman and Bordass, 1999).

The evolution of comfort expectations in offices has been steered by a range of widely cited issues including climate change, affordability of heating and air conditioning, advertising and promotion, the changing built environment, social expectations and aspirations and reducing tolerance to heat and cold (Shove 2003, Stengers and Maller, 2011 and Wilkenfield, 2004). In the context of domestic cooling practices, Stengers and Maller (2011) observe that few policies to adapt and manage comfort draw on history, which may offer insight into non-technological coping strategies.

The following section provides a brief overview of the historical development of air conditioning, critical to the conceptualisation of the practice of effective working and with evident implications for resource use. Air conditioning emerged firstly in the USA, where the ability to mechanically control indoor climates was considered a step towards more modern working environments, increasing productivity in industrialised regions (Ackermann, 2002). Moreover, it was viewed as a means to 'civilise' tropical regions. Parkhurst and Parnaby (2008) suggest that the emergence of the concept of comfort had moved from one of necessity to one of luxury, as part of the post-enlightenment movement. The 'comfort zone' was enshrined in the technical standards of the American Society of Heating, Refrigerating and Air-

Conditioning Engineers (ASHRAE) by the end of the 20th century. The Chartered Institute of Building Services Engineers (CIBSE) suggest an accepted variation in indoor office temperature over winter of between 21 and 23 degrees C, with evening peaks and low early morning temperature drops to 18 degrees C.

The rise of air conditioning in the UK in the commercial property sector has developed in spite of the temperate climate, with the Royal Commission on Environmental Pollution predicting some 40% of commercial floor space will be air conditioned by 2020 (2007). Whilst heating technology in commercial buildings in the UK is well established, the prevalence of air conditioning, by contrast, has emerged only in more recent decades (Parkhurst and Parnaby, 2008). It has facilitated the development of commercial buildings, for example enclosed shopping malls and multiplex cinemas where glazing was not necessary for either lighting or ventilation. Larger floorplates are increasingly common in the commercial sector, enabled by the ability to mechanically control internal conditions and deliver 'comfort', though as Parkhurst and Parnaby (2008) note, such environments are not always well received by occupants.

Air conditioning is now well integrated into the construction and property sectors. Occupants, in particular in commercial offices, have developed expectations of internal climates and employers consider such internal environmental control pivotal to the recruitment and retention of staff. Regulatory structures around the labour market help to hold expectations and understandings in place, with 'comfort' embedded in the concept of working conditions.

Air conditioning is one of greatest consumers of energy in buildings (Parkhurst and Parnaby, 2007). Shove et.al. (2003) argue "...*the energy cost of maintaining standardized 'comfort' conditions in buildings...is ultimately unsustainable.*" (p.307). Aims to reduce the mechanical control of internal environments is therefore often central to energy reduction initiatives (for example, as is discussed in section 6.8, the Japanese Government Cool Biz initiative). Traditional policy instruments of taxation and legislation, however are unlikely to yield energy savings from air conditioning as the ability to work in comfortable, controllable environments is "...*an integral part of contemporary culture.*" (Parkhurst and Parnaby, 2008, p.354).

Chappells and Shove (2004) argue that both definition and provision of comfort is highly contested. Understandings of comfort influence design and fabric of buildings, and technology is in turn influenced by and influence the structure of social norms (Vliet et.al. 2005).

Parkhurst and Parnaby (2008) define mechanical and natural ventilation methods of cooling. Mechanical air conditioning is defined as electrical appliance technology which cools and dehumidifies "...air in enclosed spaces using refrigeration or evaporation techniques." (p.352).

Natural cooling methods include:

- openable apertures;
- convection currents in atria or passive stacks;
- mechanical ventilation circulating air at ambient temperature; and
- ductwork (Parkhurst and Parnaby, 2008)

Socio-cultural norms around air conditioning as a desirable or standard expectation of buildings both reinforce and feed back into the prevalence of AC systems. For example there is a suggested link between the rise in international travel and a glamorisation of AC (associated with the status of airports and hotels or travel itself). Corporate globalisation is also a relevant factor, with international organisations standardising specifications across countries, irrespective of local climates (Parkhurst and Parnaby, 2008).

The role of experts in influencing the adoption of AC is recognised as influencing owners and occupiers, in terms of market expectations and future value. For example market expectations of standardised internal environments have led to the wide specification of air conditioning in office design (Cass et.al., 2016). Expert understanding and perception of client 'needs' is also key in this context, often arbitrary specification may be applied in seeking to meet comfort needs in technical terms. Power relations are of relevance in this context, often power over the office environment is held by experts or the "*professional elite*" (Parkhurst and Parnaby, 2008, p.357), such as building or facilities managers (Hargreaves, 2012). Grandclement et.al. (2015) conceptualise building managers in this context, as engaged in an "*intermediation*

process” (p.3). Occupants may be able to exert control directly (for example window opening) or indirectly via building or facilities management. Aune et.al. (2009) suggest that building and facilities managers should assume the role of “*super users*” as they understand both technology and the reality of the working environment. The concept of perceived behavioural control (as discussed in chapter three) is also held to influence comfort expectations and satisfaction.

In her study of comfort practices in university office buildings, Dansiou (2015) observed that heating and cooling preferences were “...*subject to social influences and group dynamics.*” (p.2232) resulting in the collective shaping of comfort preferences. Habitual behaviours were also found to influence comfort patterns and the associated use of devices (Dansiou, 2015). Interestingly, Dansiou (2015) also suggests that a spillover effect is in evidence in the establishment of comfort practices in the workplace, where family influences impacted on individuals’ comfort tolerance.

Whilst perceptions of comfort are implicitly subjective, Parkhurst and Parnaby (2008) posit that social norms, such as links between social status and comfort, the ability to control personal comfort or endure uncomfortable conditions denote higher or lower social status. Affordability, health and values surrounding energy efficiency and climate change, will also impact on comfort perceptions (Parkhurst and Parnaby 2008; Festinger, 1957). Shove (2003) notes that comfort needs extend beyond occupants, political, societal and production context should not be dismissed.

Cass et.al. (2015) neatly categorise changes in office working as long and short term change. Long term changes include the computerisation of the workplace, moving from pen and paper, to typewriters to computers. Short term changes include the shift from personal computers, to laptops to tablets. Such long and short term changes impact both on the nature of office work, but also on the wider design and provision expectations of offices, for example raised floors, wider provision of small power load sockets (Wit et.al. 2002). Pinder et.al. (2013) suggest that in an attempt to satisfy perceived requirements from institutional investors and tenants,

specifications often failed to “...*bear any resemblance to what most occupiers actually needed from their office buildings... [resulting in] more expensive and more energy intensive office buildings*” (Pinder et.al. 2013, p.442)

In a cycle of overprovisioning it may be contended that the end user, the occupant of the building, becomes secondary if occupation is by means of tenancy. As such the market, market norms and expectations take precedence, ensuring that the property retains maximum flexibility, resource provision and ultimately marketability within the wider market. This, argue Cass et.al. (2016) may be increasingly disconnected from office work of the future.

The physical impact of changing practices on office design is, argues the BCO (2016), limited and includes:

- Lower requirement for storage space, both paper and server rooms;
- CRD (cathode-ray tube) to LCD (liquid crystal display) monitors reducing desk space requirements resulting in energy consumption reduction;²⁰

There is arguably a mismatch between understandings of office work influencing design and fit out decisions, and the reality of contemporary office working. Employees require different spaces and environments to accomplish different tasks. Abbaszadeh et.al.(2006) in their study of occupant satisfaction with air quality in green buildings, found that acoustic issues related to noise from neighbouring colleagues talking, lack of privacy to conduct private conversations and noise from colleagues talking on phones. This is supported by findings from Bluysen et.al. (2011) and Newsham et.al. (2009), where noise and privacy issues are often associated with the layout of offices. Kellaway (2013) however, argues that the office phone is increasingly defunct, as office life is dominated by electronic mail.

²⁰ The potential energy reduction from the adoption of LCD technology is approximately five times. The BCO reflect this development in recommendations to BCO for small power load provision of 24% *lower* than recommended in 2009 BCO Guide to specification (in offices).

Also embedded in the practice of effective working are the concepts of automation and control of sustainably designed offices. Cass et.al. (2016) observe the common assertion in relevant grey literature, that office environments will be designed with responsive, automated systems through central Building Management Systems. Such ‘Smart’ or ‘Intelligent’ offices will “reduce background demand from inefficient space usage” – calling lifts, assigning desks, controlling lighting and comfort.

The concept of smart offices is widely addressed in the grey literature (CBRE, 2018; British Land and Worktech, 2017), however Cass et.al. (2015) note that theoretical discussion of findings is more limited. Technological development is framed in terms of practices moving across space and time by the Demand Centre “...*the spread of mobile and digital devices into multiple areas of everyday life practices as a practice change/co-evolutionary story of practice time-spaces fragmenting and moving beyond times and spaces to which they used to be moored.*”.

There is some debate as to the driver of change in offices, arguably technological innovation has driven the change in practice in workplaces, in line with understandings of socio-technical systems of provision. Conversely Myerson and Ross (2003) contend that the physical features of ‘new’ office buildings support and facilitate the development of the knowledge economy and its associated demand for different styles of working. This paradox, suggest Cass et.al. (2016) should be considered when evaluating the future of office working and in the context of future resources use in offices. The role of practice theory within this context is implied, applying social practice theory to contemporary working practices, this research proposes, allows deeper understandings of the convergence of elements and the subsequent consumption of resources.

6.7 Getting to and from work

As outlined in section 1.4.2, Cole (2005) includes in his definition of sustainable buildings, the provision of facilities supporting sustainable modes of travel. The Department of Energy and Climate Change have demonstrated a growth in travel to work. Getting to and from work

contributes indirectly to overall emissions and resource use of office buildings (van de Wetering and Wyatt, 2011).

Mobility may be framed as directly related to social practices, in the context of this research, energy is consumed in order to get to and from work. In van de Wetering and Wyatt's (2011) study of perception and implementation of sustainability policy in office buildings, reduction of energy consumed in getting to and from work emerged as a focus for many of the organisations researched. They found that travel plans were often in place within organisations studied, however the extent of actual implementation varied. A number of initiatives were identified in relation to travel, including the measurement of business travel in kilometres, although van de Wetering and Wyatt (2011) note that this was driven by cost rather than environmental concerns. This resonates with understandings of conventional management, that it is only in providing scientific measurement of issues that management approaches can be viable. Other organisations attempted to identify staff commuting distances, however it was ultimately considered to be problematic to obtain relevant data from HR departments.

Van de Wetering and Wyatt (2011) also found that travel initiatives failed to achieve long-term impacts, citing an example of a bus service to provide employee transport to a new location which was cancelled due to decline in use as employees adapted to the new location. Van de Wetering and Wyatt (2011) note locational change is also used as a catalyst for change in travel to work behaviour, including reducing parking spaces, creating cycle to work schemes, improving cyclist facilities.

The implications of sustainable modes of travel, such as cycling, running or walking, for sustainable office buildings are noted by Spurling (2013): "*The general assumption that office workers will arrive to work already showered and appropriately dressed (to meet cultural conventions of self-presentation and cleanliness) means that historically, offices have not provided for showering.*" (p.7). A shift to sustainable modes of travel, where exertion is required, has created the need for showering and storage facilities in offices.

Therefore, the practice of getting to and work has implications for resource use within sustainably designed offices, which will be evaluated in depth in chapter seven.

6.8 Taking part in office life

Conceptualising the practice of taking part in office life, for the purposes of this research, includes participation in office (and organisational) culture. This conceptualisation of office life is supported in the literature.

Expectations around office and organisational culture also evolved, informality extends to structural change, from hierarchical, siloed models of working to flatter, more egalitarian organisational structure. Understandings of office wear have also shifted, with a move from formal business suits to more casual attire (Dale and Burrell, 2007). Increasing informality is intended to support collaborative and innovative ways of working, providing the environment and structure to facilitate this and to reduce costs. Magnolfi (2015) notes “*Historically, workspaces were designed to communicate hierarchy, confidentiality and organizational structure... [modern design] resonates instead with net-culture and is built on values like openness, sharing and co-creation.*”

A link between informality and energy reduction is exemplified by the Cool Biz initiative. The initiative, developed by the Japanese Government in 2005, aimed to reduce energy consumption through the reduction of reliance on air conditioning through the hot Japanese summer months. A temperature of 28 degrees was set throughout government offices and a number of norms were promoted, including a shift from formal heavy business suits to lighter, informal short sleeved shirts and shorts. Senior Government officials were regularly featured in the media in more casual attire, which supported a more normalised understanding of what should be worn to work.

A further key issue in taking part in office life lies in what is termed the ‘domestication’ of offices. Building requirements have evolved both in terms of fit out and amenities provided. This extends, argues Ahmed (2014) to the provision of increasingly domestic furniture,

providing space and fit out to support work in non-desk space areas of the office. Cass et.al. (2016) suggests links to the TMT sector, arguably the initial adopter of alternative working practices. In the context of resource use, as discussed above, the provision of alternative work spaces necessitates the provision of technical facilities, for example small power loads and Wi-Fi. Moreover, such fit out and resonance with current design trends may, suggests Ahmed (2014) contribute to attracting and retaining staff, where the office building embodies meanings of a cutting-edge organisation. Framing this point in terms of productivity, the provision of an attractive and diverse workspace may encourage employees to spend longer periods of time in the office, contributing to overall productivity (Andrew, 2014).

The concept of consumerisation of the workplace is also cited as an increasing feature of offices (JLL, 2016). This extends to the provision of amenities from cafés and gyms to dentists within the confines of the office building. Moreover, the appliances which populate the office building enhance the 'desirability' of the office environment (Ryan, 2014). Campbell (2015) argues that consumerisation reflects increasing flexible working practices, the office must become "*...a destination of choice rather than just a place we go to work.*". Consumerisation, however, is also linked to productivity enhancement, that improving staff well-being will subsequently impact on productivity levels (Cass et.al. 2016).

The convergence of home and office life is supported not only by consumerisation but also by office fit out, which has shifted towards increasing domestic design, including relaxed seating and break-out areas. Morely (in Demand workshop proceedings, 2016) notes the personalisation of office computing equipment, for example, employees bringing tablets or laptops to work. The lines, therefore between work and home life, may be becoming increasingly blurred.

The provision of social space within contemporary offices is not only associated with increased collaborative and flexible working practices, but is also related to increased group cohesiveness and job satisfaction (Lee and Brand, 2005).

Dale and Burrell (2008) argue that space is lived and experienced through emotions, not as conceived, planned, managed, by power, the organisation therefore emotional attachment to the workplace is embodied in practices. Employees are encouraged to identify with organisations.

Kim et.al. (2017) argue the importance of the symbolic aspects of property. Aspects of self-identity including status, achievements, needs and values, derived from social and cultural contexts, are linked to the symbolic occupation of property. Kim et.al. (2017) suggest 'push and pull' characteristics influencing building choice. Regulatory instruments such as building codes and environmental legislation acted as 'push' factors towards the occupation of green buildings, whilst aspects such as increase in productivity, corporate image and energy cost savings were considered to be 'pull' factors. Overall "*...tenants' awareness, commitment and expectations all played a positive role in green building occupation decisions.*" (Kim et.al., 2017, p.1553). Sanderson and Edwards (2014) in their study of over 400 UK office occupants, concluded that the key determinant in office selection was location followed by staff recruitment and retention, convenience and accessibility.

Levy and Peterson (2013) found that hierarchical views of sustainability were of importance in building selection. Senior management demonstrating high levels of engagement with sustainability issues were found to be influential in the selection of green buildings for organisational occupation.

This section has set out an overview of literature to conceptualise the practice of taking part in office life, including key issues such as identity, informality, domestication, and consumerism. The following chapter evaluates this practice, and the others described in this chapter in greater depth.

6.9 Chapter summary

This chapter has reviewed relevant literature around contemporary office working and has proposed a conceptualisation of the five contemporary working practices, which underpin the

empirical research undertaken. The following conceptualised contemporary working practices are proposed:

- The practice of flexible working;
- The practice of collaborative working;
- The practice of effective working;
- The practice of getting to and from the office; and
- The practice of taking part in office life.

An overview of the background of office working and the office has provided a context to the practices conceptualised. The following chapter presents findings from the empirical research. As discussed in the methodology chapter, findings are grounded in the conceptualised practices presented in this chapter and in social practice theory, considering the elements of practice; competencies, meanings and materials.

Part Three: Findings and analysis

The final part of this thesis, presents and discusses findings and their implications in the context of the research questions set out in chapter one. Chapter seven, addresses research question three, considering how contemporary working practices can be analysed using the lens of social practice theory. Chapter eight, continues this analysis and addresses research questions three and four in probing the relationship between contemporary working practices and sustainably designed office buildings. Finally, key research findings and the research contribution to theory is presented.

Chapter 7: Empirical research: case studies and practices

“It becomes more important to ask what types of practices are prevalent, and what range of the available practices do different individuals engage in.... the question “what level of commitment is displayed to different practices?” becomes focal, and ...how people come to an understanding of what is required by the practice and their role within it.” (Warde, 2005, p.149).

7.1 Introduction

The first part of this thesis grounded the research in the context of relevant literature and established a gap in the knowledge relating to the role of occupants in the performance gap, and in particular, energy use. Social practice theory was proposed as an alternative to approaches grounded in theories of psychology, economics and rational choice, focusing on changing behaviour of individual occupants. Having set out the methodological approach to and research strategy, contemporary working practices within sustainably designed office buildings were conceptualised in chapter six. This chapter considers the empirical research undertaken and presents findings.

In order to situate findings, the physical context of each case study is firstly examined, including details of the case study sites and occupying organisations. This largely descriptive and factual account provides the background and context to findings, and moreover, considers the logic driving design decisions and intent to design for sustainable behaviour. The consideration of design intent is important in understanding where particular strategic design and management decisions are located within the dynamics of contemporary working practices and how those decisions may have impacted on operational outcomes, both intended and unintended.

Findings are then presented through the lens of social practice theory on two levels. Firstly, findings are related to proposed contemporary working practices (drawn from literature, see figure 7.1), examining the relationship between intended design for sustainable behaviour and

working practices occupants are engaged in. Secondly those practices are deconstructed to analyse the elements of practice, that is materials, meanings and competencies (Shove et al., 2012) and to consider where the relationship between practices and sustainably designed office buildings is situated. It should be noted that whilst elements of practice are considered independently, this should not detract from the importance of those links forged and broken between elements which converge to form practices. In order to facilitate the focus of this chapter, a grid is utilised to signpost both practices and elements analysed in each section.

In order to ensure a consistent approach, the background to each case study building is discussed then key features are summarised based on Rodi et al.'s (2015) list of green building features for commercial buildings. For reasons of confidentiality, set out in chapter five, the case study buildings are referred to as organisations A, B and C.



Figure 7.1: Proposed Contemporary Working Practices in sustainably designed office buildings

The findings presented are drawn from ethnographic field notes and interview transcripts and as such are largely descriptive. Figure 7.2 sets out the structure of this chapter.

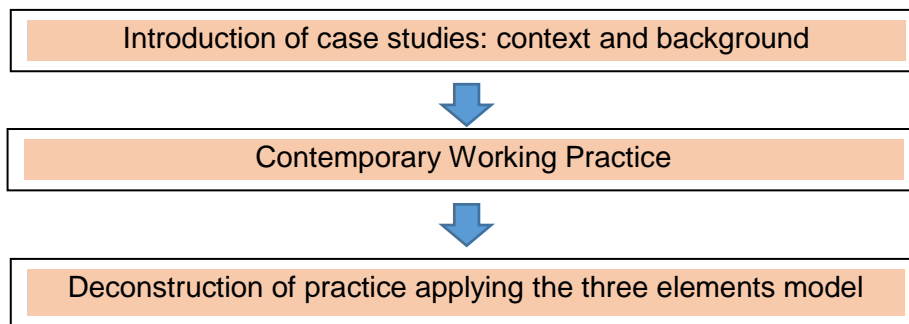


Figure 7.2: Structure of chapter seven

7.2 Case studies context and background

The role of context in social practice theory differs significantly from its consideration as part of a rational decision making process. It is identified in behaviour change literature as a powerful variable, for example physical infrastructure, social networks and norms, which can drive or inhibit particular decision making processes (Evans and Abrahmse, 2009; Barr, 2003). However, from a social practice perspective, practices are considered embedded in fluid, dynamic social contexts, socio-technical regimes and systems of provision which shape the entities and performance of practices. The following section sets out the context within which each case study is situated. The materiality and social context of social practices are examined in greater depth as contemporary working practices are deconstructed. This section is derived from observations, interviews and supporting documents provided to the researcher, for example, floor plans, design guidance and BREEAM assessments.

7.3 Case study one: introduction to Organisation A

Organisation A occupy a 7,000 m² (68,000 sqft net space) office building located on an historic site in the centre of Sidbury, a medium sized town in South West England. The town is situated in close proximity to public transport hubs, with direct rail links to London and Bristol. Constructed in 2005, the building provides the charitable organisation with a head office, café and shop which are partially open to the general public, and accommodates approximately 500 Sidbury-based members of staff, as well as approximately 70 transient employees.

Occupants span a wide range of age groups from 18-60+. The target occupancy of the building at design stage was 470 employees. The building was designed and constructed under a develop-and-lease-back arrangement. Organisation A occupy the building under a 25 year lease to Salamanca, a private equity company.

A collaborative design process was central to the development of the building, and the values of the organisation a key consideration integrated into design specifications. Whilst the organisation required a public-facing building which visibly reflected environmental and ethical values, the design requirements eschewed ostentation in line with its charitable status (Organisation A, Building Manager, 2015). The requirements were described by the building architect as “*Environmentally benign and financially efficient in location, construction, operation and dismantling*” (Design Brief, 2002). The aim of the project team was to construct an “*innovative but not pioneering building*” (meeting report, Design team, 2002). A sustainability matrix was developed by the design team and Organisation A to set out aspirations and targets for best practice.

The selection of Sidbury as a location for the headquarters was driven by the need to bring together four existing central office sites with the aim of reducing travel and frequency of London-based meetings. Accessibility and public transport links were key considerations in the location selection (Judy, Organisation A, FM, 2015).

As noted above, the building itself is separated into public and private spheres; the public area accommodating a reception desk and waiting zone, gift shop and café; the private area providing two floors of office space constructed around a central atrium. Staff access on the ground floor is secured through electronically controlled turnstiles leading to the central atrium, which provides open plan offices, a staff cafeteria at ground floor level with seating and break out space, service area, post room and three meeting rooms. The kitchen area for the cafeteria is shared with public and private counters, separated by a dividing wall (see Figure 7.3). The building is heavily glazed, with two ground floor courtyards providing further daylighting. The facilities manager described the aspiration that “...*no employee should be more than 21ft from*

a natural light source." (Judy, 2015). The adherence to British Standards Institution (BSI) Code of Practice for Daylighting is set out in the organisation's sustainability matrix. Moreover, high levels of glazing aimed to allow for heating resulting from solar gain.

Stairs to the upper floor lead to further open plan offices, meeting rooms and quiet rooms. Each floor is equipped with kitchen points and 'business centres' which provide printing/photocopying facilities (see Figures 7.3 and 7.4). The orientation of the building is south-facing to benefit from natural light and has photovoltaic panels located on the roof. The building is fully naturally ventilated through the use of air take panels, raised floor vents and roof level ventilation snouts which are opened at night to allow a daily purge of hot air. The target average temperature maintained in the building is between 22-23 degrees. A gas fired boiler provides hot water. Water consumption is managed through facilities such as automated hand washing, toilet flushing and waterless urinals.

Building services are controlled by a Building Management System (BMS), this includes the control of the natural ventilation system. Lighting in the main open plan areas and meeting rooms is controlled by motion sensors.

The building was awarded a BREEAM Excellent accreditation on based on its design. Table 7.1 provides an overview of sustainable building features, based on categories identified by Rodi et al. (2015).

Table 7.1: Building sustainable features – organisation A
(adapted from Rodi et.al. 2015)

Sustainability Category	Key targets	Operational design/fit out features
Energy Efficiency	Design and Performance	Comparison of typical and best practice buildings of a similar nature to determine sensible targets for CO ₂ production and annual running costs against: Component load; lighting; fans and pumps; small power; space heating; domestic hot water; total electricity and gas; carbon dioxide emissions. Lighting Zoning Renewable energy – Photovoltaic panels positioned on southerly facing roof.
	Commissioning	On-going monitoring, improvement and maintenance for one year post completion. Full POE of building and energy use. Building services controlled by BMS and user friendly BMS.
Indoor Environmental Quality	Air Quality	Southerly orientation Controllable ventilation via windows and vents.
	Thermal comfort	Thermal comfort – system control Fully naturally ventilated – air take panels, raised floor vents, roof level ventilation (snouts), daily purge of hot air. Target average temperature 22-23 degrees. Southerly orientation (solar heat gain)
	Lighting, visual and acoustic comfort	Adherence to British Standards Institution (BSI) Code of Practice for Daylighting Southerly orientation High level of glazing Daylight glare control (blinds and louvres) Inner garden courtyards External views Motion sensor activated automated lighting. Low energy fittings throughout - Internal noise levels – in line with noise rating standardisation (ISO)
	Verification	Occupancy comfort survey as part of POE
Sustainable site planning and management	Facility management	BMS
	Transportation	Close proximity to public transport hubs Limited parking capacity Incentivise public transport use and car sharing. Secure cycle storage and showering facilities.
	Reduction of heat island effect	N/A
Materials and resources	Reused an recycled materials	Construction materials reuse where possible. Recycled content materials where possible. Sustainable supply chain where possible.
	Sustainable materials and resources policy	Sustainable construction principles Sustainable procurement principles
	Waste management	Storage, collection and disposal of recyclables
	Green products	Refrigerants and clean agents
Water efficiency	Water harvesting and recycling	N/A
	Increased efficiency	Gas fired boiler. Metering and leak detection system Automated hand flushing, toilet flushing, waterless urinals. Use sustainable urban drainage soak (SUDS) where possible.
Innovation	Innovation and environmental initiatives	Aim to aspire to innovative practices and concepts.
	Green building index facilitator	BREEAM Excellent

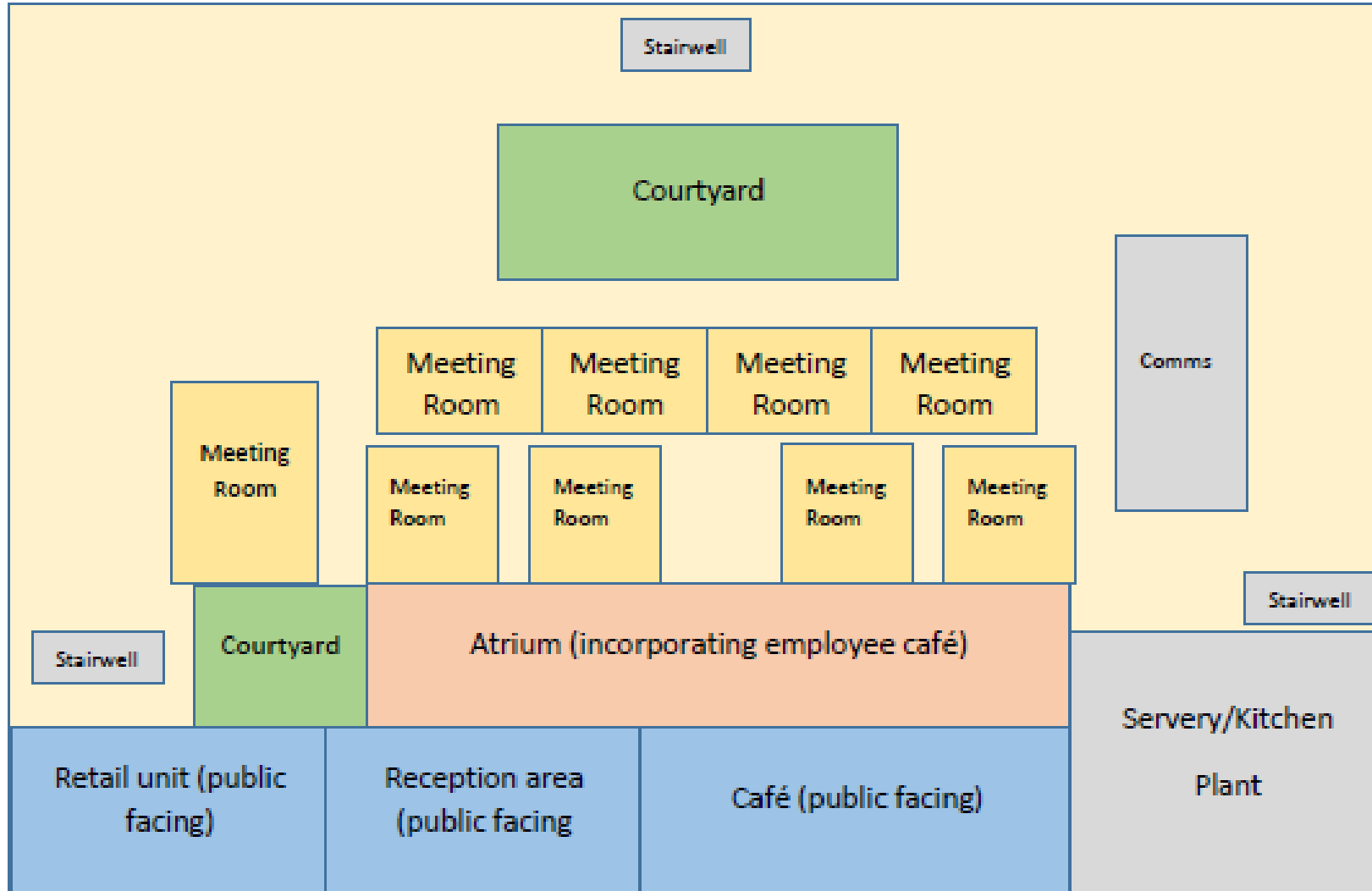


Figure 7.3: Organisation A Ground Floor Plan

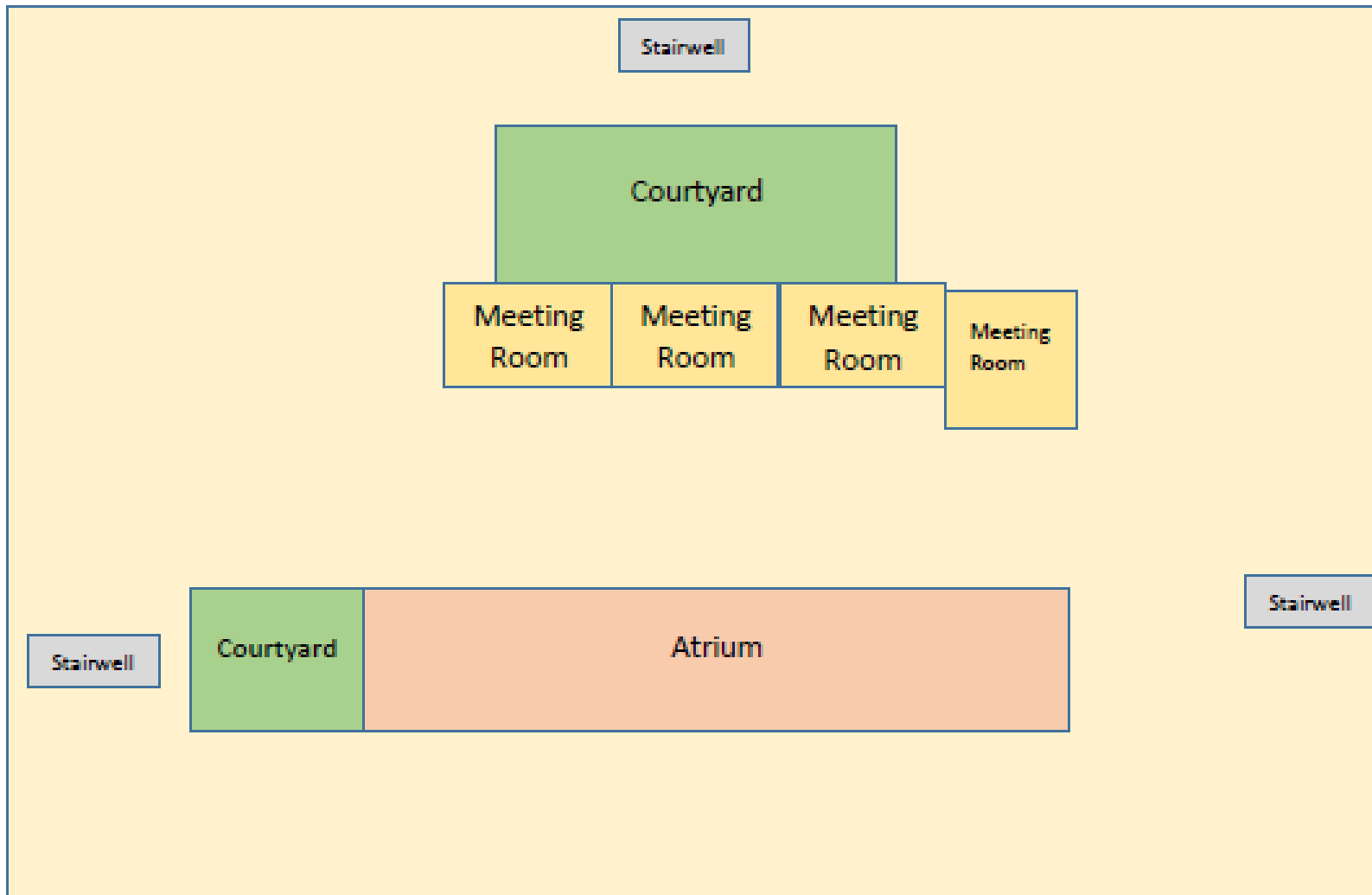


Figure 7.4: Organisation A First Floor Plan

7.4 Case study two: introduction to Organisation B

Organisation B is a European bank operating in a number of European locations, with a UK head office in the South West of England. The organisation differentiates itself from other financial institutions through its commitment to sustainability. This commitment is reflected not only in its client base - business and personal banking customers must align with the bank's ethical approach - but also in the visible demonstration of a commitment to sustainability through the occupation of a sustainably designed building. The organisation describes this through key commitments:

"...keeping energy consumption to a minimum, using renewable energy or renewable resources where possible...compensating for the environmental impact of generated energy. It is in this way [the organisation] minimises and compensates for its environmental impact. [Organisation B] is a climate-neutral or carbon neutral organisation." (extract from Organisation B Environmental Report, 2016).

The role of the building in this commitment to sustainability is emphasised to employees in an organisation induction pack which states, the building *"...aligns with our values."* (Organisation B Induction pack, 2016). This resonates with Bright and Dixie's (2014) assertion that tenant environmental goals are often pursued through Memoranda of Understanding or Tenant Handbooks, both of which are *"...non-legally binding [and]...provide easier opportunities for adjustment of policies over time."* (Bright and Dixie, 2014, pp.7).

The five storey building was constructed in 2010 and was part-let. Organisation B agreed terms for a ten year lease on four floors of the West wing of the building with the basement with the third floor remaining vacant. The building and office floors are accessed through electronic security cards. The ground, first and second floors provide open plan office space. Each floor is designed with a small kitchen area with seating, break out areas with soft furnishings, associated facilities (tea points, WC's, printing/copying points).

The fourth floor is client facing, providing four formal meeting rooms, breakout areas, lounge, a kitchen, tea point and a large seminar room (see Figures 7.5, 7.6 and 7.7). A balcony area on the fourth floor provides outdoor seating.

A BMS system controls energy efficient motion activated lighting sensors and regulates temperature. Photovoltaic panels are installed on the roof, and solar shading protects glazing from high levels of sunlight in the summer months. Low water useage systems are installed in the building, including waterless urinals using recyclable corn starch cleaning products. The building also features rainwater harvesting.

Locked cycle storage facilities are provided at basement level with showering and drying facilities in the office. Organisation B are visibly engaged with principles of sustainability and actively seek to minimise resource use through a range of behaviour driven incentives, including 'green champions and teams' and participation in local 'green week'.

The building was awarded a BREEAM Excellent rating at design stage. Table 7.2 below provides an overview of sustainable features (adapted from Rodi *et.al.* 2015).

Table 7.2: Building sustainable features – organisation B

Sustainability Category	Key targets	Operational design/fit out features
Energy Efficiency	Design and Performance	Active Environmental Management System monitoring environmental impact. Audited internally, managed by general environmental manager (FM). Aim to operate in CO2 neutral way. Energy supplied by 100% renewable supplier Lighting Zoning Renewable energy – Photovoltaic panels positioned on southerly facing roof.
	Commissioning	Building services controlled by BMS.
Indoor Environmental Quality	Air Quality	Southerly orientation Controllable ventilation via windows and vents.
	Thermal comfort	Thermal comfort – system control Fully naturally ventilated. Target average temperature 22-23 degrees. Southerly orientation (solar heat gain)
	Lighting, visual and acoustic comfort	Adherence to British Standards Institution (BSI) Code of Practice for Daylighting Southerly orientation High level of glazing Daylight glare control (blinds and louvres) External views Motion sensor activated automated lighting. Low energy fittings throughout - Internal noise levels – in line with noise rating standardisation (ISO)
	Verification	Internal auditing of EMS
Sustainable site planning and management	Facility management	BMS and EMS responsibility.
	Transportation	Close proximity to public transport hubs Limited parking capacity Incentivise public transport use and car sharing. Secure cycle storage and showering facilities.
	Reduction of heat island effect	N/A
Materials and resources	Reused an recycled materials	N/A
	Sustainable materials and resources policy	N/A
	Waste management	Storage, collection and disposal of recyclables
	Green products	Refrigerants and clean agents
Water efficiency	Water harvesting and recycling	Yes
	Increased efficiency	Gas fired boiler. Metering and leak detection system Automated hand flushing, toilet flushing, waterless urinals. .
Innovation	Innovation and environmental initiatives	Aim to aspire to innovative practices and concepts.
	Green building index facilitator	BREEAM Excellent

(adapted from Rodi et.al. 2015)

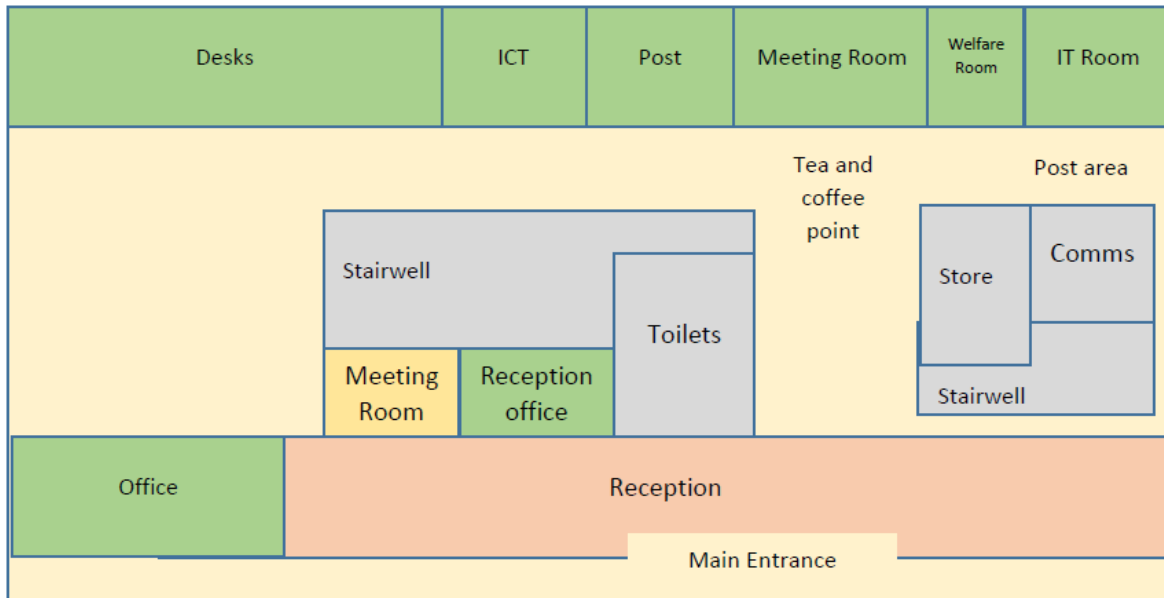


Figure 7.5: Organisation B Ground Floor Plan

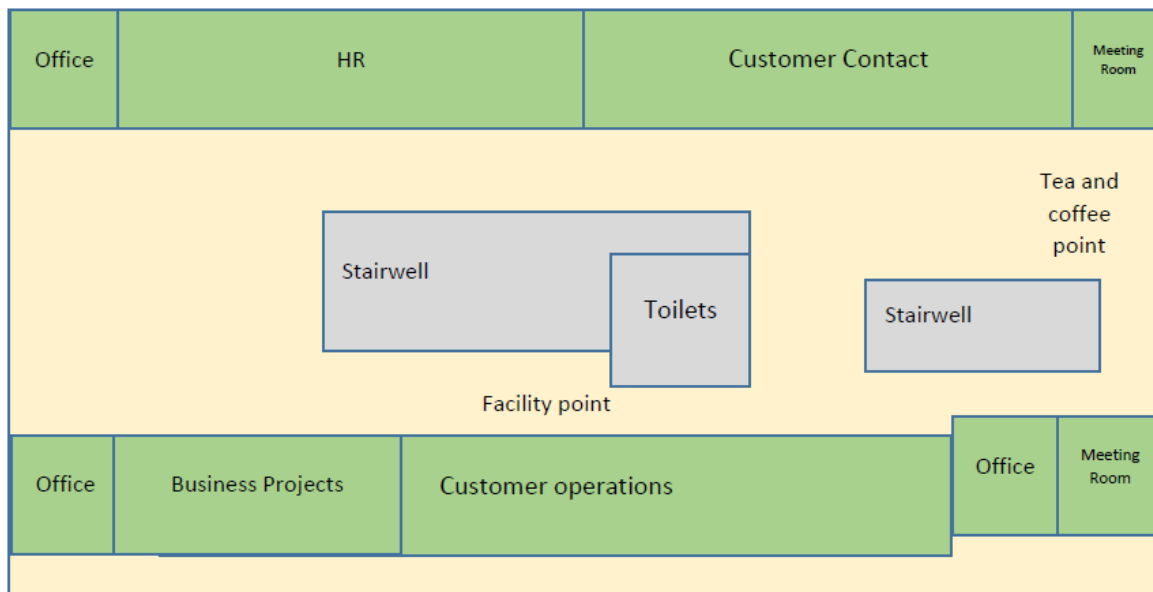


Figure 7.6: Organisation B: First Floor Plan

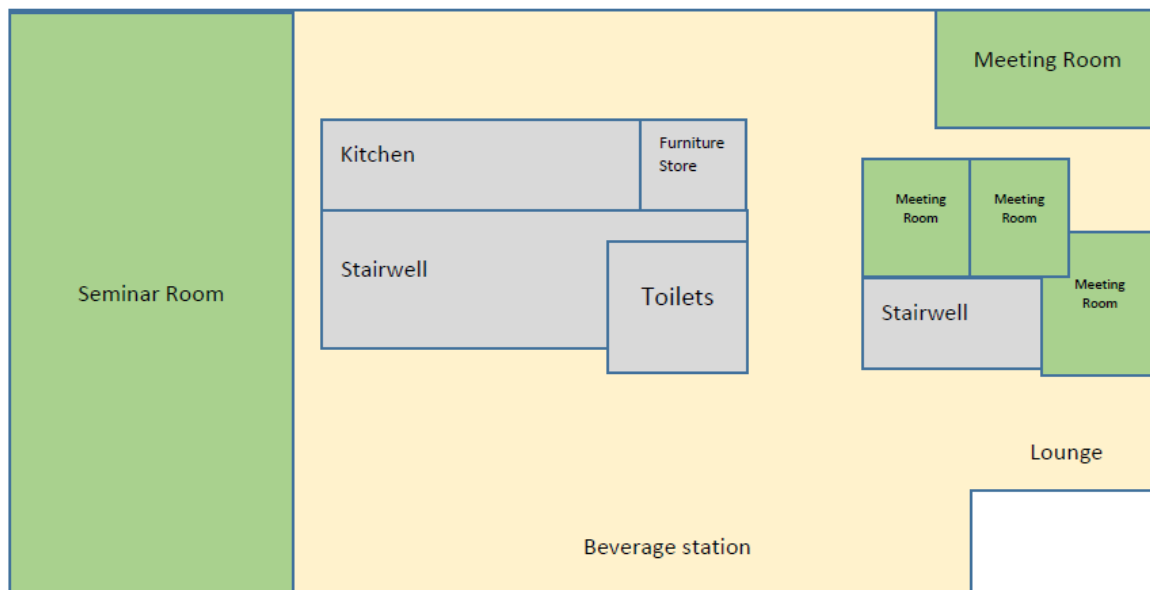


Figure 7.7: Organisation B: Fourth Floor Plan

7.5 Case study three: introduction to Organisation C

Organisation C is an overarching organisation operating a multi-tenanted building which opened in 2013. The organisation draws together tenants from the fields of science and technology, business and academia to offer a collaborative work environment. Space in the building is let on a wide range of terms, ranging from the use of hot desks on a daily basis, to private offices leased for one to five years with tenant fit out.

Varied work space is provided over two floors. The ground floor is dominated by a central atrium which is open to the public and which houses a café and a range of formal and informal seating. Raised floors provide access to power points. WCs, showers and bookable meeting rooms stem from the central atrium. Access to tenant-only areas leading from the atrium is gained by swipe card. Tenant-only spaces vary from banks of hot desks to offices of various size, some wings are in exclusive use of tenants. Tea and coffee points are provided throughout tenant zones.

The building was designed with the specific purpose of drawing together academic and commercial organisations and entrepreneurs within the scientific field. However, the building can also be considered as a constructed 'product'. There is a necessity to attract tenants and

secure rental income ensuring a marketable, tradeable, income producing asset. Cass et.al. (2016) contend that such issues are factors of 'marketable design' and encompass the requirement to "...*maximize net internal area; be of high quality; meet market expectations and norms; and provide flexibility for all potential occupiers.*" (p.11). This may be deemed of particular importance to the building, given the short-term nature of many tenancies and the pressure to maintain rental income in order to secure financial viability.

The building is equipped with 200 square meters of photovoltaic panels, aiming to provide 10-15% of the buildings energy requirements. A solar water heating system is also in place and a large solar powered chandelier furnishes the atrium. An energy centre is located adjacent to the office, housing a biomass boiler (locally sourced wood chips are used) and gas boiler. Mixed mode ventilation is controlled by a BMS system. Lighting is motion sensor activated and a daylight dimming system operates in the atrium.

The building is certified BREEAM Excellent, as with the first two case studies, table 7.3 below provides an overview of sustainable features.

Table 7.8: Building sustainable features – organisation C

Sustainability Category	Key targets	Operational design/fit out features
Energy Efficiency	Design and Performance	Commitment to sustainability Renewable energy from biomass boiler and photovoltaic panels positioned on southerly facing roof. Solar water heating system. Lighting Zoning Daylight dimming system in atrium.
	Commissioning	Building services controlled by BMS.
Indoor Environmental Quality	Air Quality	Controllable ventilation via windows.
	Thermal comfort	Thermal comfort – system control Mixed mode ventilation – natural and mechanical.
	Lighting, visual and acoustic comfort	Adherence to British Standards Institution (BSI) Code of Practice for Daylighting High level of glazing Daylight glare control (blinds and louvres) External views Motion sensor activated automated lighting and daylight dimming in atrium. Low energy fittings throughout. Internal noise levels – in line with noise rating standardisation (ISO)
	Verification	Internal auditing.
Sustainable site planning and management	Facility management	BMS responsibility.
	Transportation	Close proximity to public transport hubs Electric car charging points. Secure cycle storage and showering facilities.
	Reduction of heat island effect	N/A
Materials and resources	Reused an recycled materials	Sustainable construction principles applied.
	Sustainable materials and resources policy	Sustainable construction principles applied.
	Waste management	Storage, collection and disposal of recyclables
	Green products	Refrigerants and clean agents
Water efficiency	Water harvesting and recycling	N/A
	Increased efficiency	Solar water heating system and gas fired boiler. Metering and leak detection system Automated hand flushing and toilet flushing.
Innovation	Innovation and environmental initiatives	Aim to aspire to innovative practices and concepts.
	Green building index facilitator	BREEAM Excellent

(adapted from Rodi et.al. 2015)

7.6 Contemporary working practices in case study buildings

Chapter six presented conceptualised contemporary working practices drawn from literature (Figure 7.1). Conceptualised practices are now considered in greater depth within the context of all case study buildings, drawing on findings from participant observations and interviews. As discussed in the methodology chapter, the Social Practice Model (Shove et. al., 2012) provides a framework for analysis, deconstructing each proposed practice. Such analysis allows the complexity of practices to be captured. Each practice will be deconstructed to consider materials, competencies and meanings across all case study buildings.

7.7 The practice of flexible working

The practice of flexible working, from hot-desking to barrier free offices, emerged in the 1980s, converging with neo-liberal notions of productivity and technological development. The historical trajectory of this practice is central to the developing character of office work and expectations for the design of the supporting built environment (Chappells and Trentmann, 2015; Cass et.al., 2015.; Spurling, 2015).

Flexible working was evident in all case study buildings. In order to analyse the practice, materials, competences and meanings are deconstructed.

7.7.1 Materials

Flexible working	Materials
	Competencies
	Meanings

Cass et.al. (2015) outline the relationship between the emergence and normalisation of practices and the material development supporting and enabling such practices. Material elements include objects, tools, infrastructure and technology (see chapter four). The design and fit out of buildings, therefore, are necessary to hold the practice in place. In striving to achieve sustainable office buildings, all case study buildings sought to minimise energy use, a key element of BREEAM accreditation, through design, whilst simultaneously designing for the practice of flexible working. In deconstructing this practice insights into implications of this

practice for energy use and the performance gap are drawn out. Such insights, it is contended, would not be revealed through measuring the performance gap or energy use in isolation.

7.7.1.1 Spaces

The practice of flexible working was central to the development and ethos of organisation A. Flexible working was identified as a widely performed and well-established practice and was clearly defined in design specifications. As detailed in table 7.1, the design and commissioning aspirations set by organisation A aimed to achieve energy efficiency, whilst 'designing in' the practice of flexible working.

Organisation A's office provides spaces to support and encourage flexible working. On the initial visit to the site, the researcher noted the existence and demarcation of spaces to encourage different styles of working within the building:

"As I walk in to the office area, I am unclear where the office starts and the public area ends. There are traditional workstations to the left, some open plan, others partitioned [the legal team, I am informed, who require privacy]. Employees sit with tablets on armchairs and sofas – breakout areas. Others sit in the staff café, in groups with coffee, laptops, tablets and notepads, or individually, heads down, tapping on laptops. As we move towards the stairs, meeting rooms are all occupied, Sue points to a small room with one person working inside "that's one of our quiet rooms... when you need to get your head down." And it doesn't end there, upstairs more meeting rooms, quiet rooms and also break out areas next to kitchen points; "it's mainly the marketing team that gather there to brainstorm" Sue tells me." (Field notes 1 extract, April 2014).

This extract shows the extent to which the building design and layout seek to support flexible working practices within the office and that the material elements required are bound up with energy use. Andrew (2014) notes the *"rise of the coffee shop workplace...the need for the desk as a space to work is fading in importance and new work areas with Wi-Fi, sofas and coffee tables are emerging as the preferred choice."*

Whilst the building is predominately open plan, there is a recognition of a requirement for different work spaces to suit different types of working; office work and office design have co-evolved. It is also important to note that many of these spaces also aim to support the practice of collaborative working, also central to the organisation. The atrium, for example, was found during the observation period to support multiple functions, for example, the atrium area houses a café, and provides space to eat together with an informal meeting area, as this extract from the field notes demonstrates:

'It is 12pm and whilst a number of meetings continue to take place, lunch is already being served. Groups of colleagues queue to order lunch, whilst others sit down, opening packed lunches. At the same time, a speed networking event has started at the centre of the atrium area. This, I am informed, is to encourage staff from external sites to get to know each other and collaborate. The result of all this activity is noise, but this does not seem to bother some members of staff who remain, heads down, stoically working at their desks.' (Field notes, June 2014).

This extract suggests that the flexibility of the physical space supports different types of formal and informal working, however there is perhaps an acceptance of the limitations of the practice, in that a level of noise must be tolerated. Although this was not observed to be the case consistently, as the following extract shows:

"The office is busy, banks of hot desks are full, the café is full and meetings are taking place in the atrium below. Sheila is trying to discuss a budget with Asif "I can't hear any of that because of..." Asif points to the atrium below." The pair retreat to a meeting room. Automated lighting comes on, and Sheila plugs in her laptop. Back at his desk Asif's laptop remains plugged in and switched on." (Field notes, September, 2014).

This extract demonstrates the potential for energy use at multiple sites. **Such subtleties would be problematic to predict at design stage, thus could contribute to the performance gap.**

Issues of unpredictability in flexible working are bound up with the material elements of the building and may impact on energy consumption. Together with break out areas, meeting rooms, quiet rooms, café area and desk space are 'touchdown areas'. These are banks of bookable desks, located on both floors of the building. The meeting rooms and café are also designed to provide further flexibility. Meeting rooms can be subdivided or expanded through partitioning, the café is also used as a 'party' space for working social occasions and sufficiently large to accommodate around 450 people. However as noted above, the current staffing levels are around 500, with an additional 70 transient employees, the availability of space has become increasingly problematic and has hindered the practice of flexible working as is reflected in observation field notes:

'Upstairs, in marketing, there is a discussion about space problems and booking rooms for meetings "...they're rude enough to accept a meeting for an hour that they have to leave after half an hour. We could have used that space, they could have taken one of the smaller rooms or used the atrium..." says Penny, a member of the marketing team.' (Field notes extract, May, 2014).

This issue was also raised by one interviewee Tracey, the HR Director, when comparing Organisation A office to her previous workplace:

"...there was lots of very open plan working [in previous office]...we at least had some offices that we could use or that we were in effectively, so some of us had an office, but it was only if you also could open up that office to your team to come in and use at certain times, and if we weren't in then there was a booking system where someone else could use it. Here nobody has any space at all, that's wrong, no one has any separate offices so it does mean that it's really good because you can walk around the building and see everyone, it's not good if you're trying to find somewhere quiet to talk. There are meeting rooms but those meeting rooms generally at least Tuesday, Wednesday, Thursday or Monday, Tuesday, Wednesday, Thursday are packed. Those meeting rooms are nearly always full at the moment, so it's finding an area where you can create confidentiality. We are confidential and I'll show you that,

we've created that by the way that we've sat people and how we've constructed tables in different locations to do that ..." (Tracey, HR Director, 2015).

This interviewee touched on a common theme around the limitations of quiet rooms, their availability and their appropriateness. Another interviewee, Kate, a senior manager observed:

"Sometimes you think, I just need to go and have a little think and not be around anyone. I don't find the quiet rooms very helpful for that. In theory that's what they're for but very few of them have got windows, it's like being in a cave. You don't want to be in there, if what you want is time and space to think I find that very difficult at Organisation A. Sometimes I'll just walk and go out the building, I'll walk round the block or a I'll do a lap round the shopping centre, just to not be with people at work, it's not because they're unpleasant or the environment is unpleasant, it's just the getting a break. You know when I worked elsewhere and I had my office you would just shut the door and put up the do not disturb sign and that would do the job, so that's quite different." (Kate, Senior Manager, 2015).

Organisation A aim to tackle space restrictions by rolling out a hot desking programme with, as noted above, the provision of banks of hot desks, and also an intention to move to a hot desking policy is discussed in competencies below. Issues around the predictive nature of BREEAM and energy performance targets are relevant here, in particular **the unpredictability of occupancy in organisation A arising as a result of flexible working could contribute to the performance gap.**

In contrast to organisation A, organisation B does not occupy a building arranged around a central atrium. One observable consequence is lower levels of ambient noise, which may reduce levels of 'retreat' discussed in relation to organisation A above. The previous office occupied by organisation B, a townhouse divided into cellular offices, had highly restrictive design, which did not support flexible working.

Organisation C offers a wide range of flexible arrangements supported by design and fit out, ranging from long term leased space, with access to common areas, including atrium and

meeting rooms; to bookable hot desks and daily drop in sessions in the atrium. Banks of hot desks are available on a short-term contractual basis. The wide range of spaces and improved management of spaces has been termed the advent of the 'office hotel'. Gyford (2014) suggests many sustainably designed offices provide "*caves and commons*", in other words smaller offices designed around larger communal spaces.

7.7.1.2 Building infrastructure

Organisation A provides a physical demarcation of spaces in the office design, which are supported through the infrastructure of the building. Building services, which enable flexible working are provided throughout: electricity, water, thermal comfort systems, ventilation, acoustics, communication lines and Wi-Fi access. Acoustic buffers are also installed in the central atrium area. Meeting and quiet rooms are equipped with power and telephone points accessed via raised floors, video screens and separate heating and lighting controls. Motion sensor lighting is in place, however manual controls are also provided.

During the observation period, some complexities in infrastructure were noted, for example the researcher was involved in a discussion regarding Wi-Fi:

"We are talking about the difficulties of logging on to the Wi-Fi system, Asif tells me "there are only 200 licences and those are pretty much all used by nine am...once you've logged on it's fine but if not it can be frustrating..." (Field notes, June, 2014).

This difficulty is also noted during informal discussions with the FM team who report that the office is "*bursting at the seams*" with over 843 staff registered as employed in the office (Field notes, April, 2014). Moreover an IT project has forced parts of the team to move to temporary rented office accommodation. Increased hot desking is planned to mitigate the increase in occupancy, however difficulties in accommodating visiting staff members

The requirement to accommodate different working styles through design and building infrastructure is set out within the design brief. An aim of the brief is to provide a flexible building to British Council of Offices (BCO) standards (2000) to maintain "*flexibility for change*

in respect of future occupier needs or change of owner whose requirements are unknown at this stage." (Design Brief, 2002). Consideration of potential future subdivision of the building to accommodate multiple tenants is also detailed in the brief. Faulconbridge et.al. (2018) observe that the development of offices to accepted 'market standards', such as the BCO Guide to Office Specification, generally acknowledged as an industry minimum, may lead to "...pressures for conformance [on the part of design teams] with approaches legitimised by socially constructed ideas about 'quality' and 'need.'" (p.3). Aims within the design brief to provide a flexible structure for notional future occupiers, may lead to the overprovisioning of infrastructure, for example, high levels of small power provision and open, flexible work space providing for high density occupation. This is a particularly interesting consideration in the case of organisation A, which has an undertaking for 25 years, an unusually long lease, typical commercial leases averaging six and a half years (JLL, 2016). Whilst the landlord will benefit from this legal security and organisation A's strong covenant²¹, there remains a requirement to address risk from the perspective of both parties by means of providing a building specified to market standards, which are typically guided or above BCO standards (Cass et.al.,2016). **In this respect infrastructure may exceed necessary requirements for organisation A's working practices and lock in energy intensive practices, potentially contributing to the performance gap.**

Infrastructure was found to play an important role in shaping practices in organisation B and supporting the practice of flexible working as James, the facilities and building manager reported:

"...during the design of the building and the relocation we did have quite a conscious effort in making sure that work stations were standard so they all have the same IT equipment and telephony, you can sign on, so we have a network rather than an individual pc so you can log on to the system on any desk or in the meeting room, you can also log your phone on to any

²¹ Covenant here refers to the financial strength of the organisation, Organisation A is a well-established, publicly funded organisation, who are protected from market shocks.

phone in the building so it offers a great deal of flexibility for people to move around. It's all standard, you don't have a rush of people trying to get into the same space. The same features that you would have on a desk top, we have in meeting rooms, so the idea being that there's a sort of 4 inch TV screen rather than computer monitor but the computers are the same that they use, the log-on is the same and the access to the network, your files and the phone you can log on to the telephone as well. You may have external people coming in to do a presentation and have a laptop, there's this facility that we can just flick the switch and use the lap top if we so choose." (James, FM, 2015)

Such standardised provision, however could, as with organisation A above, lock in energy intensive practices. For example, the use of energy intensive large screens in meeting rooms in organisation B were frequently observed, providing no more than a backdrop to discussions, one which it could be contended was unnecessary and in use merely due to its existence.

The provision of this technology and infrastructure could contribute in this way to the performance gap.

Flexible working practices in organisation C are underpinned by supporting infrastructure. The aim of the building design is to provide "*...space, flexibility and support for science and technology businesses to accelerate their growth and success.*" (Design Brief, 2011). Connectivity in the building is provided through wireless internet access, which is managed through an eduroam visited service. Occupants must hold an account which is authenticated by organisation C. Belonging to this wider network, which is described as "*...a worldwide community whose aim is to "open your laptop and be online" and allows users from participating institution to securely access the Internet from any eduroam-enabled institution*" allows organisation C occupants flexibility therefore, in the building and beyond.

This provision of infrastructure supporting flexible working practices was observed to impact on energy use. For example, one interviewee in organisation A commented, "*...you can just pick up your laptop and walk and the Wi-Fi and everything works*" (Carol, FM and building manager, 2015). During the research period, many participants were observed conducting

Skype meetings, particularly within organisation C's atrium area. However, participants were also regularly observed 'plugging in' devices in common areas, often whilst leaving other devices switched on in desk spaces. **Infrastructure could be considered as a potential contributory factor to the performance gap in the context of the practice of flexible working.**

7.7.1.3 Material Artefacts

Material artefacts are employed in the performance of the practice of flexible working, as identified during observations in organisation A, many of which are of relevance to energy use:

"Employees move around the office and carry out different work tasks in different areas of the building. There is mobile IT equipment: most people arrive at meetings with laptops in tow; others use tablets or both. Telephones are in most workstations, though touchdown desks are not equipped with phones. Printers and copiers are provided at business centre points and support different tasks. Storage is dotted around the office, some pedestal drawers, hangers, cupboards..." (Field notes, July, 2014).

There is a mid-point suggested between visiting and permanent employees and the material artefacts, which enable flexible working. For example, during the research period, a team visiting from an external site arrived in organisation A:

"...one person takes keys out of her bag and proceeds to open a cabinet where she is storing some work. Evidently she is visiting sufficiently frequently to merit a storage space." (Field notes, October, 2014).

Thus, the more permanent, even transient employees became in organisation A, the greater an array of material artefacts they accessed. Some artefacts noted during the observation period were unexpected as the following extract demonstrates:

"A woman arrives at the top of the stairs carrying a laptop in one hand and a folding stool in the other. The inference here is that if you do not have a work station, you can create your own." (Field notes, September, 2014).

This was also observed in organisation C. Lockers and storage were provided for hot desk occupants however, however this did not extend to 'drop in' occupants. Hot desk occupants also have access to tea points, which provide a more social setting. Material artefacts are used to demonstrate belonging or permanence. For example, whilst some occupants arrive at hot desks with simply a rucksack, others open storage lockers, which are filled with files.

Throughout the observation period in organisation A, a constant feature as employees moved around the building, was an electronic device, a laptop or tablet, and notepad. This was also reflected in those possessions brought along each working day by employees, for example, the typical 'load' included a rucksack (containing a laptop) and a further bag (often containing packed lunches and additional clothing). Those visiting the building arrived with more significant baggage, often with small suitcases, a consequence of many visitors spending a number of days in the office.

Carol (FM and building manager) observed that in order to be comfortable in the building, it is necessary to provide storage for additional clothing:

"You can't do anything to adjust the temperature so just bring clothing. We tell them [employees] it's a cardigan culture so they should all have something on the back of their chair. I know that's more difficult when they're hot-desking but they should have something with them because the building will fluctuate. There are various little hang rails around the building and people store stuff in them." (Carol, FM and building manager, 2015).

Similar material artefacts were evident in organisation B to support the practice of flexible working, storage at desks and located around floorplates provided employees with space to store sports clothing, changes of footwear and rainwear.

Diverse working spaces equipped with material artefacts to undertake flexible working were also raised by many participants as the following extracts illustrate:

"...well equipped rooms are critical where you can gather together a number of people and run workshop sessions... taking people outside of their operation, putting them in a room and

mapping processes... I need to take them away to their day to day environment...space...the ability to communicate across geographical organisations, to video conference people.” (Dan, Business Development Manager, organisation B, 2015).

Jules, who frequently used break out spaces described the material artefacts she took with her:

“Sometimes my laptop, mostly my iPad, my book, that’s about it really, some print outs maybe. I use floor plugs, yeah with the laptop.” (Jules, marketing director, organisation C, 2015).

One interviewee noted the role of material artefacts in undertaking his work flexibly:

“I have my personal laptop, there’s the option to get hold of company laptops and other mobile devices, iPads and stuff, my sessions tend to be old school on stickies [post-it notes] and flip charts.”(Mike, HR, 2015).

The use of material artefacts, namely devices, was also observed in organisation Cs atrium (or forum) area:

‘As occupants arrive in the Forum, few do not have what seem to be the accepted tools to work here: a laptop or tablet (typically an Apple Mac), smart phone and notebook. Many plug in to floor level power points once they are seated.’ (Field notes, May, 2014)

Material artefacts are also used to denote public and private spaces. For example, one participant in organisation B noted *“...the fourth floor has more of a customer focus feel, more of a primary area, there’s larger screens and better furniture in there...”* (Field notes extract, June, 2014).

Conversely, some material artefacts inhibited flexible working:

“We often break out for team talks because we don’t want to disturb everyone else in the building, in the room, so we break out for that, the studio couldn’t break out because they need their macs and their pc’s but I probably could break out more but I don’t... I don’t know

why...maybe I'd have to take so much stuff with me it's just not worth it." (Jules, marketing director, 2015).

The integration of material artefacts into the practice of flexible working can be contended to reflect modern working practices and technological development. Technological development has shaped flexible working, allowing work to be undertaken anywhere in sustainably designed offices. **Technology and culture have developed in parallel. Building design has adapted to cater for this cultural shift, providing power points, wireless Internet access, break out and refreshment areas in offices, all of which involve energy consumption and potentially contribute to the performance gap.**

7.7.2 Competencies

Flexible working	Materials
	Competencies
	Meanings

A number of competencies emerged from empirical research required to engage in and supporting the practice of flexible working and are relevant to energy use and the performance gap.

7.7.2.1 Technical and regulatory requirements

As discussed above, market standards are adhered to in the design brief of organisation A, in line with BCO Guidance. Timmermans and Epstein (2010) propose four relevant development standards: design; performance; terminological and process. Bowker and Star (2000) (in Faulconbridge et.al., 2016) observe that many such standards form the basis of health and safety legislation and building regulations which must be adhered to. Standards have impacted on the building specification in all case study buildings.

In order to support and enable the practice of flexible working, regulatory legislation must be respected (see section 2.4). The impact of adherence to voluntary standards and the associated legitimisation of 'need' influences the practice trajectory. In developing a high level of provision, for example of small power loads in different areas around the office, material

elements hold the practice of flexible working in place. The important point to consider in relation to energy consumption is whether the trajectory of the practice is steered by high provision in a less sustainable direction.

7.7.2.2 Operational knowledge: handover and dissemination

In order to engage in the practice of flexible working, it is necessary for the design and service functions of office buildings to be effectively understood by relevant employees. It should be noted that the scope of this research focuses on *office* working practices and therefore does not seek to deconstruct employees engaged in the provision of cleaning, catering or waste management, as this would move beyond the sphere of contemporary office working.

Post Occupancy Evaluation literature (see chapter two) has highlighted the importance of handover processes to the operational performance of sustainably designed buildings. In the case of organisation A, a number of key issues were observed. The FM team informally discussed the difficulties of understanding and operating the BMS system, “*It took us years to get the measure of it. They [installers] just put it in the building and left... we had to employ an engineer in the end to really get a grip of the systems...it just wasn't clear...*” (Sally, FM team member, Field notes extract, July, 2014).

The team also discussed some of the subtler complexities of the building systems which impacted on flexible working, for example it was impossible to include signage for teams or break out areas as “*...the building was designed not to be cluttered, if we hang anything from the ceiling, unless we make it really sturdy, when the purge happens at night, it's going to set all the burglar alarms off.*” (Nancy, FM and building manager, organisation A, 2015).

The above extracts illustrate both the difficulties of familiarisation with building systems and the necessity for employees beyond ‘experts’ to have an understanding of systems and processes within the building. **At building or facilities management level, there is clearly confirmation of building underperformance relating to handover, therefore contributing to the performance gap.** At office worker level, in principle, this is addressed through

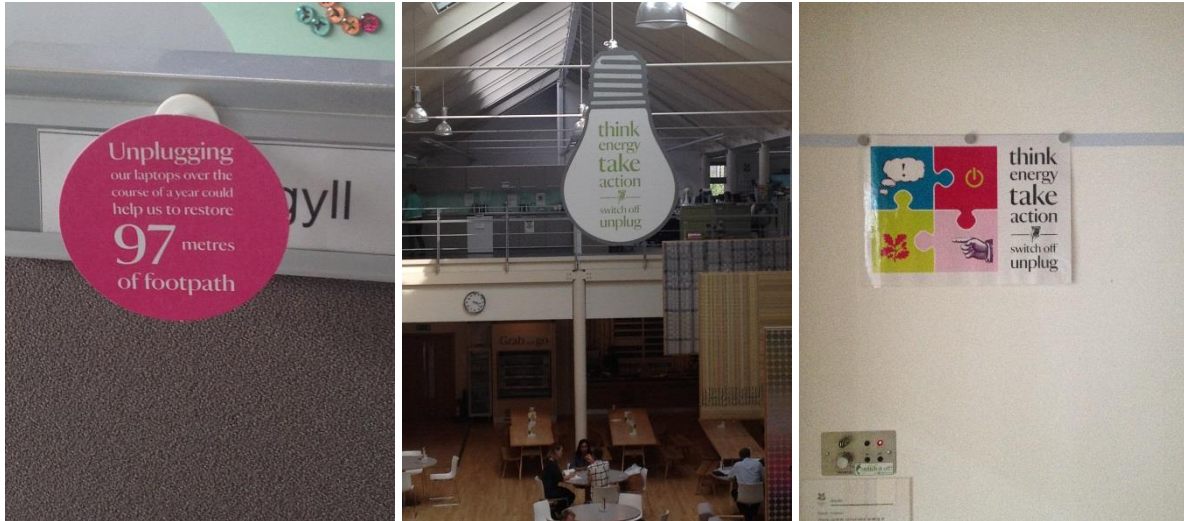
employee induction, however as Nancy (FM and building Manager) reported “...a lot of them [office workers] don't have any sort of induction at all...” (2015).

One interviewee, Sue, reported “I can't actually remember [an induction], I would have been shown round the building and shown where the fire exits were and where the toilets were and the tea points, that sort of thing. Then we do various things on the system, like the health and safety, you do that yourself, it's a computer thing you do... in fact on a Friday here, the public come in and have a tour round the building and that's explained to them, how everything works, normally a volunteer [conducts the tour]. Somebody did mention at one time, that it would be good to join in on that, to understand how everything works, but no, I wasn't told [about building systems and processes].” (Sue, Administrative support, 2015).

Information is provided to transient employees at hot desking areas in organisation A, with 'Hot Desk Etiquette' which lists details of small power points, Wi-Fi access and booking systems, however informal discussions with transient employees suggest that an understanding of relevant building systems and processes has not been disseminated. One example of this was noted during observations:

'The desk next to me is occupied by someone visiting from another of the organisations offices. We briefly chat as he arrives, he is here for a “day of meetings” and has arrived equipped with his own laptop and notebook, which he unpacks. He plugs his laptop in to the power point at the hot desk. He leaves the desk around 10am for his first meeting, detaches his laptop from the charging cable, but does not switch off the power point, leaving the charger connected and consuming energy. Nancy (FM) explains to me that this “happens all the time, they're always leaving the plugs on”. There is a laminated document propped up at each desk providing 'Hot Desk Etiquette', the visitor has not noticed the advice. Later in the day, around 5pm the employee returns to the desk to gather up his belongings, the charger has been left on all day.' (Field Notes, April 2014).

The operational knowledge and understanding required of office workers was reflected in the multiple notices and images around the building encouraging employees to 'switch off' (images 7.1 below)



Images 7.1: Reminders to 'switch off' organisation A

Cass *et.al.* (2016) contend that the practice of flexible working, embeds not only the material elements of mobile devices, but also requires new competencies of working whilst 'moving' around the office. **As such, in failing to successfully communicate and engage office workers in the necessary operational competencies, unintended energy is consumed which could potentially contribute to the performance gap.**

7.7.2.3 Understanding flexible working processes

As noted above one response to space constraints and seeking greater efficiency in terms of both productivity and energy use, in case study organisations, was to encourage flexible working within and externally to the office. This has been characterised by the introduction of hot desking. A new 'normal' (Spurling *et. al.* 2013) has been established for one department in organisation A through this process. Participants reported an initial 'panic' when the initiative was launched and some levels of distrust towards a booking system, which was released two weeks in advance and described a 'rush' on desk bookings. However, increased understanding and trust in this process has resulted in a more informal approach "...*there will*

always be a desk available; the bookings sheet provides a 'backdrop' to the process as opposed to a prescriptive structure." (Cathy, hot desking team, field notes extract, June 2014).

Kate, a senior manager at organisation A, who was in charge of the team first adopting hot desking practices, described the transition:

"It wasn't driven by our department, it was driven by the facilities team, they had too many people and particularly with the [IT] project, there were a large number of additional IT staff and project staff and a need to use the building more efficiently. There were more people but they did a bit of work around the building and it just backed up... Each director had a lead to manage their space in a different way...and we opted to go completely hot desking for our different departments. I think it's ok, there are some people who still think it's the worst thing ever." (Kate, senior manager, organisation A, 2015).

The provision of bookable spaces is a feature of both flexible and collaborative working, allowing teams of colleagues within the same department but located at different sites, to come together and create a temporary 'departmental space' as was observed:

'Two banks of hot desks appear to be occupied by one team. I ask Sue about it, she tells me they are a department spread over sites, they come in for particular projects and book a space where they can collaborate' (Field notes, September, 2014).

However the success of the uptake of flexible working, and an understanding of the processes described above, has an impact on energy use. Full integration may lead to desired energy efficiency gains, and improve operational energy performance; however a lack of understanding of the process, for example, in organisation A, was observed to have curtailed the full uptake throughout the office, potentially contributing to the performance gap.

7.7.2.4 Rules

Some simple processes extend to an understanding of the tacit rules, which enable flexible working and are relevant for energy consumption. Clearly defined rules were set out within organisation B, who adopted a rigid approach to flexible working 'rules':

"I have fixed hours, as an organisation, we have quite standard hours which are focused around our summer opening hours so that's at eight thirty till five and people working outside of those hours, that would be an exception rather than a norm... flexible working which means you can talk to your manager, you know what eight thirty doesn't really work for me can I do nine thirty, ok great so you then start working nine thirty till six o'clock. It's not flexible as in flexi hours as you can turn up between certain days and you can leave whenever as long as your hours add up in the month. It's not that at all. Our published opening times, so visitors coming in to the building and available through the telephone system, and outside of those hours we are not contactable so, unlike a high street bank, or RBS/HSBC, you could probably speak to somebody at three am, they offer 24/7 we don't do that. If you want to contact us it has to be in those published hours though internet banking is available. So it fits in with our business model. For the support functions, building facility, IT need to support the core business activity which then dictate our hours working as well." (Jim, FM and building manager, organisation B).

It was observed that occupants in the organisation B building did adhere to these rules, and occupancy reflected this:

"During our office hours so the eight thirty till five we've got sort of an average occupancy of about 72% and that's between those hours. So most people do come in but there is that flexibility from some people. It's a secure access portal and it's on licence, not everybody has that ability to do it [work remotely] and do actually physically need to be in here to answer phone calls or those kind of things and roles which are not primarily customer based around published opening times. For example, bank managers might be visiting a customer for loans, might have to travel to London so they work different hours and they may come back at six,

or they don't come back at all. Other departments which are supporting the core business may still have in a project activity/deadlines which will require them to work a bit later so the facility's still there and of course things like IT upgrades or changes will be done out of those core hours and therefore they work at those times." (Mike, HR, organisation B, 2015).

The business model which organisation B have adopted, due to economic and societal pressure is fundamentally at odds with flexible working practices, resulting in perhaps a more superficial embracing of the practice. However, some employees found this more restricted, conventional work patterns to be beneficial:

"...my last employer, they didn't care where you worked as long as you worked, I had the ultimate flexibility but I found that I would still go in to the office... it was good for me. I preferred to shut the door on it, I like to go home to the family, my preference is definitely to go into an office environment and then to switch off...you often have multiple distractions on the home front." (Dan, business development, organisation B, 2015).

There was also evidence of tacit understandings of the use of flexible working spaces, what compromises must be made, what was necessary in using booking systems and technology:

"You haven't booked a room properly, that can be an issue, and someone's need is greater than yours...video conferencing I tend to go half an hour beforehand and iron out any issues, connections and stuff..." (Jane, marketing team, organisation B, 2015)

In the context of energy use, the relative predictability of occupancy, if included in design stage, may narrow the performance gap.

"They've recently put a 15 minute rule, so if you're not in your room within 15 minutes of you booking it and it goes on these boards here [points to printed A4 sheet outside meeting room adjacent] it tells you each day who's booked for what. Clearly you can look online but it does mean that if you turn up, and go well actually we're sat out here and we could do with a meeting room, have a quick look you can see whether anyone's in them, you can just drop in and go and use them if no-one's turned up. They're meant to cancel it online but you can just go in

and... the other thing I would say is people are so polite here, as in the fact that say it was ten am and I'd got the room booked for ten and they'd been in there nine to ten, if I turn up and I loiter outside at ten they'll pack up their bags and come out, I'd never have found that in my previous company [laughs] well I might have done or it would have been slightly harder." (Tracey, HR director, organisation A, 2015).

Another interviewee also demonstrated an understanding of rules around flexibility, task and spaces:

"I'd lock myself away in rooms depending what I was working on and just if I need to isolate myself... it is open plan so I'm conscious of others, if there's a big bit of work I need to get over the line...only meeting rooms that would offer privacy...I often have meetings up on the 4th floor in the break out areas over coffee." (Dan, business development, organisation B, 2015).

Organisation C has many complex rules around the practice of flexible working as a result of the varied tenancy arrangements in place. The Forum area (atrium) is open to the public from 8am – 4.30pm and occupants can therefore 'drop in' to work during these hours. Tenants using hot desks or those leasing space in the building used both desk and shared spaces to undertake work flexibly. One participant, an entrepreneur, commented:

"It's funny really, I can work anywhere but I want to work beside others, somewhere like this...I'm more productive. The Wi-Fi and facilities mean I'm able to. It's really easy, you can just turn up and get a code [Wi-Fi code, for a small fee] from reception. I heard about it from a friend..." (Field notes, September, 2014)

Thus the material elements and infrastructure provided in the building and an understanding of the rules, allows short and long term occupants to be accommodated and engage in flexible working practices which subsequently impact on energy consumption within the building and the performance gap.

7.7.2.5 Scheduling: core working hours, access to building, personal commitments and variations

Organisation A open the office building between the hours of seven am and seven pm. Organisation A seek to actively encourage flexible working through relaxed core working hours to support a work-life balance. The rhythm of working life at Organisation A is varied as the following interview and observation excerpts demonstrate:

“People know when the building is open and people do whatever suits them best within that. In my team I have quite a lot of part-timers and just because they’ve got kids they tend to stick to quite set hours because that fits around childcare and stuff. Those who are full-time, it tends to be much more flexible and some of it is about preferences, I’ve got people who prefer to be in early when it’s quiet and people who prefer to be in late when its quiet and a couple of us who seem to be in late and early. On the whole its, yeah, flexible and I kind of drive a culture of ‘as long as you get the work done, I’m not bothered if you’re not here at nine, I’m not bothered if you wander in at ten to ten because I know you’re getting the work done.” (Kate, Senior Manager, 2015).

From a monitoring perspective, John, a receptionist noted working rhythms observed:

“We always track the amount of people in the building every day so you will always find that on a Friday it is very minimal, there is barely anybody, compared to some days when the building can have 600 people in throughout the day, sometimes it can be down to 230-40 on a Friday.” (John, Receptionist, organisation A, 2015)

Intersecting practices of getting to and from work and working rhythm were also noted during the research period. For example:

“I would say once you get past five thirty/five forty five there’s a sort of exodus at that point and a lot of that is car share driven, so you’ll see groups of people leave because they’re all in their car share. So yeah once you get past sort of six-ish that last ninety minutes is much quieter and its different obviously on different days of the week, so on a Friday anything after

about four thirty lovely. I often find if I'm in the office on a Friday, I quite like it, it's quiet, everyone's less frantic and I just get loads more done because I have fewer meetings. I end up going off for the weekend feeling really calm and not minding that I've stayed there till seven." (Tracey, HR Manager, 2015)

Throughout the research period with organisation A, patterns of occupancy were observed. For example, a large section of the workforce began to leave the building from three pm onwards on a daily basis, this was supported by informal discussions with the HR team, confirming that many employees had working hours arrangements in place to enable the collection of children from school. This was an aspect of the organisation which was widely supported at all levels and which was a source of pride for many, reflecting organisation A as an ethical and forward looking employer.

Peak working hours and days were observed in organisation A suggesting tension between flexible working and peak electricity use, a concept well documented in existing literature. Addressing such peak use from a practice perspective raises a number of interesting points. A practice perspective generates questions around altering schedules or distributing resource use over space and time. **However, it was observed that in spite of such scheduling flexibility, peak times persisted, notwithstanding that such times differed from traditional understandings of nine to five working days. Peak occupation in organisation A was observed to occur midweek, which could potentially contribute to the performance gap.**

Connections with personal commitments impacting on flexible working were noted in organisation B, although as discussed above, opportunities for flexible working were limited to some extent as the following extracts demonstrate:

"I normally work eight thirty to five fifteen, there definitely is talk of flexibility but [it is] just a courtesy thing... [you can] ask for flexibility from line manager. Of course the people I do business with keep certain hours so have to make myself available for that. I often come in

quite a bit earlier than others and work later by my own volition, because I cycle and run in. Late here is not late...” (Dan, business development, organisation B, 2015)

“Yes... probably about 50% of our staff are able to work from home so technically, can connect to the IT system from home, and that definitely shows on the latter part of the week...so we have a full complement at the beginning of the week and, bit like a gym, as the week goes on, less and less people are in and the times of day as well...definitely again the latter end of the day it will get less and less so it's quite a big exodus at five pm because of those standard times, but people still do work up until seven thirty, so the building is open until eight pm, when our cleaners lock up and we will regularly have people that are actually working until that time so the facility's there should they want or need to work any later. The office floors, so we have the 4th floor which is primarily the staff rest area and hub, meeting space, and what we'll find is that every day that's kind of deserted by four thirty and on a Friday it's regularly deserted by three pm.” (Jim, FM and building manager, organisation B, 2015).

The subtleties of routines and schedules are drawn out through a deconstruction of the practice of flexible working, creating a broader understanding of how those routines impact on office working and energy use.

“In the summer I'll try and tie in a bit of exercise [with work], I'll sometimes get in the car and go somewhere pretty and go for a decent walk. They tend to be smaller breaks...a favourite would be walking to the supermarket and get some shopping...anything that provides a break between the large chunk of work you've just done and the one you're trying to put off...I can't decide whether it's valuable or just procrastination...there's a massive amount of productivity can be gained by planning your day right... I fight rigidity, I don't think it works for me, I'm much better flexibly...my week is always planned at the start of the week and if something needs to be done it will always go in the diary. If it's not done during the day it'll have to be done in the evening...” (Lawrence, IT self-employed, organisation C, 2015)

Whilst this interviewee described the process of integrating personal commitments, such as commitment to health and well-being and work balance, he also revealed unintended energy use in 'driving' to another destination, although this is of course, not linked to energy use *within* the building.

Another scheduling issue related to international collaborations:

"I get in here early, I get in here at just gone seven thirty... A lot of our business comes from the USA, so they've been busy overnight, so I come in, clear the decks, set the workflow ready for the designers when they come in. So my first thing, walk in the door, go to the kitchen make a coffee, crank up the machine, then sit down in quiet for an hour, hour and a half and plan the day. From seven thirty till nine am and then, I'm organised. It is quiet, but it's getting busier now, I still park my car outside there at seven thirty and now there's about six or eight of us, so we're like 'hi..hi' people can't sleep at the moment, yeah so I think more people are starting to come in now but it is quiet which is quite nice actually." (Jules, marketing director, organisation C, 2015).

Such scheduling issues hold the practice of flexible working in place, supported by material elements provide the infrastructure. However, an unintended consequence for energy use, was observed in organisation C. The building systems support and enable a small number of office workers to work outside of 'traditional' working hours. Systems include automated lighting, heating and small power provision, many of which are automated. **Although a small number of office workers were observed to begin working from seven thirty am, the common areas of the building were fully lit and heated, leading to levels of energy consumption which are difficult to predict, and therefore potentially contribute to the performance gap.**

Scheduling issues are seen to shape the practice of flexible working, and evidence of interlocking webs of practice emerge. The interlocking of practices challenges 'normal' working practices individuals are implicated in:

“A practice perspective encourages us to imagine what the ‘new normal’ of everyday sustainability might look like – and suggests possible trajectories towards it.” (Spurling et. al. 2013).

7.7.2.6 Contract patterns

The business model of an organisation, to a large extent, dictates the potential for flexible working as noted above. A degree of flexible working was identified as a performed and established practice in organisation C. Flows of co-workers vary and occupancy of the building reflects this to some extent across the week, with ‘peak times’ identified (occupancy is high early in the week, reducing as week continues). This opens up issues connected to peak electricity use as discussed above.

Moreover, such patterns have led to more predictable occupancy levels in organisation C, and no current requirement for hot desking, although, there is an intent to move towards hot desking as the organisation grows. Paradoxically, during the observation period, several employees discussed the increase in turnover of staff as the following extract demonstrates:

“Sue, who works within the HR team, mentions the high turnover of staff in the organisation which has increased since over the last few years. Previously, average length of service at the organisation was six years, however the nature of project work and short-term contract use has led to a concertina effect with the workforce growing and shrinking according to volume of work. Sue tells me “We don’t want an increase in headcount so we tend to use short-term contracts”.” (Field notes extract, March, 2014).

The subtleties of such strategies have implications for predictive models, which feed into assumptions around occupancy and subsequently building performance. **It can be contended that business strategies have an impact on energy use and the performance gap.**

7.7.3 Meanings

Flexible working	Materials
	Competencies
	Meanings

7.7.3.1 Organisational identity

Symbolic meanings and understandings shape and support or hinder the practice of flexible working. As noted above, organisation A have embedded their own meanings around Corporate Social Responsibility and organisational culture in the practice of flexible working. A 'work-life balance' is promoted and supported within organisation A. As noted above, this is reflected in flexible working policies which support working parents. This was openly discussed with great pride by office workers during the research period.

Flexible working also supported some mixed meanings of both belonging and anonymity, as was observed:

"Despite having told me that they "don't recognise half the staff here anymore" as a result of both visiting employees and flexible working patterns, Asif and Sheila continue to smile and nod politely to everyone that passes. I find the same happens as I move around the office, there appears to be an expectation that although you are unknown, you 'belong' to the organisation and are accepted as a member of the 'club'."(Field notes, October, 2014).

Meanings of organisational identity, contribute to holding the practice of flexible working in place.

7.7.3.2 Seniority

During the research period, meanings around flexible working extended to notions of a disjointed workforce, perhaps even one of inequality. Whilst a flat hierarchy was reported at a strategic level, and visible in the open plan working space, some employees reported hierarchical meanings around flexible working as the following extracts demonstrate:

"I think it depends on the seniority, mainly the most senior staff aren't normally in on a Friday, I suppose because they are working from home but to be fair, from reception, we do

communicate with them but normally through their assistants, who normally are in on a Friday. It could be, I would probably say it would be more senior staff that aren't normally in on a Friday but the support of the teams and the core team are normally in on a Friday. (John, Receptionist, organisation A, 2015)

"It's the higher ups really who can work the hours they like...we [admin support] need to be in the office..." (Sue, Administrative support, organisation A, 2015).

"We don't really get that choice, as a rule we aren't allowed to work from home, in the past when I've been ill they've let me take a laptop but no, we would have to work in the office..." (Susie, call centre, organisation B, 2015)

"Ironically as a business, I really believe that the world's got to stop this nine to five thirty rubbish. It affects the roads and it's just ridiculous. We put in flexible working in our office, we have to know what our guys are doing, our client wants this, he wants it by then, we have to know who's doing it, so we have to know what hours people are working. So we've put in, you can work anywhere between seven and seven, so you start at seven, you finish at three thirty, start at eight, finish at four thirty and myself and one other, we're the only people that do it. So we offer all this (the most senior people do it), set in their ways maybe... I don't know... I know that one girl, she struggles to get in, in the traffic and I think well [laughs] you can even start at ten and then finish later... You know, but then why? Then nine o'clock, it's really odd... so we offer it, the only time they'll take it is when they've got a Doctors appointment and they need to adjust their day or something like that but apart from that no... it's odd isn't it?" (Jules, marketing director, organisation C, 2015)

The above extracts suggests that flexible working is connected to status, employees higher up the organisational hierarchy are entitled to such freedom. In this context, participation in flexible working may be limited by seniority.

There were also issues of privacy, which emerged during the research period. Evidence of an understanding of flexible, open environments and a lack of privacy to undertake confidential

or personal calls, for example, was noted. Employees in all case studies were observed retreating to secluded areas to make calls, often stairwells or quiet corners, irrespective of seniority. Although it is perhaps the very design of a flexible workplace, with its diverse physical layout, which enables the seeking out of private spheres. This was particularly evident in organisations A and C as large sections of the office buildings were open to the public. **In energy use terms, detached working in this way was often observed to encompass greater energy consumption as detached third spaces were lit and heated, whilst work spaces were abandoned leaving small power loads, lighting and heating in operation. This could potentially contribute to the performance gap.**

7.7.3.3 Negativity – enforced flexibility

Meanings around flexible working suggested some conflicting messages. A widely reported issue concerned understandings of ownership and trust. Kate, a senior manager in organisation A, leading the hot desking roll out, described a painful adaptation to flexible working:

“It is an emotional thing, people like having their photographs of their kids up. One guy in my team, wherever he sits, he puts up his calendar everyday which is the photo of his two sons and I think that’s really, really important to him... everyday he will put that calendar back up. There’s a sort of niceness about it isn’t there? About having your stuff that makes you a human being, not just a cog in a wheel, things around you and it was interesting for me about how it threw up about kind of lack of trust of other people. When we were getting quite a lot of challenge, I ran a Q&A session and I remember clearly saying to people, but ‘who are these ‘they’ when you’re saying ‘they’re going to do that, or other people are going to do this’, who are you talking about? You’re only talking about the people in this room, you’re only talking about the colleagues that you know. We’re not going hot desking across the whole building, you know all these people, so if they leave it messy one day, you could just talk to them about that couldn’t you? There was a real fear of other people and what other people would do. There was just an absence of a sort of community spirit about it, that I found, initially...very

curious and I increasingly found infuriating. You get to the bottom line of 'there isn't enough space for things that you wanted to do, and we got into talking about, you know, just helping people understand that part of what had been scoped out was porta cabins in the car park.'" (Kate, Senior Manager, 2015).

Evidence of scepticism and negative reports of flexible working practices were observed and reported. A level of veiled exasperation with informal working arrangements was observed from some employees as the following extract demonstrates:

"You'll see the mass exodus from three" Mandy from Marketing tells me "the place empties out by four". She rolls her eyes "lots of holes from then on". There is an implied undertone here that Mandy does not fully agree with flexible working. She herself never leaves before six pm.' (Field notes, organisation A, June, 2014).

Negativity was also reported in organisation C, *"I very rarely work from home...to be honest I think I'd feel guilty [laughs] so I don't..."* (Julie, HR, organisation C, 2015).

However dynamic meanings were also reported as flexible working became integrated into the organisation:

"...people will say really illogical things like 'it takes me too long to walk to the printer' or 'I have to have my paperwork close to me' why? Why do you? ...and I understand it because I used to be one of those people too, but we're a charity and it's about best use of resource, all resource I think...it's interesting we did a review after about 8 weeks, a questionnaire review ...a small proportion of people who said this change has been better than I thought and talked about how lovely it was to talk to people that they never used to sit next to and how it feels better; the majority of people said 'this is what I expected, you've managed our expectations and I can cope with it' and a tiny number of people said 'this is awful, this is the worst thing that's ever happened' and we did a review again at the beginning of June and that will be six months on that we've committed to doing it, but I think because we've managed it proactively,

... *People have just sort of got into a groove a bit and it's become normal I think.*" (Kate, senior manager, organisation A, 2015).

During the research period, continued frustration with a limited roll out of hot desking to all departments in organisation A was observed as the following extract illustrates:

"I am chatting to Samira, one of Kate's team and part of the hot desking project. Samira comments "It's frustrating, we're still the only department doing this. Other departments are being allowed to keep their own desks". Mark, another colleague, joins the discussion and comments "Yeah [laughs] we're also being told by facilities 'you guys are great, you've been role models for this... I've got so many emails from those guys telling me that we're leading the way and that's all well and good but we're still the only ones". The facilities team are still planning a full roll out but there is a lack of clarity." (Field notes extract, October, 2014).

During the observation period in organisation B it was found that formal hierarchical structures have developed organically. Space in the office was strategically planned, with department's allocated areas of the office. Collaborative and flexible working was a key concern with a strategic aim to reflect a flat hierarchical structure through open plan working. However, many participants suggested that flat hierarchy had been eclipsed over time by a return to more traditional status-driven layout as the following extract illustrates:

"Sharon, who works within the Business banking department discusses changes in the layout and location of the department: "Business banking started out as an area where all teams and levels mixed...it's not like that anymore. They've organised themselves into teams and management staff sit together now." (Field note extract, September, 2014).

However, others reported feelings of liberation associated with flexible working *"I don't feel compelled to sit at a desk nine to five...working at the best times for you"* (Lawrence, IT self-employed, organisation C, 2015).

It was observed, in organisation A that smaller companies or entrepreneurs embraced the practice of flexible working. This was reported by a director of a gaming company with three employees, who occupied a small office in organisation C building on a three year lease:

“The larger companies operate on a nine to five, I don’t know how big a company has to be before you get this culture of desk time and I don’t know how big a company has to be before you get that, but it’s smaller than you think. There are companies with six to seven people who operate like that...it’s almost as if you feel guilty as all the rest are still in the office, and then they’ll say “oh, where’s he going?” but certainly the companies of one or two they’ll just do what they need to do so it’s interesting...anything less than ten is quite flexible, upwards might be the opposite. A small number of tiny SME’s then a long tail down to one person. I think there’s quite a lot of us operating like that...there’s some people here, just the general public who have come here to work. I think if you come out here, you get the impression of great flexibility, but if you look around the larger offices I think you see something more traditional...I’m not sure you’ll find them out here all the time...” (Field notes, Jules, Marketing Director, July 2014).

This above assertion was observed within organisation C, where many of the larger tenants rarely used the communal areas. The underlying meaning here, is of link between organisational size and a necessity to be seen to be ‘at your desk’. **The above meanings may have an impact on the performance gap if assumptions around performance are contingent on designs for flexible working.** In other words, anticipated building performance is based on assumptions of how occupants will use the building (Fedoruk et.al. 2015). Flexible working is integral to contemporary working and therefore sustainable building design reflects this in design and fit out. However, if meanings associated with flexible working hinder recruitment of carriers to the practice, then assumptions are potentially invalidated. A social practice approach draws out such subtleties.

7.7.3.4 Nostalgia for the previous office

A shift in symbolic meanings of work was closely associated with sustainably designed office building across case studies, as participants moved from more traditional offices to their new sustainable buildings. Despite having been in occupation for over two years, employees in organisation B referred to the building as the 'new office' and spoke nostalgically of the previous office building and ways of working.

The previous building occupied, provided few opportunities for organisation B employees to engage in the practice of flexible working and the culture was of a small 'start up' organisation. By this, it was reported, informality was central to the office culture as illustrated by the following extract:

"[in the previous office] some people didn't wear shoes. The phone never rang. Meeting rooms were used casually, never booked. People were happy, they had access to outdoor space and were close to shops...they had parking outside and a few bike lock ups..." (Jane, marketing team member, organisation B, 2015).

This association is particularly reported by long standing members of staff, as could rationally be anticipated. As such, the office building and practices supported have led to a change in understandings around carrying out the very process of work for many employees as is demonstrated in the following extract:

'I am sitting next to Jill today, who tells me she has been with the company for 11 years. It has taken her some time to adapt to the new ways of working here "It was very different at first...a bit of a shock...the noise levels can be tricky and it's a lot less private. I used to share a room with just five others so we really felt comfortable...we could get on with it [work] you know? I used to feel embarrassed here...everyone could hear me on the phone...the space is better [in the new office] we had some teething problems...I've adapted now though, I'm a lot braver!" (Field notes extract, June 2014).

'Kathy an employee with the organisation for four years reported "I prefer this office to the last one, it's brighter and it's quieter. I used to share with seven others, it was so small and the sound echoed. You didn't see as many people as you do now." (Field notes, Susie, call centre, organisation B, May, 2014)

"...we did have a nice balcony with lots of plants and a garden which we used, I do miss that. I sometimes use the communal area here, mainly to take clients to." (Field notes, Karina, organisation B, 2014)

This nostalgia may suggest that the informality and unconventional approach of the previous office humanised the working environment, rather than imposing conventional rules (Cass *et.al.*, 2016). Once more, in understanding concealed meanings through deconstructing the practice of flexible working, insights into issues which hinder the recruitment of carriers of practice into the practice of flexible working are revealed, which are of relevance to the performance gap, as above, if assumptions at design stage are grounded in 'rational' understandings of occupant behaviour.

7.8 Implications for the performance gap

Building design, fit out and infrastructure to support the practice of flexible working was present in all case study buildings to varying extents. Case study organisations seeking to achieve sustainable workplaces, viewed flexible working practices as integral to this aim, reflecting existing research which found building flexibility to be a key factor in occupant requirements (Lizieri, 2003; Gibson, 2003).

Applying a social practice theoretical approach, the practice of flexible working was deconstructed, revealing complex implications for energy use and the performance gap. Key findings are summarised below:

1. Sustainable building design and culture have adapted in parallel, expectations for design to support flexible working may not reflect organisational practices;

2. Flexible working potentially increases energy use through device use at multiple sites, enabled by the building infrastructure and supported by meanings and competencies of contemporary working;
3. The unpredictability of occupancy resulting from the practice of flexible working may contribute to the performance gap;
4. Material artefacts supporting flexible working may be used as an unnecessary and energy consuming backdrop to support contemporary working;
5. Infrastructure to support flexible working may exceed necessary requirements and lock in energy intensive practices;
6. Meanings around flexible working, 'only for senior management' and the persistence of former workplace practices, may impact on office worker engagement in the practice. This may contribute to the performance gap as predictions around performance are contingent on in-use assumptions, including levels of anticipated use of common areas for flexible working;
7. Insufficient communication and engagement of office workers in operational competencies for flexible working may lead to unintended energy consumption and thus contribute to the performance gap;
8. Flexible working may be associated with a shift in peak working times which is not accounted for in predictions of building performance;
9. Flexible working may result in energy use through lighting and heating of large common areas for small numbers of office workers outside of traditional working hours; and
10. Business strategies may impact on energy use and the performance gap, for example strategic contractual decisions.

These key findings demonstrate the convergence of elements of the practice, which hold the practice in place. As material elements of practice such as technological and infrastructure

development evolve, practices are shaped. For example, all case studies demonstrate the impact of wireless internet and mobile devices on the practice of mobile working. Both have extended and facilitated this practice and shaped wider understandings of work. However, energy is inconspicuously involved in achieving the practice of flexible working. The use of multiple devices is common, with infrastructure allowing small power loads to be used simultaneously and energy consumed. Case study C experiences unpredictable patterns of consumption, resulting from the 'drop in' nature of the forum area.

The importance of sequences of practices have also emerged from case studies. Spurling et. al. (2012) contend that daily schedules are part-determined by institutions and organisations and have differing implications for sustainability and energy use. In the context of the practice of flexible working, schedules have been determined to varying extents by case study organisations. Organisation B, has adopted a conventional nine to five business model, constrained by cultural and social conventions of the financial sector. As such, employees converge at conventional 'peak' times with the associated problems of peak resource use.

Within organisations A and C, changes in temporal patterns have emerged with new ways of working and working hours, creating new patterns of peak demand. In turn, shifts in institutional arrangements, the capacity of organisations to culturally adopt flexible working and materially provide requisite infrastructure impacts on energy consumption (Southerton, 2009).

The BCO in its Desk Power Load Monitoring report (2014) suggested:

“Designers of building services will need to take account of supplementary areas, such as multi-function devices (MFDs), vending, tea points, satellite equipment rooms (SERs), meeting rooms, breakout spaces, etc., although it is considered these have less influence on the heating, ventilation, and air-conditioning (HVAC) design than on the design of the electrical infrastructure.” (p.4).

This is in contrast, however to some findings from this research, which noted that flexible working had an impact on building systems through automated lighting and heating of areas for small numbers of office workers, occupying the office outside of traditional working hours.

The BCO (2014) categorise building occupants into high, medium and low intensity users:

- *“High intensity users, who are predominantly office based and have high-specification IT equipment for specialised software, such as modelling, graphics or advanced simulation applications.*
- *Medium intensity users, who are predominantly office based, have more than one screen and rely on typical office applications, such as Microsoft Office, with some limited specialist applications.*
- *Low intensity users, who have relatively low reliance on IT equipment, including laptops, and are potentially intermittent users due to time spent out of the office due to the nature of their jobs.” (p.8)*

The BCO recognises flexible working is connected to different work locations and a trend towards increased use of tablets, however the BCO argues that the question of whether devices *“replace or supplement”* existing IT equipment is unclear. This research suggests that the evidence of multiple device use is common and tablets ‘supplement’ existing IT equipment.

The BCO (2014) posits:

“...it is considered that the above trends [towards flexible working, increasing use of tablets] will reduce small power consumption in the workplace even further...however, the design of the workplace cannot assume these trends at this stage and must provide an appropriate workplace specification based on fixed IT equipment in order to enable the office to cater for most types of occupier.” (p.8, BCO, 2014).

The acknowledgement of the uncertainty associated with the development of contemporary office working practices resonates with the dynamic nature of practices, which are continuously changing and evolving (Shove et.al., 2012). Such uncertainty is arguably a

limitation of the predictive nature of certification such as BREEAM which set out anticipated building performance. This could suggest that predictive building performance ratings are not compatible with the dynamics of social practices, that the complex nature of social and technological development is at odds with more scientific methods of prediction.

A social practice approach has reframed the way flexible working is understood. Linear, behavioural models may seek to understand motivations and values underpinning individual decision making processes and seek to persuade or better inform office workers to, for example, switch off devices when working from multiple locations. However, taking a social practice approach reveals that wider issues of social worlds and technological development are implicated in this practice and which may have unintended consequences for energy use. It is posited that in better deconstructing practices in this way, novel insights around the performance gap are revealed.

However, considering the practice of flexible working in isolation limits understandings of social conventions and culture, which impact on practices and ultimately energy use. It is therefore important to consider wider webs of practices implicated in contemporary office working. The following section, considers the practice of collaborative working, a practice which is closely intertwined with the practice of flexible working in sustainably designed office buildings.

7.9 The practice of collaborative working

The practice of collaborative working	Materials
	Competencies
	Meanings

Cass *et.al.* (2016) as noted in section 6.5, highlights that the design of sustainable buildings should be a response to occupant requirements. Duffy (2002) contends that the knowledge economy has driven the need for physical design, which not only reflects sustainable principles and performs efficiently, but also supports creativity, transparency and egalitarianism. The practice of collaborative working is implicated in the pursuit of organisational innovation and

this has been widely translated in conventional design of sustainable office buildings through open plan environments, often constructed around central shared spaces such as atria (Brennan et.al. 2002).

The practice of collaborative working is closely related to the practice of flexible working in terms of materiality, both requiring multifunctional spaces to enable their accomplishment. The following sections will deconstruct the practice of collaborative working, considering elements of materiality, competency and meanings and discussing implications for energy use and the performance gap.

7.9.1 Materials

The practice of collaborative working	Materials
	Competencies
	Meanings

Material elements implicated in reproducing and accomplishing the practice of collaborative working, are driven by a technological development and energy efficiency associated with sustainably designed office buildings.

7.9.1.1 Designing-in cohesion

Organisation A placed the practice of collaborative working at the centre of design decisions:

“The move to a new central office...offers [Organisation A] the chance to become a more cohesive organisation. The benefits of occupying a single site should be enhanced by a building designed to facilitate communication and engender a sense of community.” (Design Brief, 2002).

Indeed the design of the building was framed in terms of providing collaborative space drawing together office workers both socially and generating greater levels of collaborative productivity through design:

“One of the most important functions of the new building is that it should engender both a sense of community and cross fertilisation of ideas within the organisation. This necessitates careful planning to reduce distances between departments and workstations, the provision of

social and communal facilities that are currently not adequately covered in the space audit, and the desire to produce a space where the whole workforce can gather occasionally in “party: format.” (Design Brief, 2002, p.5).

Designing in greater collaboration, was also seen to encompass the provision of supporting infrastructure. For example, **the provision of a multitude of small power loads, was observed to be integral to the practice of collaborative working. Informal collaboration was observed to take place around electrical devices, as is discussed in more depth below, with implications for energy use and the performance gap.**

One of the key aims related to office design was to create a more cohesive organization embodied in the flagship organisation A building. A number of distinct central office sites were brought together and many of the research participants were aware of the aim to reduce the distance between departments, workstations and move away from a London-centric focus. However initial analysis of data has revealed some conflicting reports of success in such collaborative aims.

Participants suggested that a level of siloed working has been maintained. A number of simple issues impacting on the practice of collaborative working were identified by participants. Staff ‘churn’ was considered problematic, with a large number of staff working in the same building. This issue extended to understandings of both individual colleagues but also wider teams, participants reported a lack of knowledge concerning the wider teams located in the building. This problem is exacerbated by limited signage due to interruption with building purge processes. Since occupation, the number of employees has increased, including transient employees and visitors coming to the building for meetings and to work.

[7.9.1.2 Physical characteristics and infrastructure supporting the practice](#)

The fit out of the organisation A building is in line with conventional definitions of sustainable office buildings. Thus open plan working areas are set around a central atrium with meeting rooms, quiet rooms and break out areas. During the observation period it was noted that the

building layout encouraged and supported meetings and collaboration, both formal and informal: “*There is a constant flow of workforce with an overlap of social and work discussions.*” (Field notes, April, 2014). Such formal and informal meetings take place in settings reflecting levels of formality, for example, more formal meetings were located in meeting rooms, which were booked in advance whilst informal meetings took place in the atrium, at tea points and over desks as employees moved through the open plan building.

Meeting rooms in all case studies are considered central to supporting the practice of collaborative working. Figure 7.5 below shows the layout of ground floor meeting rooms in organisation C. Three of the meeting rooms have flexible partitioning (rooms 1, 2 and 3) and offer what is described as ‘scalable facilities’.

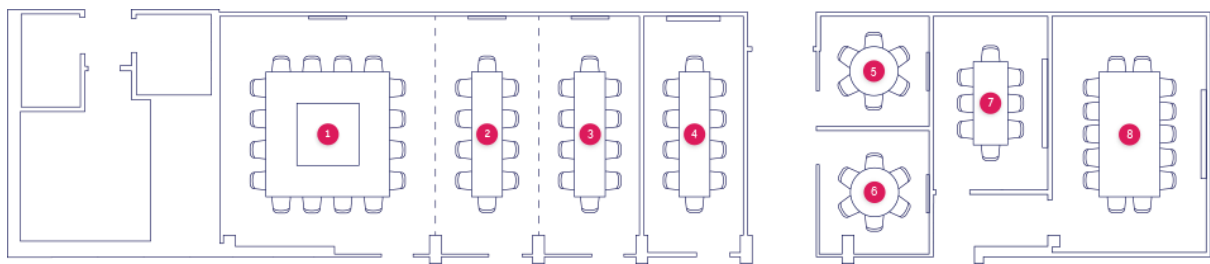


Figure 7.8: Organisation C Ground Floor meeting room floorplan

Images 7.3 and 7.4 below show typical meeting rooms, including an image of rooms 2 and 3 where a partitioning system allows the configuration of a larger room. The atrium, known as “the forum” has a capacity of 140 seated, 300 standing, and provides ceiling mounted drop down projector and screen, speakers and microphones.



Image 7.3: Example (a) of meeting room organisation C



Image 7.4: Example (b) of meeting room organisation C

The forum area and shared tenant kitchen facilities of the building were reported as providing the greatest opportunities for informal collaboration:

“The forum, and the kitchens, when we’re out there making tea every couple of hours, you bump into people ‘hi what are you doing? What are you working on?’ We’ve all got a bit of

cupboard space, people go out and have teas and coffees, in the mornings or after lunch, it's a good place to get 'hi etc.' that's actually how I met the guy we're doing this massive funded job for. That probably more, but then you end up bumping into each other again down here..." (Jules, marketing director, organisation C, 2014).

The subtleties of the use of informal areas for collaboration rather than intentional, more formal collaborative spaces are revealed, which impact on understandings of how the building is used by office workers, and are relevant to the performance gap.

Moreover, the *ad hoc* nature of meetings and collaborative working was observed to impact on impromptu change of work location and on energy use. For example, it was frequently observed that in joining a meeting spontaneously, employees regularly unplugged laptops, tablets and mobile phones, leaving charging cables plugged in and using electricity. If devices were left at desks, they were very infrequently observed to switch devices to sleep mode or off. Such subtleties potentially contribute to the performance gap. As the following section discusses, material artefacts may also be considered a contributory factor.

7.9.1.1 Material artefacts

A number of material artefacts were found to be integral to the practice of collaborative working, as the following extract demonstrates:

"In organisation C, meeting rooms are located on the ground floor of the building and equipped with a number of material artefacts to enable collaboration including: wall mounted LCD screens; ceiling mounted speakers (in larger rooms); high speed Wi-Fi and one wired Internet connection in all rooms; glass whiteboards; flipcharts; videoconferencing is available in three meetings rooms (4,7 and 8); in-rooms PCs in larger rooms." (Field notes, organisation C, July, 2014).

This extract demonstrates the implication of many energy intensive material artefacts in the practice of collaborative working. **Design stage predictions may take into account such**

energy use, however the following extract draws out some of the subtleties of consumption implicated in the practice which are relevant to the performance gap:

“Meeting rooms are heavily occupied today, in one room the large video screen is switched on and everyone attending has a laptop or tablet (or both!) in front of them. Many have plugged their devices into floor power points. Lights are on and the temperature is controlled via a thermostat. As the room’s empty I notice that lights and AV equipment has been left on. Posters are in place in rooms and on doors, emblazoned with the instruction ‘Switch It Off’ [part of a wider initiative discussed below] (see image 7.2 below), however, one meeting attendee, Sandra, tells me “turning off the lights in this building is not so easy. I try to switch it off but can only manage to dim the lights”.”(Field notes, October, 2014).



Image 7.2: example of 'Switch it off' initiative, organisation A

The material elements of physical comfort that the building design facilitates, serve to support the recruitment of practitioners to the practice of collaborative working with implications for energy use. Interestingly, the open plan nature of the office layout and established issues of noise intensification have been countered in organisation B by an acoustic design and strategy. This in contrast with less successful noise attenuation strategies reported by Organisation A employees. This may be tied up with practices of effective working and taking

part in office life in the different organisations, public and private sector. Many of the organisation B employees who have moved from the former town house office reported that the atmosphere in the sustainably designed office was very different:

“I like this building it has quite a nice feel, casual, comforting, light, open. It’s easy for teams to sit in departments and there is a lack of cross walking. Meeting points everywhere, there were only two meeting rooms in the last building, one was used for lunch and the other was more formal though we did have a nice balcony with lots of plants and a garden which we used, I do miss that. I sometimes use the communal area here, mainly to take clients to.” (Field notes, organisation B, September, 2014).

The fourth floor of the building houses an eating area, several breakout spaces and meeting rooms. However, during the observation period it was noted that areas were used very formally, with most employees remaining at their desks to work and using the fourth floor facilities for break times or client meetings. This was observed to be a defined and structured working environment as is illustrated in interview extracts below:

“We use the, I use the meeting rooms and the break out areas that we have to good effect so the kind of principle thought being, if you are collaborating rather than getting someone to pull a chair up to your desk and we’ll have a talk about it, the thought is, well that disturbs other people and creates more noise and disturbance within an open plan area so we’ll deliberately go away, we’ll think about meeting rooms or open plan space, for example on the ground floor where I am we don’t have a break out area so naturally its meeting rooms cos that’s the closest that we’ve got, if being used then we’ll go round the building and the break out areas are informal, non-bookable so if they’re free we’ll have a chat about it, more confidential will go to a meeting rooms and they are bookable.” (Jim, FM and Building Manger, organisation B, 2015).

“Break out areas, they are used and they are in my opinion valued from the feedback that I get from others...My view is that they are used quite well by the departments that they’re

nearest to but not as well used as... so if you had to walk round the building and find a break out area, there's a kind of feeling that that's our territory sort of and equally that can be much the same as going to find a desk, if you've got a lot of people in the team and you need to hot desk, not a great deal of people are confident to go down into another area/department and just work. I get that impression..." (Jane, marketing team, organisation B, 2015).

"...the break out areas are pretty conducive, often we run exercises and when we break out [into collaborative spaces]...the railway carriage bit is very popular, bit of privacy but at the same time you're out...funnily enough they tend to go out into the kitchen areas, the sofas and then come back to the point [the largest formal meeting room on the fourth floor]." (Dan, business development, organisation B, 2015).

Once again, the use of formal collaborative spaces is marginalised when office workers are given the opportunity to select an area of the office to collaborate.

7.9.2 Competencies

The practice of collaborative working	Materials
	Competencies
	Meanings

7.9.2.1 Initiatives

A number of initiatives were found to be implicated in the practice of collaborative working. Hot desking initiatives have been successfully launched in the organisation A building as is discussed in greater depth above. One of the aims of this initiative recognised by respondents was improved integration and collaboration at departmental and organisational level:

"Individual work can happen in or out of the office, facilitating interaction with others is a primary function of the office environment... the need for face-to-face communication is unlikely to change" (Design Brief, 2002)

Participants reported some increase in integration at a team level initially, however practicalities of effective working have led sub-teams to sit together. Overall, respondents reported a more cohesive department enhanced by opportunities to 'get to know' colleagues

within the wider organisation. Many respondents expressed a desire (and some frustration) to see this initiative extended to the rest of the office as noted above.

Initiatives to encourage tenants to hire meeting rooms in organisation C included offering discounted rates (15%) *“as our little way of saying thanks...we have various groups that also get a discount, so charities we give the same discount to...”* (Rodney, building manager, organisation C, 2015).

Informal collaboration between multiple tenants was also encouraged in organisation C by a monthly ‘get together’.

“They do a tenants get together once a month, they put on food and drink and everyone hobnobs and they do a speech.” (Jules, marketing director, organisation C, 2015).

A number of other informal initiatives have also been rolled out in organisation C including a monthly CEO breakfast:

“My business partner and I try to rotate it, but quite often work gets in the way. The purpose is for the leaders of all the businesses here, is to get to know the other leaders. There’s a lot of companies that come and go, to get to know everyone and find out what their offering is, and also to find out what is going on in the building.” (Jules, marketing director, organisation C, 2015).

A weekly meeting takes place on Monday mornings in organisation B in the ‘Point’ the largest, meeting room on the fourth floor. This is described as a *“school assembly”* (Jim, FM and building manager, organisation B, 2015).

Such collaborative initiatives are enabled by the physical characteristics of the building. This may potentially have implications for the performance gap, through both dual use of small power loads and initiatives which are not anticipated at design stage. **Whilst such subtleties may have minor impacts on the overall picture of energy consumption, it is important to note that from a practice perspective, it is these very mundane, everyday activities,**

which are performed routinely which build a patterns of consumption (Warde, 2005). It is contended that in failing to consider such everyday activities, potential contributing factors to the performance gap may not be fully understood.

7.9.2.2 Rules, routines and tacit understandings

During the research period, it was regularly observed that meeting rooms were used as a means of escape. Employees were aware that meeting rooms could offer a quiet working space, this was particularly marked during periods in which atrium activities were held in organisations A and C.

Employees required a level of knowledge to understand the process of room booking, in order to use the meeting rooms in organisation A which involved the use of the intranet and liaison with reception staff to make use of the 'fast track' booking system, which prioritises meetings. However, greater, more tacit understandings and unwritten rules of collaborative working in the building were also required. This included the use of the atrium and break out areas to hold less formal meetings and an understanding of scheduling as the following extract demonstrates:

"We always have our team meetings down there [the atrium]" Asif from the FM team tells me "but you need to be careful, you have to get in fast in the morning to make sure you can get the right space, we'd never have a meeting at lunch, it's manic down there". (Field notes, organisation A, October 2014)

Meeting rooms in organisation B are booked through Outlook calendar, although there are some unwritten rules surrounding seniority and prioritising "...if someone else's need is greater than yours...like the governor...you need to negotiate, but everyone knows that." (Dan, business development, organisation B, 2015).

Such tacit knowledge holds the practice of collaborative working in place, if employees were unaware of these unwritten rules, the practice would be hindered. As noted above, wider

understandings of rules and procedures also hold the practice in place for visiting members of staff, such as the ability to book a temporary departmental space through hot desking.

Some resistance to accommodating collaborative working was observed, with employees finding, as with flexible working, that the noise levels negatively impacted on their work environment. Conflict was also noted in terms of responsibility, with competencies assumed to lie with the facilities team for the organisation of collaborations and the maintenance of infrastructure which holds the practice in place, for example the responsibility for IT provision during collaborative processes, including video conferencing and use of Wi-Fi, typically reverted to the FM team.

The competencies required to hold the practice in place, could be viewed as related to the informalities and formalities embedded in the meanings of the practice of collaborative working as is developed in the next section.

Collaborative facilities in the organisation C building are available for external hire. Terms of use for meeting rooms and Forum hire are set out in detail for prospective clients. This includes rules around catering, which must be ordered through the in-house café. During the observation period it was noted that whilst the café maintained a steady trade of coffee and snacks, the central business was catering for meetings and events, as such resource use generated by the café was unpredictable.

The services offered to visiting clients also includes printing, photocopying, scanning and laminating which is undertaken by reception staff for a fixed fee. Shower room, hair dryer and drying facilities are also available to visitors at no additional cost.

Rules were also noted in organisation B in terms of how occupants were selected, restricting occupancy to those likely to collaborate:

"...because we're not science led, they had to assess us, but we convinced Rodney [the building manager] that it would suit us and we could actually help some of the clients here so we applied and because of that, we are the only design agency here. It's good, mind you we've

only done work with one/two customers here, all of them aren't really going to commerce, going out into the commercial world, we've not yet managed to have a launch in that way, yet..." (Jules, marketing director, organisation C, 2015).

7.9.3 Meanings

The practice of collaborative working	Materials
	Competencies
	Meanings

Throughout the observation period a number of key meanings and understandings holding the practice of collaborative working in place were found.

7.9.3.1 Organisational image

There was an understanding that collaborative working contributed to the image of the organisation as the following extract illustrates:

'I chat to Mandy (Marketing Department) about this office, compared to the previous, smaller and more conventional office prior to the move, "It's all about working together here, we have the space you know, the break out areas, the atrium...I never used to see anyone from other parts of the business, that's all changed now, that's really who we are, more joined up..."

(Field notes, organisation B, April, 2014).

The material elements of the building support the practice as noted above, but the practice is held in place by the symbolic meanings of collaborative working, that this practice is representative of the organisation. This resonates with the ethos of flexible working as noted above, that such practices reflect a 'forward thinking' organisational image.

There are however, some limitations to the practice with some participants in organisation A noting a continuation of siloed working. This was observed to be in part, due to the large numbers of transient staff in the building and virtual departmental zones continuing to be respected:

“Speaking to Nancy about desk space she tells me “Don’t talk to them about hot desking, they all want to be seen to be moving with the times but they all still want their own area for their department[s] to gather together. You ask them about changing and it all kicks off...” (Field notes extract, organisation A, 2014).

There are also continued connection to meanings of siloed working, despite design intent to reproduce collaborative working and change the organisational image:

“I know part of the vision was, you know we had lots of people in offices hidden away down corridors so that’s been a very conscious thing. New people are still really surprised at how departments are quite separate even though it’s very open plan. So when I’ve had people on secondments, from regions for example, they’ll say but we don’t understand why we’ve not joined up with marketing we’d only have to walk 20 paces, and it’s been encouraged but...” (Kate, senior manager, organisation A, 2015).

Despite initiatives and physical design of the office, meanings of subversion continued to emerge. For example, it was widely observed throughout case studies that small organisations (in the case of organisation C) or departments (organisations B and C) typically worked and socialised principally with each other. As one employee reported:

“I guess if we were completely hot-desking across the building, we might end up fortuitously sitting next to people from another department and might end up working more closely but I think you’d lose the value of having the team and the value you have from sitting next to your colleagues. I had a member of staff who just left, who needed to work really closely with the HR department and it’s been a bit bumpy before she joined us, so one day a week she hot-desks in their department and that works really well and it’s almost like she secretly forced herself upon them” (Kate, senior manager, organisation A, 2015).

Issues of micro-identity were reported by some participants *“I tend only to know the people I work with directly...” (Field notes, organisation B, May, 2014)* and at times observed, for example employees were unclear about who they are looking for when delivering internal mail.

This issue did not extend significantly to understandings of wider teams, but more individual colleagues in the building, which is arguably an inevitability. There are a number of opportunities both formal and informal for such cohesion to be enhanced in organisation B, through the weekly office Monday morning meeting to informal sports clubs and a social committee.

7.9.3.2 Defining collaboration

The definition of collaborative working impacted on the practice and varied across case studies. One interviewee in organisation B provided a detailed description which is cited in full below as it reveals much around links between physical design of the building and meanings of collaboration:

“...let’s define collaborative working, what does that really mean, does it mean being able to shout a bit louder at somebody in the next bank of desks, or creating some kind of space where ideas can be written up on a wall or something like that. So you know, I think our collaboration or our understanding, or what we were trying to deal with was ‘meetings’ what would widely be referred to as meetings. So we chose open plan because we wanted a sense of integration, again the property that we moved from was a lot of cellular offices, the walls not able to knock down, they were bricks that offered a divide and you really had to open a door, walk through a door to see a department which then, said you have to have a need to go in there, whereas open plan you can walk past on your way to a meeting room, on the way to another department and then there’s that sense of integration, shared facilities, where we all share a photocopier in the open plan office or a printer, whereas previously it was a printer in each room. So it was more really for a sense of integration between co-workers rather than collaboration being in a creative sense, let’s all brainstorm you know, put stickers on the wall and that kind of thing. Marketing – that’s what I was thinking of, as you know the meeting room walls are glazed so we try to retain that open plan feel and yes our marketing department which arguably would be the department that is supposed to be the most creative, and deal with their colouring in books and stuff like that, they put stickers up on the windows, they also

use the washable pens, they use the window panes as a whiteboard for example, to sort of 360 degree coverage of notes on walls that sort of thing... It would wash off, post-its etc. it's very temporary, just used as a white board, they might leave it up there for a day, but then wipe it clean and do something else so that's how it's being used." (Jim, FM and Building Manager, organisation B, 2015).

The definition of collaborative working is, within organisation B, largely based on notions of integration, rather than innovation. Such a definition resonates with Duffy et.al.'s (2011) wider description of collaboration as involving transparency and equality.

Within organisations A and C, collaborative working was understood differently. Organisation A defined collaborative working as both an aim to integrate and innovate.

Organisation C linked the practice of collaborative working to innovation, describing the building as aiming "*create an environment where individuals and businesses are able to innovate and inspire*" (organisation C website, 2015) and was described by the building manager as providing a scientific ecosystem. The management team understood their own role within the practice of collaborative working:

"We come out into the forum area, people can still get hold of us if they want to, we're casual and we want to be approachable, we want people to speak to us if they want to, that is the whole idea of collaboration for us." (Rodney, building manager, 2015).

Moreover, different work spaces were associated with different styles of collaborative working:

"Rodney (the building manager) is describing meeting rooms to me as he waits for a party to arrive in the Forum today, "The smaller rooms are usually used for interviews, brainstorming, sometimes the tenants just book them if they need a private chat. The larger rooms are more lectures, lunches, seminars...some of the tenants hold board meetings there too. The Forum's more about networking if it's hired out... breakfast and lunch networking sessions..." (Field notes extract, organisation C, July, 2014).

Such definitions and understandings of the meaning of collaborative working have an impact on the physical manifestation of the practice and subsequently, an impact on energy use. This could potentially contribute to the performance gap.

7.10 Implications for the performance gap

The practice of collaborative working has a number of implications for energy use, some of which could be held to support prior explanations of the performance gap. Applying a social practice theoretical approach, the practice of collaborative working was deconstructed to better understand implications for energy use and performance gap. Key findings are summarised below:

1. The practice of collaborative working was observed to impact on impromptu change of office work location, leaving workstations 'on charge' whilst plugging in devices to participate in informal collaboration. Device use at multiple sites, as with flexible working, was enabled by building infrastructure, materials and understandings of collaborative working;
2. The use of informal areas for collaboration rather than intentional, more formally designed collaborative spaces were found to potentially impact on the performance gap as energy is used in unintended and unexpected ways by office workers in performing the practice of collaborative working;
3. Definitions and understandings of the meaning of collaborative working have an impact on the performance of the practice and subsequently, an impact on energy use which could potentially contribute to the performance gap; and
4. The performance of the practice of collaborative working implicates multiple physical and infrastructural characteristics as well as material artefacts. The provision of such characteristics and artefacts support collaborative working, however may also create demand. For example, the provision of small power loads in meeting rooms was found to enable the 'plugging in' of devices whilst collaborating. The subtleties of consumption implicated in the performance of the practice are relevant to the performance gap.

Menezes *et.al.* (2012) examine the influence of diverse tenants on energy demand and foreground habitual and routine behaviours of individuals. This may be seen to resonate with understandings of occupancy patterns with buildings used by occupants with diverging timeframes and in terms of workspace occupied. In deconstructing the practice of collaborative working, it was found that employees across case studies used multiple work spaces to engage in the practice. However, duplicated and dual resource use was observed, for example, whilst employees engaged in often, resource intensive (small power load and heating/cooling/lighting) meetings, workspace was also resourced in departmental areas.

As the practice of collaborative working has become more closely associated with symbolic meanings of innovation, the practice has recruited increasing numbers of participants, to which sustainable building design has responded. Conversely, there remains evidence of more conventional, team and department based ownership of space; employees seek to retain their own workspace, despite high levels of collaborative working situated in different areas of the office.

Energy use is implicated in collaborative working in terms of competency and understanding the operation of lighting and comfort technology. This is discussed in greater detail within the practice of effective working below.

The physical space to support the practice of collaborative working was found to engender open and integrative design. Open plan offices were in evidence in all case study buildings and found to be synonymous with understandings of innovation associated with sustainable office buildings. However, some of the criticisms of open plan offices surmised by Hodgkinson, (2010) including cognitive overload and lack of privacy were also found. Employees, used collaborative space, for example meeting rooms, as a means of escape. Framed in terms of energy use, this resulted in under occupancy of large meeting rooms which were resourced in terms of heating, lighting and small power loads. This could also be argued to resonate with arguments of overprovisioning raised by Cass *et.al.* (2015) with meeting rooms equipped for

high occupancy rates, whilst an unintended consequence of the practice of collaborative working is the under occupancy of such spaces, whilst energy is still consumed.

In deconstructing the practice of collaborative working subtleties around energy use and implications for the performance gap are drawn out. Moreover, the practice is implicated and interlocks with a number of other practices, which once more supports the contention of Hargreaves (2012) that examining one practice in isolation fails to understand broader networks of practices.

7.11 The practice of getting to and from work

The provision of facilities to support the practice of getting to and from work sustainably was a key focus of the initial design brief for Organisation A. The practice is analysed in greater depth in this section through deconstructing the practice to elements of materiality, competency and meaning, which converge to hold the practice in place in order to better understand implications for energy use and the performance gap.

7.11.1 *Materials*

Getting to and from work	Materials
	Competencies
	Meanings

7.11.1.1 [Technical requirements and strategic guidance](#)

The initial design of the organisation A building included agreement with both the Management Board of Organisation A and the local Planning Department, which led to the specification of car parking space provision and the development of a Green Transport Plan. The Transport Plan includes a strategy for car parking and the management of numbers of employees travelling to work by car. The Plan also details the intention to provide incentives to increase car sharing, public transport use, cycling and the potential for a bus service linking the office and local railway station.

An initial requirement of the development included the provision of a bus service to provide transport to those relocating from offices in the surrounding area as the following interview extract illustrates:

“When I joined it was when Organisation A was still in its transitional period where it had made a commitment where for the first five years after moving to this building it would support people to travel from other locations, there were two buses, there was a bus that ran from the south, Warminster/Westbury/Trowbridge that way, and a bus that came from Cirencester and I therefore was able to join, because I was living in Westbury at the time so I joined the staff bus. I used to use the staff bus sometimes and then I used to drive and park in the public car park sometimes...But initially, technically, I was going on the bus. The bus system stopped after five years...” (Interviewee 3)

The means by which such active discouragement of personal car use is enacted, includes a car share scheme within organisation A and in the wider area of Sidbury. Benefits of car sharing are promoted including: cost savings; reducing local and national congestion and pollution; reduction in private car ownership; facilitates the integration of public and private transport; stress and fatigue reduction; and social benefits of spending time with colleagues (Organisation A Car Share Scheme, Staff Intranet, 2014). Some stipulations are set out, including proximity to office:

- minimum five km distance from home to office;
- formation of car sharing group with minimum five colleagues;
- registration of car share group or joining existing group;

The allocation of car sharing parking is awarded on this basis and is centrally approved.

In spite of a strategy towards sustainable travel the researcher observed many employees driving to the office and parking in the retail outlet centre, adjacent to the building. The organisation’s car share scheme was reported as highly successful, particularly by employees from the previous site at Cirencester.

7.11.1.2 Physical characteristics supporting the practice

A number of material elements support the practice of getting to and from work. Many aspects of materiality emerge in the organisation A design brief, with a focus on facilitating and encouraging sustainable modes of transport through building design. In terms of car parking, 143 spaces were agreed at design stage in organisation A based on the ratio of one space: three employees and including five disabled parking spaces. Crucially, the design brief also sought to make provision for accepted expectations of car parking within the real estate market, resonating with earlier discussions relating to overprovisioning (Cass et.al., 2015, see chapter five):

“In order to provide flexibility within the institutional funding market it is suggested that space for an additional 100 or so car spaces could be provided on the site for additional parking should any future owners require it...this being the maximum allocation [permitted by the local Council].” (Design Brief, 2002, p.11).

Material elements are also included in the building design to support getting to and from work using sustainable modes of transport. Indoor cycle storage, accessed via code, lockers for outdoor clothing and four showers are provided in the building, aiming to offer a provision for 10% of employees.

Organisation B demonstrated a more targeted approach to sustainable travel. One key driver to undertake the lease on organisation B building, was the facilities to support getting to and from work sustainably:

“We wanted things to be different, so many people were driving before and that’s just not part of the whole ethos of the organisation. We need to practice what we preach...so the office offered lots of ways to travel sustainably, I mean there’s no parking so that’s a big motivation...” (Jim, FM and building manager, organisation B, 2015).

The welcome pack distributed to all new employees to organisation B cited:

“...sustainable travel is where we limit our damage to the environment by using less CO₂ hungry forms of travel.” (Welcome Pack, organisation B, 2014).

Facilities supporting getting to and from work included secure bike parking, showers and a drying room. A number of initiatives are also in place as discussed in competencies below. No car parking is provided other than for visitors.

Organisation C provided similar facilities, with showering, drying and bike storage facilities, however car parking was not limited with an overflow car park in use. Moreover the location of the building, in close proximity to major motorways, was promoted within advertising literature to attract tenants. The geographical location of the building was of benefit to some employees enabling them to align their personal schedules with sustainable means of getting to and from work, simply due to a reduced commuting time.

Understandings and strategies towards getting to and from work are relevant to the performance gap as the provision of appropriate, and sufficient, facilities may impact on the recruitment of carriers to this practice.

7.11.1.3 Material artefacts

Organisation A participate in the Cycle to Work Scheme²² which allows employees to purchase appropriate cycling equipment to travel to and from work. As one interviewee noted:

“There is a cycling programme manager and his assistant and they both cycle to work, they do it through the winter and summer and have all the gear. Some people also have folding bikes so they can take the train some of the way.” (John, receptionist, organisation A, 2015).

²² Tax free salary sacrifice scheme allowing purchase of bikes, see example here: http://www.bike2workscheme.co.uk/?gclid=EAlaIqObChMIp7qrkcqM2wIVF5kbCh3c2QpzEAYAyAAEgIMSfD_

During the observation period a number of key material artefacts were also noted for those getting to work by foot or bike:

“From 7.30am employees are arriving on site. There is a clear distinction between those coming by car, who are dressed in office wear and less practical footwear, and those arriving on foot and bike. Cyclists are dressed in sportswear, some in professional looking cycling wear, they carry bike helmets and panniers. The walkers are already dressed in office wear, but most are wearing trainers or comfortable footwear. Sue arrives in trainers and opens her desk drawer where she stores more formal work shoes.” (Field notes extract, August, 2014).

Material artefacts here include suitable footwear and appropriate clothing (for example rainwear for inclement weather conditions) but also extend to storage for formal office wear. Conversely, conventions around dress in the office may impact on the practice of getting to and from work as was noted in organisation C:

“I’m a cyclist, I cycle a lot, but I can’t cycle to work, it’s not because of the facilities, it’s I have to bring so much stuff that you know, my business partner, he runs in, he’s a man for goodness sake, I’ve got to bring my hairdryer, my make-up, my clothes, then my lap top so I’ll never get up the hill with all that so that’s why I don’t do it, otherwise I’d love to cycle in, it’s just not practical. From home, it’s only six miles...” (Jules, marketing director, organisation C, 2015).

Organisation A provide four pool cars which are bookable for a maximum of two days to ‘discourage personal car use’ (Field notes, April, 2014). Fleet cars are also supplied to staff with roles involving significant travel (in excess of 10,000 miles per annum):

‘Gillian, who is responsible for the pool and fleet cars, is arranging for the collection of keys and tells me “They [pool cars] are well used, because it’s our policy that we prefer people to use a pool car or a hired car rather than their own when they’re on company business”. Interestingly, there is little discussion of alternative transport modes.’ (Field notes, organisation A, June, 2014).

The material elements implicated in getting to and from work have changes in organisation B. Car parking is limited to such an extent that employees are 'forced' to consider alternative means of transport. This supports the carrot/stick cognitive approaches to 'changing behaviour'; in removing facilities, individuals must change their behaviour (Al-Saleh and Mahroum, 2015).

Many participants described their use of showering and changing facilities in organisation B which allowed them to engage in more sustainable practices of getting to and from work such as cycling and running. It is important to note the interlocking practices of fitness and health and well-being, and the links between these practices in the context of contemporary office working. Employees described the material features of the building as supporting their engagement in fitness practices, and enabled the integration of fitness practices into time-limited contemporary working life. Thus the recruitment into fitness practices, had implications for getting to and from work:

"...no one told me all this stuff [sustainable travel options] when I started, I just assumed that I would run/cycle in, I've never been fitter." (Tom, first floor employee, field notes, organisation B, July, 2014).

The provision of lockers and pedestals allow employees to store fitness equipment and support this practice as was observed:

"At 4pm, Mark starts to organise his desk, he is packing up for the day. But instead of popping on his coat and heading out, he reaches into the pedestal and brings out his trainers "I try to run home as often as I can" he tells me with a grin..." (Field notes, organisation B, September, 2014)

"Cycling to work I use underground car park facilities to lock up your bike... then we have six showers and a drying room, so you can stick your towel there and it dries overnight...it's good provision" (Dan, business development, organisation B, 2015).

7.11.2 Competencies

Getting to and from work	Materials
	Competencies
	Meanings

7.11.2.1 Routines and schedules: personal commitments and variations

Whilst the commitment to the provision of a bus service supported employees in getting to work sustainably in organisation A, this impacted on the practice of flexible working as the following extract illustrates:

“I guess I started to use it [the bus service] less and less because it was ok but it was really fixed hours, it got you there for 9 and it left at 5.10 so there wasn’t a lot of flexibility about it and by then you could just pay £1 to park opposite so then it gave me much more flexibility, if I’m not in the office many days in a week I tend to do long days to get the most out of being there and then I moved house and I had the options of things like car sharing with a colleague in my team so that’s what we do. I travel 37 miles each way. I can’t really cycle walk and there’s no public transport that would work.” (Kate, senior manager, organisation A, 2015)

Scheduling issues also prevented employees from walking or cycling to work, with car travel providing a faster and more convenient alternative:

“I usually walk to work. I come by car, usually once a week, I do have access to parking. It was a route I already knew. Weather doesn’t tend to bother me, if it’s rain, its only rain, I’m fairly hardy. I did bring the car today, because I was running late.” (Carol, FM and office manager, organisation A, 2015)

Observations and informal interviews supported well established links between car travel and notions of convenience. This also extended to personal and professional scheduling issues:

“I drive to work, not far at all only about 2/3 miles probably not even that. I have to have my car with me though because I have another job in the afternoons so I have to go straight from

here. I'm a driving instructor so that's why I need my car, it could be anywhere." (Sue, Administrative support, organisation A, 2015).

"We only have one car in our family which my wife uses for the kids..." (Jim, FM and building manager, organisation B, 2015).

"I live 20 minutes away...I could take the bike but it's not quite that easy on cycle paths here and then also because then I come in and out at different times, I'm not here all the time so I do go out into the properties or what have you and it's much easier for me to be able to do that [by car]..." (Tracey, HR, organisation A, 2015).

A clear intention of the selection of organisation B's office was its public transport links, however getting to and from work using public transport was reported to be problematic:

"I travel by the dreaded public transport or I cycle in... I would love to use a car, I dream of it every day... but no, I don't – we have no car parking facilities here for co-workers, we have a car park with 15 spaces and we have an occupancy of 120/140 so there are obviously not enough to go round...the policy we have...and also to encourage more sustainable means of commuting... is that car parking spaces are for visiting customers or business travel or if you have a medical emergency. Other than that there is no co-worker parking, we're in the centre of the city, parking is a luxury, trying to get out of the city at 5pm is awful..." (Jim, FM and building manager, organisation B, 2015).

The practice of getting to and from work was also found to interlock with practices of flexible working and of taking part in office life:

"My wife, who is a teacher...I drop her at work first...then I might stop at the shops, have a coffee, read a book...I really don't like working nine to five anymore and I will deliberately not do that...I've done it all my life and I don't want to do it anymore" (Lawrence, IT, self-employed, organisation C, 2015).

“Earliest to arrive will be about eight am, it is fairly quiet, usually a few people working out here...it will start to get busy by eight thirty and by nine it will be normal. It all hinges around the coffee shop, so people will arrive in time to get a cup of coffee when it opens. I wouldn’t dream of coming in if I couldn’t get a coffee...” (Jules, marketing director, organisation C, 2015).

7.11.2.2 Know-how

Organisation A provides a range of sources to offer information regarding sustainable transport modes to employees. Public transport information is offered on the staff intranet and through partnering with the local travel initiative, Sidbury travel, however whilst the Green Travel Plan made provision for detail of sustainable travel to work modes to be made available to staff during inductions, it emerged that in practice this was a more fluid and informal arrangement:

“We have all the bus and train information on reception, provided by Sidbury travel that we can give out to new starters if we need it.” (John, receptionist, organisation A, 2015).

During the observation period, informal discussion with staff members confirmed that information regarding alternatives to driving had to be sought out to some extent although the car sharing scheme was most widely promoted. This, remarked several participants, was due to the paucity of car parking spaces:

“They (Organisation A) make it almost impossible to get into the car park, to get into our car park you have to live more than 5km away from our building as the crow flies, share a car with at least one other person and be in the office at least 4 days a week.” (Tracey, HR, organisation A, 2015)

During the research period, a focus on the car share scheme in organisation A emerged as central to the practice of getting to and from work. The scheme was widely publicised and monitored. Employees reported high levels of multi-channel dissemination in respect of the scheme:

“I car share with another member of staff on reception, we car share together. There are a certain amount of spaces that we have for visitors and a certain amount of visitors are car share spaces. If people want to join a car share we have the central office news which goes out every Wednesday for the whole of the organisation...it does have a lot of information and if you are wanting to join a car share it is good way to put your name out there and say you want to share.” (John, receptionist, organisation A, 2015).

“Yeah we have an email that comes out on a regular basis that highlights who does car shares etc., there is car sharing spaces here in the main car park so if you were car sharing, then you could use that space so.. Yeah if we needed to or if there was an opportunity, you can do car share here.” (John, receptionist, organisation A, 2015)

Car sharing was also praised for convenience by those who participated in the scheme:

“I don’t live too far away, I live a ten/fifteen minute drive away so me and my car share live right next to each other so that was perfect for us, working together as well.” (John, receptionist, organisation A, 2015).

“If you are car sharers, you share petrol and you have access to the [car parking] space with your swipe card”. (Kate, senior manager, organisation A, 2015)

However the scheme was subverted to a degree by the availability of car parking at the adjacent retail outlet centre.

“When that shifted to being a pound a day, from the ridiculous 5 or 12 pounds or whatever it was, that made a difference, gave you more flexibility.” (Tracey, HR, organisation A, 2015).

Moreover, issues of distance were also discussed during the research period. Those who had lived in more remote areas where public transport was unavailable and distance prohibited walking or cycling. Car driving here was often a solitary undertaking and supported by the affordability of the outlet car park:

“...we park in the outlet which is the shopping centre which we’re based on. We get that subsidised, no we don’t, yeah we do, if you park in there between one to five hours it’s £1 if not it goes to £12, but you can pre-pay and it’s £1 for Organisation A staff. I’ve always used that car park.” (Sue, administrative support, organisation A, 2015).

It was also observed that in spite of enthusiastic responses around the car sharing scheme when asked directly, daily discussions in the office related to traffic conditions and individual car use, it became clear that the majority of employees observed travelled to work by car.

The unreliability and inconvenience of some public transport modes as a means of getting to work was reported by several respondents, particularly those travelling from greater distances across case study organisations.

A second important issue within the organisation highlighted during the observation period, is addressing and reducing business travel. Many measures have been put in place including restrictive measures, air free days, and video conferencing equipment provision. Whilst business travel itself is beyond the scope of this thesis, the impact of initiatives, such as provision of video conferencing technology, has impact for the overall resource use within the building. Although, this by no means negates the resource saving associated with a reduction of business travel.

Policies in place to support a change to more sustainable forms of travel in organisation B are designed and evaluated in terms of behavioural change campaign, however as with the widely cited Japanese Cool Biz intervention, the policy has led to both intended and unintended consequences (Shove, 2010). For example, the sustainability manager cites successful outcomes following the occupation of the building with numbers of occupants using private cars reducing. However, when considered from a practice perspective, outcomes may not be derived from the cognitive behavioural policies, persuading individuals to change their mode of travel to work through raising awareness of environmental impact, but from more complex convergence of elements of practice, intended and unintended.

However, there were some conflicting reports regarding level of knowledge amongst staff and the impact on the practice of getting to and from work, for example, one FM described the staff as “*out of touch with travel and carbon implications*” whilst another considered all staff to be “*pretty engaged with sustainable travel*” (Field notes, organisation B, April and June, 2014). Anecdotally one third of staff in organisation B travel to work by bike, supported by the changing and storage facilities. However, during the observation period, it was noted that cyclists were predominantly travelling from distances of over 10 miles and this was typically part of a training plan, suggesting cycling to work was linked to practices of health and fitness and engaged in by ‘experienced’ cyclists. Those living in closer proximity to the office largely travelled on foot. This is illustrated in the extract below from organisation B:

‘I chat about getting to work by bike with Clare in the HR team, a new practice for her, “It’s been remarkable, I hardly use the car now, I used to live in the car or trains and planes. Health, time, environmentally, money, there’s multiple benefits, it just sets you up for the day.” (Field notes extract, organisation B, August, 2014).

“I’m not a cyclist, I only cycle in because I hate the bus. My journey in is a 30 mile round trip, for someone who is not into cycling, that is a lot to say for how bad the bus service is... it’s constantly late, they’ve changed the timetable and it’s still late. There’s this 20 minute window where if the bus is 20 minutes late you can claim compensation, so I think it was November 2012 I complained about everything and I had 3 weeks work of free travel and I thought that’s it and I started cycling, in February, in the cold and the dark. Why would I recommend that [bus service] to anyone? As part of my role I’m trying to encourage people to choose a more sustainable way but I know if I recommend the bus service it’s going to be absolutely horrific for them...each week I spend about two and a half hours waiting for a bus...you talk about work life balance and I’m stuck waiting at a bus stop while the kids are getting ready for bed...so why would I use the bus...why?” (Jim, FM and Building manager, organisation B, 2015).

There are understandings of how systems work which enable practices of getting to and from work and discourage car use:

“We’ve got some car parking spaces but they’re on a needs basis so you kind of request one and if you have a good enough reason, I have used them if I’ve had hospital appointments sort of self-regulated use them when they really need them. I know they’ve had some problems, there’s a bunch of spaces down there, it’s a shared parking environment, always risk other people taking spaces. We occasionally get a missive if you want a space, this is the protocol.” (Dan, business development, organisation B, 2015).

“It’s brilliant, the bike cage is activated by same pass that gets you into the building. You can get a locker assigned, I don’t use it too much. The changing facilities, to me they’re really good. I had intended to cycle, I don’t think I intended to run as much as I do. With a cycle I can get away with having a shower at home, but I’ve changed from showering at home to showering here. My new morning routine, you can freshen up here.” (Mike, HR, organisation B, 2015).

Cost was cited as a consideration in the selection of sustainable modes of travel, the prohibitive cost of public transport and car parking was cited by participants. Employees were widely aware of cycle to work scheme, and a lesser known employee wellbeing allowance of £50:

‘Discussing the cycle to work scheme with an employee, she notes an additional scheme. This is the first time this has been raised, although I have been visiting the office for over five months, “you make a case for something that will fall under that wellbeing umbrella – trainers, membership, enter a race...I can’t believe I haven’t used it.” (Field notes, organisation B, September, 2014)

The required skills to ride a bike were also reported in the context of getting to and from work:

“I walk in whatever the weather, takes me about 25 minutes, “I don’t cycle, my balance is awful. I don’t like the main roads, especially around Temple Meads, I wouldn’t trust the roads.” (Karina, office worker, field notes, organisation B, June, 2014).

“I haven’t ridden a bike since I was about 14, I don’t think I could balance on one and I certainly wouldn’t want to go on roads.” (Mark, office worker, organisation A, August, 2014).

Occupants in organisation C understood that car parking, whilst informal, was widely available and considered an added benefit:

“If I drive in I usually get a space...there is a car park for everybody’s use. There are some spaces reserved for a company and then there’s the overflow area...I’m aware of Bristol City Council’s aversion to car parking but we don’t have that here. I went to the Environment Agency once, there’s 600 people working there and no car parking...” (Field notes, organisation C, October, 2014).

7.11.2.3 Initiatives

Initiatives were observed and reported across case studies. Mawson (2010) argues:

“Getting people to work in a mobile, agile way within the office takes leadership and commitment and a carefully constructed change programme to prepare people for change.”

However, within the context of social practice theory interventions are considered as part of the dynamics of social practice, and not as levers or instruments of change which are external to the practice (Shove et.al. 2012).

Organisation A developed initiatives to encourage more employees to travel to work sustainably, this included promotion of car sharing scheme, cycling and walking promotion and partnership with local sustainable travel organisations as illustrated in the interview extract below:

“They recently did a cycle thing cycle to work, so basically they organised, the company that came around just to show people the local cycle routes and bits and pieces, so they definitely

encourage cycling ... car shares are encouraged, they promote it they tell people about it, people can log in and put their car shares in... they promote it more than my previous company ... (Tracey, HR director, organisation A, 2015).

Visits by local sustainable transport organisations were also observed in organisations A and C during the research period, including stands set up in the atriums giving away free bus passes and timetable advice.

During the research period the rolling out of a 'winterising' bike scheme was also observed in organisation A encouraging the engagement of employees with cycling over the winter months:

'Asif, a senior FM, discusses the 'winterising bikes' scheme that is going on at the moment "We have Mark who's heading it up, we get the bikes ready for the winter, you know tyres, gears and such. It's good, it keeps me on the bike longer". (Field notes extract, organisation A, October, 2014).

The scheme also addressed wider issues of competency which some novice riders may experience, as discussed above, aiming to overcome anxiety about cycling in less temperate conditions.

Organisation B was visibly engaged in promoting sustainable ways of getting to and from work. During the observation period, employees proudly showed the researcher a certificate awarded for regional Sustainable Travel Awards. The organisation also belongs to a local travel network. The aim to integrate with likeminded organisations is reflected both through travel initiatives but also within wider office life as is discussed in section 7.15.

Organisation B also launched an electric bike loan scheme in partnership with the city council. Bikes were loaned to employees on a six monthly basis in exchange for a log of data to monitor utility and leisure journeys.

Organisation C viewed sustainable travel as a strategic aim and partnered with local organisations:

“We try and encourage people wherever possible to travel sustainably to work, working closely with Lisa who’s the director of North Bristol Suscom, we’ve got new bus routes introduced and the new houses are going up. So everything has been designed and that’s communicated to the tenants, we have regular sustainable travel roadshows here every 6 months, we have a team from the local council that come in, they do a free mini bike servicing for the people that do cycle in so wherever possible we do try and encourage that, we’re very proud, despite being a state of the art modern building, wherever possible we’ve stuck with the fundamentals of looking after the planet and try and make sure that everything is as kind and gentle to nature as possible. Getting tenants engaged... it can be challenging, once you get the engagement they’re usually quite good at going with it, but it’s the most accurate way and most effective way of getting in contact with the tenants, we try not to bombard them with emails, as you can imagine they have hundreds of emails coming in so we try and keep it pertinent, important, so we will send an email out, there’s a roadshow coming up.” (Rodney, Building manager, organisation A, 2015).

Other initiatives around travel to work included questionnaires around working patterns and the opportunity to participate in a scheme to use electric pool cars. Sustainable travel options include details of train and bus services; cycle and walking routes, including connectivity to a 13 mile cycle path; and details of on-site electric car charging points. The building has three standard charge points and a rapid charge points.

Organisation C promotes sustainable travel to work options through a number of key partnerships which include a local sustainable travel organisation, local travel southwest network which provides public transport information and membership of Co-Wheels. Co-Wheels are an independent national car club who provide “low emission, hybrid and electric cars on a pay-as-you-go basis for organisations and communities across the UK.” (Co-Wheels website).

“...there’s a lot of interest in this building and how you get to work. There’s been an initiative about why don’t you cycle to work and car share and that sort of thing. I’m aware of the cycle path, bus routes, but not I think as an induction process...only aware of it from those who have an interest in telling me. I’ve never seen anybody use one of the electric cars, I don’t know how I’d go about using one...they’re always out there, always on charge...I kind of don’t understand why they’re there in the first place... I think I got an email about how they’re managed by an external company...outsourcing the management of the cars...” (Julie, HR, organisation C, 2015).

The location of the building and its proximity to major roads is well understood in organisation C and was observed to be the main mode of transport for getting to and from work:

“I know of people who walk or ride their bikes, there is a chap who sits in the hot desk office, he walks here from up the hill. I think it’s interesting, being on the ring road it’s designed to be accessed either by car or by bus...the cycle paths are good, I don’t know where they run...” (Lawrence, IT, self-employed, organisation C, 2015).

“We chose here because of the location, it was part of our big decision, because a lot of our clients are London, and up to our furthest is Durham, we needed to be on the M4/M5 thing, that’s why we chose our previous office as well and most of our staff are in the surrounding areas, so for us it was the most central point, without having to battle the traffic. There’s no way we were ever going to put the business in the centre of Bristol, just wouldn’t do it, why would you? It’d add an extra hour either side of your day, why would you do it. It would have been either here or Aztec west. This was our first choice, we liked the environment here as well as the position.” (Jules, marketing director, organisation C, 2015).

A wide range of information is available to building occupants in organisation C and also to visitors. The information leaflet is split into two sections: driving directions and sustainable travel options. Driving directions are presented in some detail, which includes an emphasis on

the proximity of the building to major motorways, suggesting this is the most convenient and most frequent mode of travel to the building.

During the observation period the researcher travelled by bike on several occasions and made use of these facilities and some tacit rules were noted:

'I arrive by bike today, locking up my bike in one of the many cycle racks. I ask at reception about showering and Mika (the receptionist on duty) points me in the direction of individual wet rooms to the rear of the forum. There is no key, no code, I simply arrive and use the showers. I notice another occupant arriving at the same time "lovely showers" he laughs as I am making my way in "hot water never runs out!".' (Field notes extract, organisation B, June 2014).

This extract suggests that the practice of getting to and from work by bike, implicates water and energy use through the provision of hot water. Whilst issues of water consumption emerge from the data, however this is beyond the scope of this research. Energy consumption through the heating of water in the office enable the practice of getting to and from work by bike.

Understandings of an abundance of hot water suggest that the 'office hotel' Gyford (2014) is implicated in this practice. This may relevant for the performance gap as predictions around energy use may not recognise such subtleties.

7.11.3 Meanings

Getting to and from work	Materials
	Competencies
	Meanings

7.11.3.1 What it means to be a 'green' traveller

The promotion of a green travel policy within the organisation was observed to show meanings of inferred status as the following field note extract reveals:

'Sue and Marcia are discussing their journey to work as I arrive on site (the traffic is bad today). Sue tells me "I don't drive" to which Marcia responds "You're a 'green person"', Sue laughs

modestly and seems pleased to be thought of in this way." (Field notes extract, organisation A, May, 2014)

This resonated with material artefacts implicated in the practice, for example when Sue arrived at the office wearing trainers and changing into formal footwear in the office, this was observed by the researcher to confer a certain status upon Sue, that she was 'one of the green people'. This was also noted during the observation period in respect of those travelling to work by bike:

"Mark and Rob (the Cycle manager and his assistant) make an entrance! They are kitted out in full cycle wear and cleats rendering their arrival both noisy and striking. There is something of a peacock strut in their walk, they are clearly proud to show that they have travelled by bike, particularly perhaps, in the less than favourable weather conditions today." (Field notes extract, October 2014).

Meanings of fitness, hardiness and environmental commitment were found to be associated with sustainable travel, John (receptionist, organisation A, 2015) described those regularly cycling to work as *"healthy and sporty"*. Meanings around hardiness and fitness were also reported in organisation C:

"There was a guy in the forum promoting electric bikes? Electric bike? I'd feel like I was not being true to my cycling roots, I've just spent 2.5 grand on a carbon bike, I couldn't justify it [laughs]" (Field notes, organisation C, June, 2014).

Perhaps this was also more evident given the smaller number of employees travelling to work, in particular by bike, increasing their visibility. This, however, should not be considered in isolation as other elements of the practice, such as the availability of appropriate facilities to support the practice are limited.

Walking and cycling were also found to hold symbolic meanings of health and wellbeing, for example many employees described the opportunity to walk to work as a means of clearing their head before the working day.

Meanings of effort and reward were also observed and reported in occupants getting to and from work by bike or walking/running as the following extract illustrates:

“Scott and James (part of a technology team who work in organisation C) cycle together to work most days. They describe their morning routine to me “It’s great, I really enjoy it, it gives us a chance to chat and then whatever the weather, there’s a good hot shower waiting at the end....and a coffee too, can’t do without a coffee after the ride...” (Field notes, organisation C, September, 2014).

This extract illustrates the **meanings of rewarding physical effort with cultural conventions of freshness and luxury associated with showering practices (Shove, 2003). Moreover, the reference to coffee could be held to be a demonstration of wider social conventions in cycling culture, that is the interconnection between cyclists and coffee culture. This is relevant to the performance gap as it may imply greater energy use than predicted at designs stage.**

7.11.3.2 Getting to and from work and organisational ethos

The practice of getting to and from work is of importance to Organisation A. A car share scheme has been set up by the organisation as a demonstration of commitment to sustainable travel. Green travel initiatives, as they are referred to within the organisation were clearly of pride and importance as noted in initial observations:

“Sue and Marcia, the head of facilities management and her right hand woman chat to me with great pride on that first day. They are keen to show me around the office building and show me the physical features that support their ethos of sustainability, but also clearly want to let me know that there is more here than meets the eye; they are truly committed. They discuss the intranet and Marcia tells me it is really important that new colleagues are shown where to find information so they can understand how the organisation is different to others new recruits may have worked in. Here, it is a question of belonging, once you are here, you belong to the organisation and need to be an “Organisation person” to truly fit in (there is an

undertone here that there may be some who do not fit). Part of belonging is how you travel to work and Marcia encourages me to have a look at the staff intranet and the green travel promoted.’ (Field notes extract, April, 2014).

As the above quotation demonstrates, the promotion of green travel is considered a key commitment and demonstration of sustainability-in-action. Within the staff intranet, policies are set out in respect of green travel and include practical steps which employees should undertake to take part in the scheme. The document states:

“We are an environmental organisation and we must practice what we preach. We are in close proximity from both the train and bus station, so we actively discourage staff from using a car.” (Organisation A Car Share Scheme, Staff Intranet, 2014).

Importantly from a practice perspective, key meanings in organisation B are communicated to all employees by the flat hierarchical way in which the change of facility the building offers is delivered. In changing the practice of getting to and from work, a number of ‘levers’ are exercised, one of which that the material change is applied to all employees, *“Even the higher ups have to think about how they get here”* (Tom, Administrative Team, organisation B Field notes, August, 2014).

Driving to work, in organisation B, was described as ‘unusual’ by many participants. Another organisation B employee also described the commitment to getting to and from work sustainably:

Definitely encouraged on getting to work sustainably here, through communication really, we have a bit of a clunky intranet but we have partnerships with Sustrans and Travel West, the FM team do a very good job of raising awareness, also they run lunchtime bike session, we have customers that support us in various initiatives. They do surveys [FM team], to demonstrate, not to shame anyone...there’s quite a healthy respect for doing stuff in a sustainable fashion, it’s part of who we are.” (Jane, marketing team, organisation B, August, 2014).

7.11.3.3 Greenwash and hierarchy

Symbolic meanings associated with getting to and from work related to both seniority and greenwash. Whilst there was an outward commitment to getting to and from work sustainably, as noted above, in practice it was observed that there was some discrepancy. This translated to the emergence of 'greenwash' as the following extract illustrates:

"We monitor car sharing and they [employees] lie. The organisation is public facing, it's supposed to be environmentally aware, it's got to practice what it preaches. Staff pay lip service to it, but if it's not convenient for them they... park in the outlet centre." (Carol, FM and office manager, organisation A, 2015).

There was also some contradiction noted between the contention that staff at all levels must adhere to the travel policies of the organisation and the reality observed, where senior staff often travelled by personal car. Moreover, this was widely acknowledged as an issue related to seniority:

"[a senior manager] thinks she has the right to [drive her personal car to work], in terms of her role in the trust and because it's convenient for her. She would have an expectation that everybody else would follow the rules." (Sue, administrative support, organisation A, 2015).

7.12 Implications for the performance gap

Whilst getting to and from work is not a direct contributor to energy use and the performance gap in sustainably designed office buildings, van de Wetering and Wyatt (2011) argue that there is an indirect contribution to overall emissions and energy use. Applying a social practice theoretical approach, the practice of getting to and from work was deconstructed, key findings relating to the performance gap are summarised below:

1. Understandings and strategies around getting to and from work are relevant to the performance gap as the provision of appropriate, and sufficient, facilities may impact on the recruitment of carriers to this practice;

2. Understandings of an 'office hotel' Gyford (2014) are relevant to the performance gap as predictions around energy use may not recognise such subtleties; and
3. Meanings around getting to and from work and health and fitness, are linked to notions of rewarding physical effort with cultural conventions of freshness and luxury associated with showering practices (Shove, 2003). Social conventions in cycling culture may also be inferred. This is relevant to the performance gap as it may imply greater energy use than predicted at design stage.

Deconstructing the practice of getting to and from work demonstrated, in line with Cole's (2005) definition of sustainably designed office buildings, that sustainable travel was a strategic aim across case study organisations. Common features included cycle storage, showering and changing facilities.

A wide range of initiatives to recruit occupants to more sustainable ways of getting to and from work were reported. However, initiatives launched without a wider understanding of converging elements of practice were less likely to be successful. For example, stand-alone electric bike schemes failed to recruit large numbers of participants, underlying meanings of what it means to be a cyclist were not considered.

Cycle schemes and initiatives are also well established and travel surveys demonstrated some increased uptake in sustainable practices. The removal of physical infrastructure supporting car driving, for example the removal of car parking spaces, did have an impact on many occupants of the organisation B with many reporting walking, cycling or using public transport to get to and from work. Data relating to business travel was collated by organisations (however this was largely for cost reduction purposes), however business travel is beyond the scope of this research.

Issues of routines and scheduling were noted across case study occupants as shaping the practice of getting to and from work, for example car use was often reported to be linked to convenience and family commitments.

Getting to and from work incorporated sustainable messages among case study organisations, however there was some evidence of 'greenwash' and hierarchical divisions. Shove (2003) suggests that the markers of social distinctions, such as age, gender and seniority must be addressed if practices are to be shaped more sustainably.

Inconspicuous consumption of energy is in evidence in getting to and from work. Whilst there is often not a conscious consumption of energy, it is implicated in accomplishing the practice of getting to and from work sustainably, for example through rewarding effort with coffee; showering; providing and heating drying facilities.

In deconstructing the practice of getting to and from work, multiple issues around sustainable travel are revealed, however there are limited direct implications for energy use in sustainably designed office buildings and the performance gap. This may be considered a limitation of a social practice approach, however nuanced elements of practice are revealed, allowing alternative understandings of the recruitment to and performance of this practice. Perhaps the most valuable finding from the analysis of the practice of getting to and from work lies in its future implications, which is an area for further research.

7.13 The practice of effective working

The conceptualisation of the practice of effective working framed the practice in terms of satisfactory and comfortable working conditions within sustainably designed office buildings. Key issues contributing to the effective working included technology, infrastructure, comfort and noise. Section 7.13.1 considers the implications of the BCO Guidance (2014) for effective working within case study buildings.

The practice of effective working is arguably provides the most direct link to energy use and the performance gap. For example, maintaining levels of comfort relates to conventionally resource intensive technology implicated in heating and cooling. This section will deconstruct the practice of effective working and discuss resource implications. It should be noted that

whilst issues of waste management were raised during the research period, they are considered beyond the scope of this research.

7.13.1 Materials

Working effectively	Materials
	Competencies
	Meanings

7.13.1.1 Infrastructure and characteristics

Building infrastructure and physical characteristics were found to be central to the practice of effective working. The UK's Future Energy Scenarios propose technological and market based initiatives and approaches to reduce future energy demand, including the foregrounding of smart technology and the rise of green consumers (National Grid, 2016). The European Commission's Energy 2020 paper, argues that smart meters will be central to European energy efficiency (European Commission, 2011). The development of policy and interventions in these terms however, frames individuals as rational and autonomous decision makers (Strengers, 2013). There is an underlying assumption, contends Strengers (2013) that social practices in this scenario are static and any change is shaped by technology. However Powells *et.al.* (2014) note that technology has developed as a consequence of social practices, for example changing expectations for heating and cooling has led to requirements for cooling systems which are an outcome of evolving social practices.

Tables 7.1, 7.2 and 7.3 set out the key physical and infrastructural characteristics of each case study office building. Key characteristics and infrastructure of the buildings support the practice of effective working. A number of key expectations and minimum conditions for effective working were described by Tracey (organisation A):

"...we need space for our team to be able to operate both individually and as a team, and then ...accessibility to systems and networks and printers, technology as in the normal phone system...We need it so that it's environmentally friendly to work in so we need it light

...spacious...not too hot, not too cold, those sorts of things you know.” (Tracey, HR director, organisation A, 2015),

Thermal comfort was found to be implicated within effective working, with office work undertaken in thermally regulated indoor spaces. All case study buildings feature infrastructure and characteristics which reflect Cole’s (2005) definition of sustainable office buildings in terms of building orientation, thermal efficiency, natural or mixed mode ventilation and efficient water supply. Organisation A and B buildings were designed with a fully naturally ventilated system, controlled by BMS and aiming for a target temperature of 22-23 degrees, in line with BCO (2014) guidelines. Each building was constructed to benefit from southern orientation. Organisation A’s design brief considered orientation pivotal to maximising solar heat gain (Design Brief, 2011). Thermal comfort in organisation C is managed by a combination of natural and mechanical systems, controlled by BMS.

Organisation B is supported by infrastructure for variable indoor temperature, setting a range of 21-25°C with a tolerance of +/- 3°. A temperature falling below the tolerance level will trigger heating systems. Each room of the building is zoned independently and there is an ability to remove tolerance allowance via the BMS. Whilst employees have the ability to open windows manually to adjust comfort, this is discouraged before twelve pm during the summer months. Organisational aspirations to a sustainable workplace are reflected in the selection of energy supplier with 100% of energy derived from renewable sources. Everything, the FM tells me, is sourced ethically in the building, “*from electricity to coffee*” (Field notes, organisation B, July 2014).

Lighting

The WGBC (2014) note that the provision of daylighting has multiple benefits in terms of productivity, stimulation and reduction of energy use through reliance on electrical lighting. Moreover, proximity to natural light and windows have been found to result in improved productivity (WGBC, 2014). Lighting systems across case study buildings are automated and

are activated through motion sensor technology. Lights in all organisations are manually adjustable, however as discussed in more detail below this was not widely understood or acknowledged (see section 7.13.2). Organisation C features daylighting technology in the central atrium which is automated (and adjustable) to reflect daylight levels. All case study buildings have external shading to deflect solar glare and windows have manually adjustable blinds. Lighting in case study buildings is in line with BCO (2014) specifications as discussed below.

Wireless technology and infrastructure

In order to work effectively, wireless internet connection was provided across all case studies. As discussed above, this technology is implicated in the practices of flexible and collaborative working. It is important to note wireless technology is considered a minimum requirement within sustainable office buildings.

Small power provision enables the use of electronic devices. This was noted for example, in organisation C, where a 'virtual office' was created through the use of infrastructure in the forum:

'In the forum, four people share a table. They have laptops and smartphones in front of them, most are plugged in to floor power points. One of the four engages in a Skype meeting. They continue to work alongside each other throughout the morning, they have created a virtual office which allows them to work together yet independently.' (Field notes, organisation C, June, 2014).

Working effectively implicates energy consumption through the use of multiple electronic devices. Patterns of consumption facilitated by building technology and infrastructure have enabled effective working for office workers to evolve in this form. The increased use of ICT devices in the workplace has implications for energy demand and is relevant to the performance gap. As discussed in earlier sections of this chapter,

occupants participate in various forms of electronic work and, as noted above, this work is undertaken in thermally regulated environments.

7.13.1.2 Material Artefacts

A number of material artefacts are implicated in the practice of effective working:

“...it’s really important for me that I’ve got one place to go back to because if you’re carrying a bundle of papers for one or I don’t know you carry stuff for ... I really like having a place to go back to which mostly I leave my laptop. I don’t tend to take my laptop with me unless there’s loads of papers that I’ve chosen not to print off. I just come back and touch down, and even then I’ve got my phone with me so I can check emails when I’m in meetings, I prefer to just come back and have a bit of a base at my desk.” (Kate, senior manager, organisation A, 2015).

Technology is central to how business is undertaken in case study buildings, as could reasonably be anticipated, what is interesting is how these practices are facilitated by the building and expectations of how the building will be occupied. Electronic devices were found to be ubiquitous in the practice of effective working:

‘Devices are easily the most obvious characteristic of work here. Every occupant sits at a desk with a laptop and often there is also a tablet, blackberry or iPhone. No meeting is attended without an electronic device.’ (Field notes, organisation A, April, 2014).

Kawamoto et.al. (2003) note that the increased use of laptop computers in offices rather than desktop computers is more energy efficient, with lower power usage and faster power down rate. The use of tablets is also a more energy efficient technology which could contribute to reduced energy demand. However, as Faulconbridge et.al. (2018) note, this may be duplication of device rather than replacement. This assertion resonated with observations where the **‘standard’ ICT equipment was a laptop or desktop computer, supplemented by other electronic devices, which has implications for energy use and could contribute to the performance gap.**

The impact of noise on effective working was addressed through the provision of acoustic materials in case study organisations. Organisation A has installed a number of artworks in the atrium which act as acoustic buffers and can be lowered to create smaller spaces to work in, however it was reported to the observer that the system had never been in use. This was in part due to the open nature of the atrium, where sensitive conversations were less likely to be held. However, the FM reported:

“..We could do with them [acoustic buffers] in the light wells but the cost is prohibitive...I heard the CEO’s private conference call when I was sat near the light well.” (Carol, FM and office manager, organisation A, 2015).

Noise attenuation was also noted in organisation C as the following extract illustrates:

“We asked for a certain layout, we have certain people that have to work with certain people, just for the dynamics of it. All the designers are in one area, I’m on the phone a lot to clients, so is my business partner, we’re quite noisy so we pulled ourselves away. So we organised the layout to suit what we do. We don’t use [acoustic buffers] to be honest we’ve got to the point where, we’re, because we’re open plan, I wouldn’t want to expand as an open plan office, if we expanded again, I’d want to take another office next door because we do find, when I’m doing the finance and people are bellowing questions over you, it does my head in, so I think we would need some kind of sound barrier, physical barrier sometimes [laughs] just leave me alone I’m busy! Just because I’m here doesn’t mean you need to talk to me [laughs]!” (Jules, marketing director, organisation C, 2015).

Effective working, therefore is once more associated with the ability to retreat from the open plan office in order to provide a physical barrier to noise and interruption. This is of relevance to the performance gap as the reality of occupying office buildings differs from anticipated use. This may impact on energy use as the configuration of the building changes over time and could contribute to the performance gap.

7.13.1.3 Clothing

Clothing was also implicated in the practice of effective working and in the management of thermal comfort. As described above, a 'cardigan culture' was promoted in organisation A. The provision of branded clothing was also noted in organisation A, with employees provided with fleeces. Clothing storage was noted across case study buildings. Social conventions were noted with occupants wearing an accepted 'uniform' of smart/casual clothing. More formal clothing was almost entirely lacking across case studies, the researcher rarely observed ties or suits:

"The general atmosphere is relaxed in the office, this is reflected in how people dress. This is a bank, but it is not conventionally formal. Some employees arrive in suits but suit jackets are quickly divested and male employees do not wear ties." (Field notes, organisation B, April, 2014).

"...as teams move around the office, they take an array of material artefacts with them. There is almost always a laptop or tablet, notebooks, mobile phones, and often scarves or cardigans, as if they are expecting the temperature to change." (Field notes, organisation A, June, 2014).

7.13.1.4 The role of printing and photocopying

Printers, photocopying machines, paper shredders and scanners were provided in all case study buildings. In contrast to the ubiquitous use of technology, a reliance on physical copies of work was observed to be central to effective working in case study buildings. This is of relevance to the performance gap as energy consumed in the printing and copying of documents may not be anticipated. The following extract highlights the use of such electronic machinery to support effective working in the office:

"We do print, yes we do, it needs to be done, we don't generally print off an email, but we have to print off a lot of stuff we receive via email, forms and things...we keep them filed...Every Friday fortnightly, we've got confidential waste people that pick that up, we've got a shredding machine that we can use that's in our area, we've got business points in our area, we've got

our own shredding machine. We've got one in every business centre, 3 upstairs and downstairs, you don't have your own printer, you use a business centre." (Sue, administrative support, organisation A, 2015).

Meanings around the use of physical copies of work are discussed in section 7.13.3.3.

7.13.2 Competencies

Working effectively	Materials
	Competencies
	Meanings

7.13.2.1 Policy

The implications of standards in the practice of effective working are important to consider. As noted in chapter two the British Council of Offices provide common specifications which have become synonymous with high quality office space. For example, technical and performance specifications of office buildings seeking to be characterised as Grade A space, typically meets or exceeds BCO guidelines (Cass et.al. 2016).

BCO Guidance to office specification sets out key standards around occupational densities, thermal comfort, fresh air, lighting and small power consumption. An overview of key criteria is provided in table 7.4 below.

Table 7.4: BCO Guide to Specification (2014) key criteria

Criteria	Specification criteria
Occupational density	1 person: 8-13msq
Thermal comfort	Mixed mode (natural and mechanical ventilation) Natural ventilation Maximum temperature: 25°C (for maximum 5% of occupation) and 28°C (for maximum 1% of occupation) Minimum temperature: 20°C (tolerance of 2°C)
Fresh air	12-15 l/s/person 10% additional air in meeting rooms and high density areas
Lighting	300-500 Lux VDU/general use 500 Lux paper tasks Lighting energy use: 12-22kWhr/sqm/year
Daylighting target	2%-5%
Small power consumption	20-25 W/sqm – on floor distribution 13-15 W/sqm - Area greater than 1000m ²

Criteria	Specification criteria
Lifts	Waiting time: peak <25 seconds Time to destination <90 seconds Up to 15 floors
Raised floors	100mm typical 300-500mm trading floors
Cycle and shower facilities	Secure cycle spaces - 1 cycle per 10 staff Shower facilities - 1 shower per 100 staff Secure lockers - 1 locker per cycle space

Whilst BCO standards aimed to curb an ‘arms race’ around office specification, however Cass *et.al.* (2016) found that standards led to a ratcheting associated with market demand and a “*more is better logic*” (p.3). **All case study buildings were found to adhere to BCO standards. Such adherence impacts on potential issues of overprovisioning and may contribute to the performance gap.**

Shove (2003) posits that notions of comfort, convenience, efficiency and productivity cut across the need from both standards, market and normative.

7.13.2.2 Initiatives

Initiatives around working flexibly ranged across case study buildings. Simple initiatives related to cleaning strategies, however as noted previously, the focus of this research is on office workers and the contemporary working practices they are engaged in, therefore cleaning practices are considered beyond the scope of this research.

Organisation A also had a number of initiatives around energy efficiency relating to lighting and thermal comfort:

“Carol explains some of the initiatives underway in the building and organisation: “We have a target 20% reduction by 2020 (CO₂)...we’ve launched “unplugging” Think Energy Take Action: switch off, unplug.” The initiative is being monitored daily and weekly by external organisation. The main problem reported by the FM is staff engagement in energy use and reducing waste. The Unplug initiative was intended to run for one financial year however was delayed by internal communications and was rolled out in July. Initially the FM team checked all desks

every night in order to ensure switched off - sweets were given to those who had unplugged, post it notes on the computers/equipment of those who had not. Carol and her team also report sleeping laptops - left switched on while staff move around building, attending meetings and so on, therefore large period of time where small power loads are used while equipment unused.” (Field notes, organisation A, October, 2014).

However, employees outside the team report some engagement and a normalisation of a ‘switch off’ culture:

“I think its cultural now, in the fact that generally people will [switch off], you won’t find lights left on, you don’t tend to find that. I’ve never seen that [lights on]... it would be frowned upon, which is good, I think it’s right.” (Kate, senior manager, organisation A, 2014).

Organisation A also reported that a post occupancy evaluation of the building was undertaken in an attempt to understand resource use and improve efficiency, however the FM team reported limited benefit *“it’s not telling us anything we didn’t already know”* (Field notes, organisation A, April, 2014).

Observations undertaken in organisation B revealed a limited understanding of settings for controlling any building services, i.e. there was not a wide understanding that temperature *could* be controlled.

“When engaging in discussions of resource saving initiatives, observations demonstrated a short-lived engagement, with some employees commenting that they found some of the information provided technical and difficult to relate to in some instances, leaving them feeling less connected to the initiative. Practical issues, did they have the chance to see emails, did they have a view of what was going on and were they able to attend relevant workshops?” (Filed notes, organisation B, 2015).

Organisation B undertook significant monitoring of resource use, monitoring: energy use; paper; travel mode; occupancy. The aim of monitoring is to reduce resource use, and is used as a basis for behaviour change initiatives. A process improvement hall of fame to encourage

printing reduction is one example *“reducing printing is related directly to productivity and on the sheet we list how it has been saved and name of person is given”* (Mike, HR, organisation B, 2015).

Organisation B also took part in a regional initiative: Green Week. At organisational level, this included targets were set with 'fun activities and rewards' to encourage participation, for example rewards for changing travel mode or taking the stairs instead of using the lift. Challenge sheets were distributed to employees, with points awarded for travel to work, avoiding business travel, paper use, using the stairs instead of the lift, sharing a green idea, turning the lights off and educating someone. At the end of the week prizes were awarded for the highest scoring employees. The following extract is from promotional material distributed to occupants:

“During the Business Green Week, organisation B is running a fun and entirely voluntary co-worker challenge. As well as the nice warm feeling you’ll get inside by doing the right thing and knowing that the planet will be a healthier place for our children there will be some prizes awarded for the best ... the most ... and the craziest.” (organisation B Green week email extract, July 2014).

Green week also included a challenge to 'switch off lights', asking employees in promotional material 'how many times did you think about switching off the lights?'. The FM reported that staff often *“...accept that the lights are on in the middle of the summer when you don't need them.”* (Field notes, organisation B, July, 2014).

A wider initiative was also launched during the observation period and linked to green week, that of the creation of a 'green team'. The initiative was instigated by the FM who described key objectives:

“I want to feed back to LEM forum, knowledge sharing and target setting. Generally I want to 'nudge' and influence behaviour, persuade people...possibly report back on agreed targets at Monday meetings.”

However following the recruitment of the green team, members reported some conflicts:

"I still forget [to switch off]. I should be more conscientious than anyone else, but I'm guilty like anyone else..."

"...almost a guilty thing with the lift, I feel a responsibility to take the stairs because I'm part of the Green Team, we need this to be ingrained but I don't know how you can do it." (Field notes, organisation B, October, 2014).

Organisation C also developed a number of initiatives to encourage switching off and bringing in layers. **The above observations and interview responses, support earlier discussions of literature around the limitations of behaviour change initiatives. This is of relevance to the performance gap, as a reliance on cognitive approaches to behaviour change as a means to reduce energy consumption and improve building performance, may not achieve savings required and therefore may impact on the performance gap.**

7.13.2.3 Induction

The induction processes in each case study building were reported as important to effective working as new employees were *"...unfamiliar with the technology"* (Rodney, organisation C, 2015). However, across case study buildings, induction processes were reported as inconsistent:

"We did need a tour of the new building when I moved in, we came round the building in different groups and saw it at different stages, depending on the building work (fit out only). Part of the initiation to the new building was to know about how green it is." (Field notes, organisation B, June, 2014)

"They work a buddy system, met me at the door on the first day and showed me all the practical stuff and also as part of that week there was a schedule of meeting Heads and stuff.. 50% practical, 50% of orienting people you are working with here. If I'm honest, the building systems, that evolved organically, I found out 3 months in don't open the windows when the air cons on...there were a few hot days and the word went out... sort of tribal knowledge. Here

it's a lot more, I guess, I would never even have considered having this in my thought processes where I worked before, you are more part of what needs to happen in this building... Previously everything would be done for you, you wouldn't even dream of opening a window, here it's a lot more collaborative, you get to know about certain stuff..." (Dan, business development, organisation B, 2015).

The inconsistency of office building induction was observed across all case study buildings as office workers demonstrated varied levels of understanding of building systems, leading to subversion of systems, for example, through window opening during purge times and overriding automated lighting controls. This may contribute to the performance gap as office workers lack the necessary competencies to engage with the practice of effective working and consequently energy consumption may rise. It should be noted however, that this extends beyond filling information deficits, which are suggested in linear models of behaviour change. Competency in this context encompasses practical engagement with building systems.

7.13.2.4 Automation and control

Strengers (2013) argues that 'smart' technology is bound up with understandings and predictions of the future. Wimberly (2011) suggests that smart technology offers "*transformative*" possibilities and will steer the direction of social and cultural conventions.

Smart technology was a feature across case study buildings and is implicated in definitions of sustainable office buildings:

"The staff tend to assume that the building is automated so it will do the work for them, in meeting rooms they assume that everything will switch off 'in a bit' so why bother turning it off. They leave on lights, air conditioning and plasma." (Carol, FM and building manager, organisation A, 2015).

Automation and smart technology is in evidence in the organisation A building. The building is automatically lit, heated, cooled and ventilated, controlled by the BMS. Sinks and hand driers

in bathrooms are automated with low flow flush. There is a focus on smart technology, however the 'set and forget' concept is widely reported as the above extract illustrates.

Capitulation to automated systems was widely reported. For example, BMS systems to control thermal comfort in organisation A building was designed with manual override to allow adjustment of windows, returning to automated BMS control at the end of each day. However, this override function was swiftly 'capped off'. The FM team reported the subversion of systems by employees and concluded: "*technology can do it better [control ventilation and cooling]*" (Carol, FM and Building Manager, organisation A, 2015).

However confusion around understanding the 'rules' of automated systems and manual control around systems impacting on effective working, specifically thermal comfort, lighting and noise was widely reported. This could impact on the performance gap as energy consumption may increase if such confusion around automation and manual control impact on competencies which hold the practice of effective working together.

The following extracts illustrate such confusion:

"It's annoying [automated systems]... what you'll find is if you're in a meeting room, I'll show you, you've seen the rooms here? The doors they'll automatically open if the building says it's too hot but you can't shut them so our payroll team can't pick up and move because they're fixed roles, not like you're in a meeting and you go, oh it's a bit chilly we'll just move around a bit or move to a different desk, they can't because they have fixed equipment and of course you can bring extra stuff in but they do get really cold. The temperature gauge isn't great, and in the winter, that's when I first joined, I don't know the full effects of the summer because I've not been here this summer but in the winter, ..." (Tracey, HR, organisation A, 2015).

"I suppose from an energy point of view, every room its habit you turn the lights off or open or close a window, its habit you... you might have had encouragement before but it's so in your face you know, the way they put stuff up so it is communicated clearly around making sure you turn lights off and plugs off." (Kate, Senior manager, organisation A, 2015).

“I’m not aware of where the light switches are in the hot desks, I’m aware that when I open the blinds up it’s a lot lighter so I’ll do that. I think there’s no process of changing the artificial lighting...” (Lawrence, IT, self-employed, organisation C, 2015).

“It’s the same with lights, people do all know if they have desk tops or lap tops, when the lap tops fully charged turn the charger off and unplug it. With desktops when they’re going home turn the screen off, unplugging and switching off all the sockets as well. We do checks as well, so we do go through the office and try and make people aware they aren’t following it. It’s all for the energy reduction in the building, in the meeting rooms all the air conditioning and TV are turned off and the lights do have auto dimmers, so if there’s no-one in there for 20 minutes the lights do dim and then go off. People should know to turn them off the second they leave meeting rooms, most do, it’s very occasional when you walk past and the lights on and there’s no-one in but I would say a lot of people follow it because they know they should be. There are signs in all of the meeting rooms about turning the lights off, energy reduction, recycling so it is all out there it’s just whether people follow it and I do think most people do.” (Carol, FM and building manager, organisation A, 2015).

“The other thing I guess that people notice, and when you’re new you notice but you stop noticing after a while is stuff like all the automatic windows and the heat control stuff when you’re in meeting rooms, when they start up without anyone touching them, they’re on those sensors, you sort of, you get blind to that stuff after a while but that is quite different and definitely different to anywhere else that I had worked before.” (Mike, HR, organisation B, 2015).

“There is normally the air conditioning on that we can change and the heating, we have got buttons in the room that we can change, you know the thermostat that we can press to change the temperature. I wouldn’t have known that when I started, just watching other people” (Susie, call centre, organisation B, 2015).

“I think the thing that frustrates me at the moment is because the controls on the windows have been overridden and they can only be in control of the meeting rooms from reception, the frustration at the moment, it’s increasingly common now to walk into a meeting room and it be really hot and stuffy because 12 people have just left and you just can’t open a window, you can’t do anything to get a blast of fresh air in there. So particularly if you’ve got visitors coming to your meeting, you’re really conscious about you’re making people walk into something that’s really smelly and unpleasant. There used to be sensors in the room, you pressed them and you could open them, but in some of the rooms that’s gone and you have to talk to reception and it’s just a faff...it should be really simple and it’s not.” (Kate, senior manager, organisation A, 2015).

This confusion with specific reference to ventilation of meeting rooms was widely reported:

“the small ones [meeting rooms] are the ones that sometimes don’t have any ventilation at all and so those little meeting rooms can get pretty unpleasant when you’ve done a day of back to back interviews. All you can do [open the door], the ones that face into the atrium, technically they’ve got natural light coming in to them via the atrium but it’s not a window to any fresh air but there’s not a window to any fresh air, so the cooling systems that are in the room, there a bit of a comedy... and no-one really knows how they work and you do that thing where you fiddle with them and it makes a noise but you’re not really sure it’s making any difference so I’m not sure they really make much of a difference or we’re all confident about how to use them. You’re inducted into that you’re told the lovely story... but we’re not actually sure how to use them.” (John, receptionist, organisation A, 2015).

The above extracts demonstrate the varied accounts provided by participants to the researcher in the context of semi-structured interviews, however, the observation process was also revelatory. The researcher noted across case study organisations, that whilst an awareness of automation and override was often reported, engagement with simple measures, for example, switching off lights, unplugging devices and switching off VDU equipment was rarely observed as the following field notes extract demonstrates:

'I have been invited to sit in on a marketing team meeting held in one of the ground floor meeting rooms. As we walk in, I note that the lights are already on, the large LCD screen is on with a blue screen suggesting it has been used but simply not switched off. A member of the team plugs in her laptop to upload a presentation, others reach to the floor to plug in their own devices. The temperature is cool in the room despite a large attendance (12 people in total)...once the meeting is over we leave the room. No-one turns off the lights or screens...' (Field notes, organisation A, August, 2014).

Dantsiou (2015) also concluded that competency and knowledge levels of individual users should be taken into account in designing behaviour change interventions, for example, an overly technical feedback system may assume a base level of knowledge of technical terms.

Initial scepticism around automated systems was also reported in organisation A resulting from problems with the interface between building and services. For example lighting systems are automated to adjust depending on daylight levels. In the evenings lighting will remain illuminated creating a pathway to the door, zones will remain illuminated for 15-20 minutes following activation. Local lighting controls can be used, dimming the lighting for around 20 minutes, reverting to automated settings after this period:

"It's [lighting] designed to be unnoticeable so the changes are subtle, but I don't think people believe that...they never think it's working..." (Jim, FM and office manager, organisation B, 2015).

However a growing reliance on and capitulation to automation of comfort and lighting controls was observed in organisation B, with few members of staff aware of the ability to adjust lighting manually:

"I never touch the light switches, I don't know what system I'd muck up..."

"There are hot days in the summer, but we wouldn't touch the windows, there's an email about that...we aren't allowed to open them before 12..."

“We have an air system here, there’s no way you can interfere with that...”

“I don’t know where any light switches are...I would never use them” (Field notes, organisation B, June and August, 2014).

This was also noted amongst ‘office champions’ who had been appointed prior to the office move to gain expertise around building systems and conduct tours for other employees:

“I was a champion and I didn’t know where the lights were...we didn’t think we had any control over them...” (Field notes, organisation B, April, 2014)

There is a tacit understanding that a level of competency is required to operate and exert control over comfort and lighting conditions in the building which could contribute to the performance gap. The World Green Building Council suggest that “putting trust in the occupier and putting them at the centre of design, including personal control over their indoor environment can reap rewards in terms of satisfaction, productivity and energy performance...” (WGBC, 2014). It was widely reported to the researcher that comfort and lighting systems were respected and that only expert employees controlled these systems. However, a degree of subversion of systems was observed as is discussed in the next section.

Employees across organisations were widely observed to demonstrate tacit understandings of regulating thermal comfort through clothing:

‘People wear short sleeve shirts, put on a cardigan to go outdoors, or hooded tops. There is an understanding of what clothing is required in and out of the office and therefore an understanding of the temperature expected within the office.’ (Field notes, organisation A, June, 2014).

“I always have an extra layer of clothing on the Monday because it would be quite chilly on the Monday because there’ll be no-one in the building on a Monday.” (Susie, call centre, organisation B, 2015).

“We are provided with fleeces and everyone knows that the building is like that, if you’re cold you should bring a jumper sort of thing. In the winter I put on extra layers and just deal with it [laughs].” (Kate, senior manager, organisation A, 2015).

“We tell them it’s a cardigan culture so they should all have something on the back of their chair. I know that’s more difficult when they’re hot-desking but they should have something with them because the building will fluctuate. There are various little hang rails around the building and people store stuff in them.” (Carol, FM and office manager, organisation A, 2015).

“...in colder months you notice first thing in the morning that it’s colder and we usually get a handy little reminder on web email that on a Monday morning, no-ones been in the building over the weekend, it’s not warmed up. So yeah, it’s not really a problem later in the day, I notice it more on a Monday. I always kick myself when I’m there and I think I haven’t got enough layers on, but then I think oh well I can just go and sit somewhere else because you work out which bits of the building tend to be cooler, even in the café I know where to sit to avoid being under the flipping air conditioning, if you sit near the window you know... you just get used to it over time.” (Kate, senior manager, organisation A, 2015).

“...sometimes they’re a bit cold and sometimes when we have a lot of people in them...normally the air conditioning on that we can change and the heating, we have got buttons in the room that we can change, you know the thermostat, that we can press to change the temperature. I wouldn’t have known that when I started, just watching other people.”
(Interviewee 4)

“I put a different jacket on a Monday, different set of clothes that you’d wear on a Monday compared with other days...everybody, everybody follows that, it’s known, it is cold on a Monday. So and of course I don’t know how they do it but it definitely is harder to flex the temperature up and down in this building. It’s lovely and light and airy and spacious but

nevertheless, the extreme it can be depending on what's happening outside I guess." (Sue, administrative support, organisation A, 2015).

In the context of confusion around thermal comfort, employees reported the requirement to work with the building systems to ensure effective operation and thermal regulation:

"Some people keep the windows open when I can 'no-one trusts the system' we should keep it shut and let the building do its work "let it do what it does". Every day I'm telling people to shut the windows, how the system works I remember from emails telling me to shut the windows or you can find that the building is stuffy by 5pm even if you have had the windows open all day. Sash windows [in old building] let a lot of air in, crazy hot/cold, if the cooler system breaks we are in trouble. In the old building we knew it was going to be cold so dressed appropriately "came prepared". If we are uncomfortable we give office services a call, Jim asked people to be honest about the building and let him know. I have emailed him on a few occasions but personally I always bring layers, I always have a scarf and a spare cardigan, I think a few people have layers, mostly the girls and more have changes of clothing because they walk in." (Field notes, organisation B, July, 2014).

Other participants, suggested very different knowledge and understanding of building systems:

"It's like going into a shop [the office], it warms me up/cool me down" (Field notes, organisation B, June, 2014).

'Discussing the link between outdoor and indoor climatic conditions, Paula in the business support department suggests "It's nothing to do with it [the weather] it's the air conditioning".' (Field notes extract, organisation C, August, 2014).

It was noted that discussions around comfort became more prevalent in more extreme conditions across case study buildings, for example, an external temperature of 25°C upwards or heavy wind/rain/snow provoked discussion, as could be rationally anticipated. However, **it was noted that clothing changed little within the office, adaptation to different**

conditions once occupants entered buildings was limited, this could contribute to the performance gap as expectations around ‘normal’ office attire is bound up with expectations of thermal comfort which requires energy use that may not have been anticipated at design stage. This is consistent with organisation A’s aim from design stage to develop a ‘cardigan culture’, relying on the competency of office workers rather than energy intensive thermal comfort systems.

7.13.2.5 Systems and infrastructure management

The management of systems and infrastructure was found to be implicated in the practice of effective working. One key element related to the handover of systems at completion or upon occupation. Organisation B, noted this was particularly limited and impacted on effective working:

“The handover of the building started now...and then finished now! The handover about how the building works from a design to the end user was poor to non-existent. We identified as an organisation, we moved from an old house to a commercial grade building, new build so it was a new capability we had to take on and we recognised that. Within our contract with our chemical and electrical we stipulated that training had to be provided. As the project progressed and various elements, such as electricals reached that phase of completion, whoever was on site, the installer, gave an overview of how that worked to whoever happened to be on site from organisation A. So, it was lucky that I was a PM and then took on the role as office services because I gleaned that information, but in a role as project manager. So instead of it being, the person identified for the running of the building and this is their team so let’s have a structured training process where there are handouts, guides or associated paperwork, that never happened, it was very much a.. I’m an installer, I’m not a trainer, from the fit out, this is how it works and if you’ve got any questions, well I can’t really answer any questions, because I’m an installer and if you have any questions well... I’m not really interested. So that was the handover.” (Jim, FM and building manger, organisation B, 2015).

“...if you’ve got a problem here, it’s not like you can just call a handyman. An IT guy is more what you need...it’s all computer stuff...” (Jim, FM and building manger, organisation B, 2015).

The importance of the building and its perceived complexity is evident in the creation of a FM department in organisation B, which prior to the move to the new building, did not exist. The FM reports that the office was managed by administrative staff with very limited or no experience of building services. The estates structure was established following the move to the new building which provided a catalyst for cultural change. The role of ‘office manager’ is now framed in very different terms, that of a technical and challenging post. However the FM reported problems linked to the lack of a prior established structure, as the project had not included the involvement of an FM from the outset, issues of handover and commissioning remained. As noted above, training on the operation of systems on completion was requested, however in practice this reverted to contractors and was insufficient. Adjustments were undertaken incrementally as the FM and team became more familiar with the system, establishing a working knowledge:

“...we’ve managed a 10% reduction in gas and a 6% reduction in electricity use from technical adjustments alone...” (Field notes extract, April, 2014)

The failure of building commissioning and handover is consistent with post occupancy literature discussed in chapter two and is implicated in energy use and the performance gap.

The management of systems and infrastructure in organisation C was understood in terms of alleviating responsibility:

“From a managerial perspective it does take the worry out from us, the management, they run reception, there’s 24/7 security which we didn’t have at the other place, and of course they deal with all the rubbish and deal with recycling and all of that kind of stuff so an element of it is taken away, the worry element. You pay for it but from that perspective it’s a lot easier here. And also lone working, because we move around a lot, occasionally we would have people

working in the dark in the office, so as a manager we've got lone working problems, but here you don't have that, there's a first aider on site and security." (Jules, marketing director, organisation C, 2015).

"Lighting is automatic, as soon as you walk through the doors into the hallway, they ping ping ping ping on as you go, so when I come in, in the winter, I'm usually the first one in on my floor and it's pitch black and likewise, and when you're working there, after a few minutes of just your fingers going, they all turn off, because they can't sense it.. it's all motion sensors, you just wave your arms about and they come on again... so they're not wasting electricity. When I'm at my desk, I think there's about 6 lights around our room, all 5 except for the one above me will go off, so I'm busy in the spotlight!" (Jules, marketing director, organisation C, 2015).

"I believe there is [someone I could speak to about thermal comfort] but to be honest I'm not really that bothered about it. The only time I've been bothered about it is when I've been in here, and it's cold, but I don't think you can change it, the temperature comes out of those useful pillar things, and I think they change it for the season and that's it, so yeah, I'm not too sure really." (Lawrence, IT, self-employed, organisation C, 2015).

Reception staff in organisation C have the capacity to adjust forum lighting and do so regularly. The role of reception staff extends to non-technical staff using judgement and requests to manage comfort and lighting, for example, adjusting lights on sunny or overcast days, deactivating automatic doors during high winds, adjusting heating during seasonal change, which is notoriously difficult (Field notes, organisation C, October, 2014).

The management of comfort in the central area is recognised as taking a degree of skill, given the fluctuating occupancy patterns due to the transient nature of many occupants. Resulting from the public/private integration of the central forum and meeting rooms.

7.13.2.6 Managing noise and interruptions

The management of noise is implicated in the practice of effective working and is related to health and productivity (Baron, 1994). Abbaszadeh et.al.(2006) categorised acoustic issues

related to noise from neighbouring colleagues talking, lack of privacy to conduct private conversations and noise from colleagues talking on phones impacting on productivity. Such issues are widely associated with office layout, and in the context of sustainably designed offices, the shift to open plan working (Bluyssen et.al. 2011; Newsham et.al. 2009). The following extracts demonstrate the strategies adopted by occupants to manage noise:

“...if I’m in early and I don’t have a meeting that starts till say ten when the café opens, the public café opens, I’ll go and sit there because fewer people will come and interrupt me and it’s like, if you take yourself to the café, it’s like it’s the organisations international sign of ‘I don’t want to be disturbed’ [laughs]. The public site opens at eight thirty and it used to be that the staff side opened at the same time and when they stopped that, for staff reasons which makes perfect sense, actually it was better, because there’s something about being on the other side where it’s almost like you’ve given that sign of ‘I’ve taken myself off to do something else’ so people don’t tend to come and find you...” (Kate, senior manager, organisation A, 2015)

“Sometimes I’ll just walk and go out the building, I’ll walk round the block or a I’ll do a lap round the shopping centre, just to not be with people at work, it’s not because they’re unpleasant or the environment is unpleasant, it’s just the getting a break, you know when I worked elsewhere and I had my office you would just shut the door and put up the do not disturb sign and that would do the job, so that’s quite different.” (Kate, senior manager, organisation A, 2015).

“The other day, we were down at the tea point and there was a presentation going on and they asked us to be quiet while we were just getting a cup of tea. Somebody was leaving or something, and they must have heard me and my colleague speak and they asked us to be quiet, we weren’t being very noisy, we were just getting a cup of tea! I personally don’t use earphones, but a lot of people here do have earphones on, a lot of people do that when they’re walking and cycling, I did notice the other day, it did catch my eye a lot of people, so it must be getting more popular, a whole bank of people with their earphones on and I thought ‘they’re

a social lot!'. I think it is probably the noise, if you've got to get on with something in-depth and someone you haven't seen before comes in and sits at the desk next to you, and they come in and their phones are on loud and you think 'it's really noisy'. Me personally, I do find that really hard when you've got to concentrate, a lot of the jobs are quite easy to just get through but when you've got to concentrate it is hard but everybody must find that, that must be why people do work from home sometimes." (Sue, administrative support, organisation A, 2015).

"...if we're focusing on getting contracts out, employment contracts, which you've got to get critically, because you've got to get legal documents out, or any other legal documents, they'll put their headsets on, you know, or earplugs..." (Field notes, organisation B, September, 2014).

Again, effective working requires the capacity to retreat from the open plan office in order to provide a physical barrier to noise and interruption, which has implications for energy use as discussed above.

7.13.3 Meanings

Working effectively	Materials
	Competencies
	Meanings

7.13.3.1 Role of the building – expectations and understandings

As noted above, occupants across case study buildings often reported perceptions of fully autonomous, highly technical building systems which were regarded as normal features within sustainably designed office buildings.

In terms of recruiting participants to the practice of working effectively [within the building infrastructure] meanings and understandings of 'sustainable rules' were also observed. Sue (second floor employee) described her own 'sustainability rules' and the ambiguous feelings of power she experienced towards her colleagues:

“I turn off monitors from my team at the end of each day, no one told them they needed to turn their screens off I ‘feel like a mother’ [I] don’t do it during the day if we’re at lunch, but it is visible energy use.” (Field notes, organisation B, May, 2014).

As noted in competencies above, occupant knowledge appropriate clothing to ensure thermal comfort has developed which is related to expectations of building temperature as illustrated in the extract below:

‘The temperature has dropped significantly and it is overcast and chilly outside, however inside the office there is little evidence of any change of season. Employees continue to arrive in summer attire and in the hot-desking area where I am based this morning, Misha has her desk fan on. This is a good example of meaning attached to the office, that working effectively involves understanding temperature expectations, which create a summer environment.’ (Field notes, organisation C, September, 2014).

Such expectations of thermal comfort associated with sustainably designed office buildings and implicated in the practice of effective working are relevant to the performance gap.

7.13.3.2 Noise and intimidation

Noise seems to be accepted or perhaps tolerated in the open plan environment across case study buildings, the expectation in organisation A was observed and reported as an expectation, and something to be managed:

‘At twelve pm people find spots in the atrium to sit and have lunch. Noise from the atrium is significant, however many people remain at their desks, heads down. No one actively complains about noise, though some are observed putting on headphones...’ (Field notes, organisation A, June, 2014).

Such an acceptance resonates with WGBC’s findings that *“...occupants are more forgiving and willing to work in a greater range of temperatures in a ‘green building.’* (WGBC, 2014,

p.5). Acceptance was reported to be acquired as occupants accepted limitations and ways of working:

“I found that quite difficult, the whole being on the phone and feeling like everyone was listening to you, if you’re new in post... I remember feeling very new and very nervous, and you do feel like everyone’s listening to you, especially for phone calls, I used to go and find a quiet room and do them in there cause you felt then no-one was listening to me. Now you just don’t care do you, in a good way, I’m more comfortable...” (Susie, call centre, organisation B, 2015).

Kate (senior manager, organisation A) however, described how the open plan environment could be intimidating and impacts on effective working in particular contexts:

“...whereas if you’re just in the atrium people look over to see if they can see you and often if people have done early meetings, if they book them in for 8/8.30 we’ll do them in the café because it just feels like a nicer way to ease yourself into the day, you can get a nice cup of coffee. It’s just being in a different environment, it’s just a change, something about being on the other side that feels slightly more informal, so every time I’ve had staff, they’ve had difficult things, there’s somebody in my team whose father died really unexpectedly last year and she had quite a lot of time off and she was coming back on her first day and she specifically emailed me and said ‘can I meet you in the café instead of the atrium, because I just need to ease myself back in gently’ and I think that’s sort of how people use that café space, there’s just something a bit more gentle about it, especially when there’s no members of the public, they don’t tend to turn up till sort of ten am.” (Kate, senior manager, organisation A, 2015).

7.13.3.3 Subversion

Subversion of systems was also reported. Despite design of office and initiatives described above to reduce paper used, there is still meaning attached to printing work and this work accumulates with the unintended consequence of impacting on natural ventilation systems.

Paper in office life

Dematerialisation has not been achieved in case study buildings. Paper is anchored in routines and practices in office work. Paper-based and digitalization have co-evolved, at present it is unlikely that digital will substitute paper. Administrative practices are shaped by the materials around which they have developed:

- Paper as a memory aid, bridging gaps between time and place e.g. train and office
- Verifying and backing-up – proving things have been done and checking they have been done correctly; don't trust IT, mistakes happen, you need a hard copy.
- Social co-ordination “I could send the same thing by email but then I would need to explain it anyway”
- Anticipatory practices – getting ready for a task in the near future, meeting minutes, agendas
- Stacking up of paper, visual organization of tasks, structuring work.
- Modelling practices, how has a job been done in the past?

In understanding how paper is implicated in office life and energy consumption issues associated with printing, scanning, copying and shredding, the potential to reframe the issue of paper use is revealed.

Whilst policies and initiatives are in place to discourage resource use, there are many instances of subversion. As discussed in section 7.14.2.2 participants reported a respect for automated systems, however this was observed to be subverted:

‘At 10am the hot June day is increasing the ambient temperature. Stuart, who I am sitting next to in the business banking section this morning leans over and opens a window “I’m not meant to do this” he tells me “we’re supposed to ‘leave it to the system’ (he uses air quotes to demonstrate his disdain) it’s ridiculous though, we’re roasting.” Across the desk, Kathy whispers conspiratorially “You’d better hope Jim [FM] doesn’t catch you...” (Field notes, organisation B, August, 2014).

Underlying meanings of rebelling against systems and scepticism around automation are revealed. This can also be considered to link to the semantics used around the office, there is a 'school assembly' once a week, rules are considered overzealous.

Subversion was also observed in printing practices. Whilst the policy in the organisation was the use of swipe cards and 'follow me' printing, in order to monitor paper use, the researcher observed employees overriding this system, requesting more junior members of staff to undertake their printing.

It could be posited that the paternalistic approaches to energy use in the building result in unintended consequences of subversion and result in little change in demand and consumption patterns.

7.13.3.4 Expert knowledge

Some meanings around expert knowledge of building systems were also noted during the research period. As discussed above, the FM team developed a level of expert knowledge incrementally in organisation B to understand the building services systems which was applied not only in technical management but also in more instinctive manners:

"I get a gut feel for occupancy that drives how I manage the temperature. I know the second floor is south facing, there are solar heat gains, the ground floor is north facing so cooler...there's a spread of cold down here, warm up there... in the summer I aim to keep a similar temperature indoors as outside...no major step change...but it's a gut feel..." (Jim, FM and building manager, organisation B, 2014).

Building complexity was also raised as an issue post completion in organisation B. New building 'champions' who undertook tours of the office for staff, were briefed to a limited extent:

"...we gave them a discretionary level of information, it was a lot to take on... the building is too complex for people without a technical background" (Jim, FM and building manager, organisation B, 2014).

7.14 Implications for the performance gap

This section has analysed the practice of effective working, deconstructing the practice by applying a social practice approach. Key findings are summarised below:

1. Working effectively implicates energy consumption through the use of multiple electronic devices. Patterns of consumption facilitated by building technology and infrastructure have enabled effective working for office workers to evolve in this form. The increased use of ICT devices in the workplace has implications for energy demand and is relevant to the performance gap;
2. Effective working involves the use of ICT equipment, which is frequently supplemented by other electronic devices. This has implications for energy use and could contribute to the performance gap;
3. Effective working is associated with the ability to retreat from open plan offices and seek physical barriers to noise and interruption. This is of relevance to the performance gap as the reality of occupying office buildings differs from anticipated use. This may impact on energy use as the configuration of case study office buildings changed over time and could contribute to the performance gap;
4. All case study buildings were found to adhere to BCO standards. Such adherence impacts on potential issues of overprovisioning and may contribute to the performance gap, consistent with existing research (Cass *et.al.*, 2016);
5. Behaviour change initiatives undertaken to reduce energy use related to the practice of effective working relied on cognitive approaches. Findings support earlier discussions of literature around the limitations of behaviour change initiatives as a means to reduce energy consumption and improve building performance, which may not achieve savings required and therefore may impact on the performance gap;
6. The inconsistency of office building induction was observed across all case study buildings as office workers demonstrated varied levels of understanding of building

systems, leading to subversion of systems, which may contribute to the performance gap;

7. Office workers were found to display confusion around 'rules' of automated systems and manual control of building systems, and levels of competency required. This could contribute to higher levels of energy consumption and the performance gap;
8. Building commissioning and handover was found to be inconsistent and inadequate in case study buildings with implications the practice of effective working and subsequently for energy use and the performance gap;
9. Understandings of thermal comfort were implicated in the practice of effective working and the provision of 'normal' conditions could contribute to energy use and the performance gap; and
10. Paternalistic approaches to energy use in case study buildings were found to have unintended consequences of subversion and result in little change in demand and consumption patterns.

The practice of working effectively, as conceptualised in the previous chapter, is closely linked to the practice of taking part in office life, which is analysed below. Working effectively provides a suite of practices surrounding requirements for undertaking contemporary office work. Key material elements implicated in this practice are the building systems and technology which provide 'comfortable' temperature ranges. From a practice perspective the convergence, or non-convergence of elements can be held to lead to the recruitment of practitioners to the practice of working effectively. Materials are provided through technical building systems, which are centrally controlled by facilities teams to provide temperatures which are considered, and enshrined in regulatory frameworks and guidance, to be comfortable (Shove *et. al.* 2003). Competency elements are reflected in levels of system understanding; some occupants have received training or information about the system and understand that they should not open windows for example in organisation A. Tacit rules can also be noted, some employees follow these 'rules' bringing in layers to respond to variations in temperature.

Meanings around technological innovation also form part of this practice, suspicion and mistrust associated with new technology were observed and reported. This reveals the complexity of recruiting carriers to a new practice, and thus the contended insufficiency of simply filling a perceived information deficit (Burgess *et al.* 1998). For example, an email was issued to all employees explaining the operation of the building systems in organisation A, only some office workers were reported to have been recruited to this new system. Negative meanings associated with technological innovation and lack of awareness of tacit rules contributed to prevent the recruitment of many carriers of this practice. Frustration around adoption of technology and building systems was also observed, resonating to some extent with negative meanings of technological innovation, but also with notions that technology is for the few, not the many.

The meaning of 'experts only' was observed and noted at many levels. Whilst some employees maintained the lack of understanding was personal reluctance to learn the system, in other words, laziness, others spoke with greater trepidation about the building systems. In order to work effectively within the building, therefore, it could be held that employees must be comfortable, in order to maintain comfort, there must be knowledge and understanding of how the building systems work, and those systems must work effectively. However, meanings and understandings of sustainable buildings are also important to note here. It was observed and noted by many employees that widely held perceptions of fully autonomous, highly technical buildings were prevalent.

There is an element of potential over-provisioning in seeking to respond and provide effective working conditions. A wide range of working styles are provided for supported by effective working conditions, for example thermal comfort and lighting, to accommodate *any* potential occupant. Such a range of provision may not be used to the extent anticipated. For example lighting in kitchens is excessive, meeting room motion sensor lighting is left illuminated long after employees have departed.

Design of offices to meet aesthetics and technical expectations are in line with market norms. Cass et.al. (2016) describe a focus on “*delivering bright, airy open spaces, i.e. a ‘blank canvas’ which is flexible for any use...*” (p.3). Lettability, drives aesthetics and high specification fit out, impacting on designing-in sub-optimal energy performance. For example Cass et.al. (2016) cite higher solar gain from heavily glazed areas or energy consuming lighting. Market standards, argue Cass et.al. (2016) have evolved into a “*form of tradeable currency*” (p.4).

Speculative development is associated with the concept of flexibility, speculative office developments aim to provide form, fabric, structure and environmental services which are capable of accommodating diverse tenants and are implicated in the practice of effective working. Changing market structure, including shorter leases, have contributed to this over specification, designing for “*...the worst case scenario rather than need.*” (p.4).

The following section of this chapter will consider the practices of taking part in office life and implications for energy use and the performance gap before reflecting on the research process.

7.15 The practice of taking part in office life

“It’s funny, you don’t have to work in an office anymore, but people seek this out. I feel it should be a more fascinating and shocking thing, that people are paying for office space. It shows one of the essentials of office life, that it’s social and cultural and building relationships.” (Nikil Saval, Dwell, 2014).

The WGBC (2014) contend that in modern offices, it is not merely work and task driven spaces which impact on productivity, but also social and breakout areas:

“Places for staff to congregate socially and relax, and not to disturb or be disturbed by directly by the working environment are vitally important. They help to drive a cross-pollination of ideas, employee engagement and foster a sense of community, which can serve to strengthen a company’s culture, or its ‘organisational ecology’.” (p.18).

A shift from autocratic and paternalistic working environments, to more autonomous working styles is reflected in the practices of flexible and collaborative working discussed above. However, sustainably designed offices also embody new materials, competencies and meanings around what it is to take part in office life. It has been posited that the increasing amenity and domesticity integrated into modern offices is linked not only to health and well-being but also in response to the rise of home or third space working (Campbell, 2015).

Campbell (2015) categorises office working tasks into “‘work’, ‘share’, ‘source’, ‘show’ and ‘refresh’” which may be undertaken in a typical working day, noting the implications for building design “*Designers are...creating spaces that can facilitate all these activities, as well as rest and relaxation – sometimes with a multi-functional brief.*” (Campbell, 2015). The following sections will consider the deconstructed elements of the practice of taking part in office life within case study buildings, before considering implications for resource use.

7.15.1 Materials

Taking part in office life	Materials
	Competencies
	Meanings

Taking part in the practice of office life in organisation A requires both an understanding of the organisation and of the building itself as discrete from the more traditional existing stock of office buildings. One of the recurring themes from both observations and interviews is the variety of users in the building. The building is occupied and used differently by a range of occupants:

- Administrative employees
- Managerial employees
- Permanent contracts
- Temporary contracts
- Flexible employees
- Visiting employees

- The general public

The scope of this research does not extend to general members of the public, cleaning and catering staff and retains focus on the professional side of the building: office workers and associated contemporary working practices. This point notwithstanding, the implication remains that the office must accommodate and address the needs of a wide variety of users, who are occupying the space for different tasks and from different social contexts.

The material forms implicated in this practice are distinct within case study buildings, yet some commonalities associated with normalised provision of sustainable office buildings were noted. All case study buildings were designed with break-out areas and informal social spaces. In organisations A and C much of this space centred around the atrium space which formed a key feature. As Faulconbridge *et.al.* (2018) found in their study of commercial offices ‘lobby’ or reception areas such as atria were held to be highly marketable and essential features of sustainably designed offices.

Organisations A and C also provided café facilities which were a central feature of office life, aligning with the rise of the ‘coffee shop workplace’ (Andrews, 2014; BCO, 2014). Both organisations also included outdoor spaces, within the building footprint, in the case of organisation A, which were equipped with seating areas and some sporting equipment.

All case study buildings provided desks, chairs and ICT equipment discussed in section 7.13. Understanding the competencies and meanings required to take part in office life, enables wider understandings of the implications for energy use and the performance gap.

7.15.2 Competencies

Taking part in office life	Materials
	Competencies
	Meanings

7.15.2.1 Systems, rules and tacit understandings

Observations and interviews revealed different levels of understanding of the case study buildings, including functions, tacit and explicit ‘rules’. For example, it was observed that many

of the more transient staff members in organisation A, used the available touchdown points and hot desks as a base to store belongings while attending meetings. However, it was frequently observed that such storage included plugging in of laptops and mobile phones which were left on charge throughout the day, demonstrating excessive use of small power loads.

Practices of flexible working, led to the establishment of informal routines which were observed to mirror conventional working styles as the following extracts illustrate:

“Because we’re hot-desking we’ve arranged in sort of team zones, the thing about that is there’s sort of a home location where I know my guys will be, I’ll zip in and make sure they’ve seen me and I’ve seen them, not to check up on each other but just to say hello.”(Kate, senior manager, organisation A, 2015)

“We eat together at lunch time, we try and do a social on a quarterly basis, we go out to lunch off site, sometimes we’ve actually had breakfast here. Sometimes using the café, sometimes not.” (Jules, marketing director, organisation C, 2015).

“When we arrived here, we weren’t arranged by department, but we’ve naturally fallen into those seating arrangements...” (Field notes, organisation B, April 2014).

Rules around the flexible working space and modern office environment were widely publicised in organisation C:

“A ‘Welcome to organisation C’ flyer is placed on each table around the forum. It advertises Wi-Fi access “Speak to reception to get a permit and Wi-Fi Access Ticket”, “Chilling out? Enjoy a coffee and snack from the café and catch up on local and business news with complimentary newspaper/magazine from reception” “Need a meeting room? We have the facilities and technology for six to sixty people. Ask at reception for more details.” It is also noted “...if you have enjoyed your visit today, please tell others, if you are tweeting, use [handle].” (Field notes, organisation C, August 2014).

The in-house café is central to the forum, providing refreshments to support informal meetings. However, the resource use within the café was contradictory:

'The café markets itself around the principles of sustainability, serving "organic, local, seasonal and ethically sourced produce" (Café marketing on-site), however coffee is served in disposable cups with plastic lids. Clearly marked recycling points are located in the Forum, but I regularly notice the cups dropped into 'landfill' bins...' (Field notes extract, September 2014).

Whilst organisation A is located next to an outlet centre with many restaurants and cafés, there is a proliferation of packed lunches filling the fridges at tea points, free tea and coffee is on offer. The office is somewhere you stay. Facilities are provided to encourage employees to remain within the office and this is linked to productivity.

Members of staff based in the building used laptops and docking stations at desks, this suggests **a blurring of the lines between work and home, the transfer of energy use from the workplace to home. The domestication of the workplace here is relevant to the performance gap.**

7.15.2.2 Initiatives

A number of initiatives were observed and reported in case study buildings, which inducted or promoted the taking part in office life. Inductions to organisation A building included both practical orientation but also a sense of indoctrination into the ethos of the building and its links to the organisation. Building tours are undertaken by volunteers to the charity and the general public are also invited to attend tours. New members of staff encouraged to participate as the following extract illustrates:

"My first day on site, and Sue has arranged for me to attend one of the building tours, guided by a volunteer. She notes that the information regarding how the building works "isn't quite right" but the enthusiasm for the building is great." (Field notes, organisation A, April, 2014)

Organisation A established workshops to encourage energy and waste efficiency, however attendance was not high: "...we sat out in the main atrium for two hours, the only person who came to the energy one was one of my people, and only the waste advisor came to the waste workshop. They're not interested." (Carol, FM and office manager, organisation A, 2015).

There is a sense of disconnection between staff and FMs who are directly involved in building management and resource use. Such disconnection may impact on energy use and the performance gap, where office workers do not engage with required competencies to take part in office life.

Organisation B aims to be strategically aligned with 'likeminded' organisations. This includes involvement in regional initiatives such as Forum for the Future and Green Week. Both initiatives aim to promote sustainability within business, organisational and individual levels. During Green Week a number of initiatives are run to encourage employees to engage with organisational ethos:

"It is Green Week and office initiatives are running to promote this and the organisation itself as sustainable. Staff have attended lunchtime screenings of 'blue economy' videos. Green Week provides different themes each day for staff. Each member of staff is given a challenge sheet and a prize is given for the employee with the most points. Points are awarded for travel to work, printing and paper use...The green team have also been appointed. Five employees have volunteered and the FM has decided to take one topic at a time and concentrate on it as a team." (Field notes extract, organisation B, September 2014)

Initiatives in place in organisation C, support the collaborative practices encouraged in the building whilst supporting understandings of office life:

"We have tenant events once a month where tenants will get together and it's an opportunity to network, if we've got anything that's important/relevant for them to know, we will let them know at that point so for example we had a textile recycling bin put in and we communicated that, when the electric cars moved over to being managed by co-wheels we had that

communication made at the tenant event so that we had the whole audience that was going to be relevant in place. It's not compulsory for tenants to come to the events, but most of them will come, we provide the food and drink and they provide themselves. It's a good way of them making contacts and it's a good opportunity when we've had new tenants coming in it's a good opportunity for them to meet them, their neighbours along the corridor. That's what the whole idea of the building is, to make those connections that likeminded businesses that won't necessarily be able to make if they were in a standard office.” (Rodney, organisation C, 2015).

7.15.2.3 Breaks and eating

The provision of social space within sustainably designed offices is associated with increased group cohesion and job satisfaction (Lee and Brand, 2005). Moreover, as noted above associations with productivity and innovation are also implicated. Material artefacts and infrastructure support the practice and contribute to understandings of office life in sustainably designed buildings. It was observed that social spaces were well used, with occupants taking regular breaks and remaining in the office over breakfast and lunch periods.

Understandings of the rituals which make up everyday office life are also implicated in resource use, for example, the morning routine of coffee and chat at the tea points and in cafés was observed across case study buildings. This was particularly evident in organisation B where a more structured routine of breaks was in place. Such structure was actively encouraged as part of wider well-being strategies within the new office:

“We have a legacy problem of people eating at their desks and still tapping away on the keyboard so not actually getting a break. We're concerned for their wellbeing as well as our health and safety obligation. We deliberately designed the fourth floor to be the main rest area, so we put a free vending coffee machine to encourage people to go there. It's the only space in the building where you can heat a meal. We recognise that not everybody would like to do that or has time to do that so on every floor we have provided a tea and coffee facility with tables so you can move away from your desk and then go and eat... just have that break away from your desk area.” (Mike, HR, organisation B, 2015).

Such facility provision was observed to be widely enforced and accepted within organisation B. **The scheduling of breaks throughout the day was observed to create peak moments of energy consumption and may contribute to the performance gap.** This structure was not observed to the same extent within organisations A and C. It may be posited that this is indicative of the more commercial nature of organisation B, a private bank, as opposed to more public facing organisations.

The scheduling of breaks and eating in organisation A was observed and reported as more ad hoc in nature, although peak use of the café was noted between twelve and one pm. However, whilst many occupants used the café area, there was evidence of employees continuing to work in spite of strategic organisational aims to promote well-being and productivity:

“You wouldn’t believe it if you walk round this building but people are not meant to eat at their desks, we discourage it. Because they should take a proper break, then they’ll be more productive. If you don’t take a break then you won’t produce anything at the other end of the day. Even if you just come down here (atrium) with a friend and have a sandwich, that’s still a break. I think it was fairly rigidly enforced when we first moved in but it seems to have slipped, everyone seems to eat at their desks now. It isn’t good for you, you don’t switch off.” (Tracey, HR director, organisation A, 2015).

7.15.3 Meanings

Taking part in office life	Materials
	Competencies
	Meanings

7.15.3.1 The domestication of office life

The evolution of the meanings of office working is bound up with the design of sustainable offices. One key trend noted in chapter six is the increased socialisation and domestication of the workplace (Gillen, 2014). Whilst the emergence of flexible working trends removes the

capacity to personalise workspace, paradoxically a trend of domestication has emerged (BCO, 2014).

Organisation B actively encourage employees to socialise, drawing together professional and personal lives:

“We have a social committee and they plan social events, we had a picnic in the park for Green Week and we’ve got a running club that go out in the lunchtimes, we have a bbq at the end of the month which is free of charge. The social committee have a budget, those are the kind of social aspects.” (Mike, HR, organisation B, 2015).

“We gather in the point, during the lunch times, we take the chairs out and we have a table tennis table which is well used, people with inner children go up and play on it, there’s also a foosball table, we do yoga sessions in there as well in the lunch times ,we also do a meditation session, a mindfulness session in the afternoons and we also host events in there so collaborations with other organisations and business, so soil association, board meetings, AGMs product launches – where we have aligned partners. It has an impact on the rest area if it is all day, there will be food and people will come out. We think about the impact hosting that event will have on our co-workers, impact on lunchtime...so infrequently if we think it is getting a bit much, one day a week, that’s a bit too impactful on our people.” (Jim, FM and building manager, organisation B, 2015).

Organisation A also promote social events:

“We have a social page on the intranet...I’m the page owner, I must add pilates. Some of them [social events] take place here, a lot of them take place at the local leisure centre, there’s a badminton club. Some of them take place in public spaces, so there’s a softball, football, cricket team that play with other organisations...Things like Zumba are here, we start at 5.30 and they know it’s happening at 5.30. It’s loud and if they don’t like it, then come in a bit earlier and leave a bit earlier. Some of them do just like the music. They can find out about it on the intranet, hopefully told about it on their induction.” (Carol, FM and building manager,

organisation A, 2015). A number of other social initiatives were noted during the observation period as the following extracts illustrate:

'The marketing team are discussing the office gardening club, they enjoy getting outdoors and growing produce which is then used in the café. The club appears to enhance both the domestication of office life and promotes the message that health and wellbeing are valued by the organisation.' (Field notes, organisation A, July, 2014).

'It is Tuesday lunchtime and a group of men and women meet at the exit, dressed in fitness wear. This is the office running club. It is an inclusive club with beginners and improvers catered for with more experienced runners leading. Anne (the run leader) tells me it is possible because of the facilities in the building – drying rooms, showers, lockers. (June 2014).' (Field notes, organisation A, August, 2014).

The above extracts illustrate the means by which practices of taking part in office life are increasingly linked to activities which would have conventionally formed part of employee's home lives. The infrastructure of the building and understandings of work culture have shaped the practice of taking part in office life.

Occupants in organisation C, reported a collegiate atmosphere which was part of office life:

"...because it's science and technology driven, we get so many people linked to universities and that's why it does have quite a college feel to it...we're a design agency, we'd never wear a suit or anything so we couldn't go to somewhere that was too corporate, we would just drown in that..." (Jules, marketing director, organisation C, 2015).

"...it is like living with a bunch of students, they're messy as anything... I think they've just come straight from University and just think mummy will clear up after them... other people use these facilities notes...and wanted posters, when someone nicks someone else's mugs... we've lost our mugs all the time..." (Julie, HR, organisation C, 2015).

“I’m a small business, actually to feel part of something bigger is quite nice, you know, a nice feeling and you can expand and contract within that but it doesn’t really... if you did it and you’re outside, in my old job, old office, and you expand and contract, it would be even more noticeable in a way, this way you can just, it’s a lot freer and it’s just nice, you walk in and ‘hi, hi’ you feel part of a much bigger organisation.” (Lawrence, IT, self-employed, organisation C, 2015).

Informal dress was observed across case study buildings, although a degree of formality was observed in organisation B. However, paradoxically this represented a shift towards professionalism for the organisation:

“Physically the building is immensely different, we took the opportunity to get rid of some of our legacy issues – we have created coffee machine moments, open plan space so there is that integration. We’ve also changed the dress code policy, you might think it is casual at the moment but it was much more casual before... you know where shoes were optional...so it helped us to make a step change in the way that our organisation was growing. In the eyes of our regulator, we are a medium size bank, we have just achieved that recently. As we have just come to a commercial, grade A office, having to wear shoes, be at our best, it’s given a different feel. It makes us feel like a medium size bank as we are on the balance books...professionalism is the right word. It’s something that I notice, I arrived shortly before the move and I’ve always worn suit and tie. As I wandered around everyone was sort of looking at me like I’m out of place or like I’m some kind of inspector and now has helped to change how we view ourselves and how it feels. It feels more professional and people feel more confident to engage with other departments, you haven’t got to knock on the door, walk in the door and everyone looks at you. What are you doing? You’re walking past or you’re seeing them a lot more.” (Jim, FM and building manger, organisation C, 2015).

The nature and flexibility of Organisation C, with the main Forum area open to the public daily, also supports the desire to integrate into the local community and encourage informal collaboration with neighbouring, likeminded organisations. The café is open to all, and it was

observed that neighbouring occupiers made use of the café and forum during lunch hours. At times, this was clear as branded clothing was worn.

The changing nature of the practice of taking part in office life draws together professional and personal aspects of the lives of office workers and therefore many of the practices which would traditionally be associated with domestic life are carried into the workplace. This demonstrates not only the dynamic nature of the practice of taking part in office life but also draws out implications for energy use and the performance gap.

7.15.3.2 Belonging to the organisation

Meanings around taking part in office life also extend to belonging to and identifying closely with the organisation. The language used by employee's often denoted implications of indoctrination into the organisations. For example, in organisation B in order to be an employee and take part in office life, you are required to be 'initiated' and part of this initiation is linked to the physical attributes of the building. Importantly, this can be held to be linked to the organisations business model, its market differentiation situated in its ethical commitment to sustainability. To occupy a building which was not demonstrably sustainable, and to fail to communicate these key messages to employees could undermine corporate branding.

Employees in organisation B are provided with documentation to enhance their understanding of both the company and the building. The induction pack, places the building itself at the centre of organisational identity; it is a tangible demonstration of a collective commitment to sustainability.

The physical layout of the organisation B building, supporting open plan working, was widely reported to reduce hierarchical barriers in line with organisational ethos, for example many participants reported regularly having contact with the Managing Director, who was less visible in the previous office building. Such a suppressed hierarchy, reflects organisational ethos to promote a more equitable culture. The Monday morning meeting for all staff in the office,

hosted by the managing director, was regularly referred to and was a key symbol of identification with the organisation for employees. It was framed in terms including: “a get-together”; “a catch-up”; “a chance to collaborate”; and “a school assembly”. During the observation period, it was noted that there was an element of ‘roll call’ and accountability embedded within the meetings, with each team and department presenting an activity and providing a swift overview of weekly targets and any significant business and an open forum for co-workers to ask questions directly to the managing director, as the following extract illustrates:

“...those questions are answered, it’s quite an open atmosphere, they can be challenging questions, not just a patsy type question. We have that opportunity for a business point of view.” (Jim, FM and building manager, organisation B, 2015).

The company ‘verse’ was also recited at every meeting a clear symbol of organisational ethos which was bound up with the occupation of a sustainable building and the integration of sustainable behaviours:

*“The healthy social life is found
When in the mirror of each human soul
The whole community finds its reflection
And when in the community
The strength of each one is living.”*

Participants also reported the close connection between organisational culture and the office:

“Here sustainability is promoted as part of the organisation this was not the case where I worked before in the private sector, it is embedded in the organisations culture and actively promoted in the office.” (Dan, business development, organisation C, 2015).

Pride in occupying sustainably designed buildings was also reported, for example in organisations B and C:

“It’s quite pleasant, it’s a very nice place to work, it’s not noisy, I don’t work on a busy shop floor, I don’t work in a factory, it’s a nice, on the whole, nice, clean, pleasant supported environment to be in. It’s a nice place to be, I still love it when visitors come in for the first time and they go ‘oh my God it’s great’ and you think ‘yay!’” (Kate, senior manager, organisation A, 2015).

“I love it, I think it’s an amazing building, it’s nice to come to work, they need to do more of these I think. People like the atrium and I think, have you seen the offices?” (Jules, marketing director, organisation C, 2015)

This was also demonstrated in the following observation extract:

‘Upstairs a man who uses the building regularly as a virtual office but does not have a long term lease, is having professional pictures taken by a photographer. He explains this is for his linked in profile and website, he had to request permission as photos in the building are not usually permitted.’ (Field notes, organisation C, October 2014).

Pride and value in the building were described as bound up with office life:

“What this place gives for me is what I was looking for... a non-formal, open, creative environment and that works for me...I think a lot of it is coming from the design of the atrium...the trees...it does work...I’d say it was a happy place to work, you’ll always see people laughing and jolly. I think people like coming to work here. It’s a very constructive, positive environment, you feel that things are being created that there’s value being added that there’s some quality work going on and therefore I feel like I’m doing quality work. It does have that feel of quality, it wouldn’t work if this were an older building I don’t think that would happen. It feels like there should be some really good stuff going on here...I wish I knew a bit more about what that was...people need to feel the buzz from our successes, the organisation needs to do that. Valuable and therefore valued as a building” (Lawrence, IT, self-employed, organisation C, 2015).

However, in organisation A, some conflicting accounts were given. These centred around conflict between a traditional, heritage based organisation and the modern, sustainably designed office, as the following extract illustrates:

“...[the building] is not the organisation, it’s not the organisation... it’s a lovely building and I do love it but it’s not the organisation it gives you a very false impression of the organisation if you don’t go out and understand... There is a contradiction of modern building and heritage nature of organisation, the link between building and organisation is contradictory – the building as a symbol for the organisation can be confusing.” (Carol, FM and building manager, organisation A, 2015).

This extract demonstrates the **powerful meanings associated with the occupation of a sustainably designed building**, and there is a suggestion that the **disconnection between organisation and ‘cutting edge’ building impacts on the practice of taking part in office life, creating confusion in organisational identity. Such confusion may hinder engagement with the sustainable office and its systems and design features impacting on energy use and the performance gap.**

Disconnection was also reported in organisation A in terms of hierarchy. Whilst the building design aimed to support a flat hierarchical structure, with all employees visible, equitable and therefore participating in office life, a disparity in integrating employees into the organisation and building was reported:

“If you are senior management then you get a three month induction and you’ll go round the country and you’ll get a real feeling of belonging, but if you’re working in admin you’re lucky if you get shown the tea points...” (Sue, administrative support, organisation A, 2015). It was also observed that occupants reporting a connection with the organisation, demonstrated a stronger engagement with the building:

“So my induction plan was planned for over a 6-week period so obviously that means meeting the exec and loads of people, then there was an office induction... I met a number of people,

so that works, then you have online training things like fire safety those sorts of things which you've got to do within a certain window...I got the ethos of the organisation, the ethos of the building...I get what to expect, you know, dealing with the temperature, turning lights off..." (Tracey, HR director, organisation A, 2015).

"...the only difficulty I had was that mine [induction] wasn't set up until, nothing to do with Carol [FM] or anyone else, just the way that it went... mine wasn't scheduled until 2 months in, as in I'd had an induction and a tour of the building and it was explained but the formal half day induction wasn't until after I'd been here sort of 2 or 3 months so actually I was like there's no point in me doing that because of the role I was joining, I'd already had to meet most people flittering around the building but the actual induction does explain, this is the carpets we have, and this wool, and this is why you know, absolutely...I sort of found my way as in how to work things..." (John, receptionist, organisation A, 2015).

7.15.3.3 The old office

Whilst the practices of taking part in office life and working effectively are tied up with notions of professionalism and organisational identity, this change is linked both to the material features provided by the building and also to the intent of the company to present a more professional image.

Another key focus around the move to the new office was to mirror the values of the organisation which would be embodied in the occupation of a sustainably designed building. Meanings of organisational ethos and the buildings' place within this were very clearly demonstrated and understood. Co-workers were proud to work for the organisation and to occupy a prestigious building, a visible demonstration of a commitment to sustainability. However, there were also some more confused accounts around the role of co-workers within the building and understandings of the impact of their own practices on energy consumption. The focus of such confusion was often around comfort in the building. Many co-workers had some awareness of building systems and the importance of energy efficiency, however there

were varied accounts of the 'rules' understood around their own ability and competency to control the building.

- *"The old building was drafty, you had to wear layers, here I put in a call to office services if I'm uncomfortable"*
- *"In the old building, you knew it was going to be cold so you came prepared, here you can call office services"*
- *"I don't trust the system, I open the windows..."*
- *"I tell them, 'don't open the windows' let the system do it's bit, we have to...but it can get very stuffy by the end of the day"*
- *"How many ways can you tell people to close the windows? They just don't understand how the system works"*
- *"It's a cold building"*
- *"I prefer to sit here, not directly under the air conditioning"* (Field notes extracts, organisation B, April-November 2014)

Many other participants reported a comfortable building, where temperature was consistent. It was observed that many co-workers dressed in light business wear, a contrast to the more casual dress of the previous office, and whilst some retained the adaptive practice developed in the previous office, there was a level of expectation around building capability and meanings associated with the comfort provided by a sustainably designed office. Many participants found the technical aspects of the building unclear, and as seen above some 'mistrust' of the systems was reported.

Such confusion was also reported around lighting in the building:

- *"You can't control any of the lights here"*
- *"you just have to accept that the lights are on in the middle of the summer when you don't need them"*

- *“I don’t know where the lights are...I did try and find out but I thought I wasn’t allowed to touch the light switches”*
- *“the lights are automatic here, I never use them”*
- *“I know we can turn off some lights, I’m just not sure which ones, so I tend to leave them so I don’t mess up the system”* (Field notes extracts, organisation B, April-November 2014)

There are expectations around the practice of taking part in office life which are perhaps drawn from practice trajectories, over time contemporary office life has evolved to the extent that employees have distinct expectations of highly controlled environments which has implications for energy use and the performance gap (as noted in section 7.14). Such expectations inform tasks undertaken and attire worn: the work is very sedentary yet light clothing is worn at all times, an expectation of a stable, consistent temperature as was noted during observations:

“Outside the rain is pouring down; it feels like winter although we are in early summer. I can see people walking along the pavement, wrapped up in thick coats and scarves but inside there is an array of short-sleeved shirts, light trousers and summery dresses but nothing to denote an exceptional change in temperature. It might be cold outside, but in the office summertime goes on...” (Field notes, organisation C, October, 2014).

Taking part in office life across case study buildings was reported to require both an understanding of organisational ethos and of the buildings occupied, as discrete from more traditional existing stock of office buildings. Observations and interviews revealed different levels of understanding of the building, its functions, tacit and explicit ‘rules’:

“The work life balance is valued, you get the sense it matters. In a more corporate environment, people wouldn’t notice that you weren’t taking lunch, working late, working through your lunches, that’s part of the job, unwritten. Here the culture is geared towards looking after yourselves as well as working hard. Same with holidays, I couldn’t imagine getting

to the end of the year and having 20 days holiday still to take. It's almost the noticing...here they would notice. The size of the organisation helps, you're less anonymous, and the culture also is very much, wellbeing is quite important. This is an environment that's not driven by a bonus culture, here most people, I don't think people work here for the money I think they work here for the love of the job." (Mike, HR, organisation B, 2015).

"We want to shout about the building, we want to show we practice what we preach" (Field notes, organisation C, August, 2014).

7.16 Implications for the performance gap

This section has provided a discussion of elements of materials, competency and meanings which converge to form the practice of taking part in office life. Shove et.al. (2012) note, the dynamic transition of elements of practice and the impact of those elements in shaping evolving practices, makes it useful to consider elements in isolation, whilst this does not privilege individual elements over their role in practices.

Having deconstructed the practice, key implications for the performance gap emerging from the data are summarised below:

1. The practice of taking part in office life encompasses a domestication of office work. A blurring of the lines between work and home was found in case study buildings, with the transfer of energy use from the workplace to home, which could contribute to the performance gap;
2. Disconnection between office workers and FMs who are directly involved in building management and energy use, may impact on energy consumption as office workers delegate relevant competencies to expert members of staff. Such disconnection resonates with systemic notions of the removal of individual agency. However findings demonstrate that disconnection may be implicated with higher levels of energy use as engagement with systems and design features is hindered. This could contribute to the performance gap;

3. Taking part in office life was found to vary across case study buildings in terms of schedules and routines. The scheduling of breaks throughout was observed to create peak moments of energy consumption and may contribute to the performance gap; and
4. Expectations around practice of taking part in office life are associated with highly controlled internal environments which has implications for energy use and the performance gap.

The WGBC (2014) contend that social spaces have increased importance within sustainably designed office buildings. The provision of a variety of spaces through building design, reflects changing concepts of formality in office work. Work has shifted from autocratic to autonomous with the flattening of hierarchy reflected through open plan working supporting flexible and collaborative working. However, participants reported hierarchical divisions in terms of engagement with the building. This extended to induction processes where more senior staff were provided with greater levels of information and training which were found to impact on understandings and identification with the building and its systems. Moreover, conventional hierarchical structures were observed as emerging over time, despite organisational intent.

Clothing was found to be implicated in the practice of taking part in office life, with informality of the design, reflected in conventions of dress. Occupants dressed in light, casual clothing. However this was found to be tied up with expectations of thermal regulation. As Shove (2003) noted, there is an expectation that indoor temperatures can be controlled, and technology has developed to support those expectations, and in turn the ways in which conventions around office clothing have evolved. Thermal comfort within the practice of taking part in office life as such has evolved over time. It could be contended that keeping warm, keeping cool or simply maintaining comfort, has become integral to understandings of what it means to take part in the practice of office life. Office environments are expected to maintain certain, consistent temperatures. This contrasts with the ease with which adaptation and change in clothing was observed in the outdoor environment. Technology has enabled the taking part in office life to

be bound up with notions of comfort. This is similar to the overprovisioning of flexible working environments, practices have developed over time, impacted by technology, consolidated by guidance and standards, compounded by CSR and in the very eagerness of organisations to provide the 'best possible working conditions', as Shove (2010) notes, enshrined for example in building regulations, we have increased our use of resources.

Ahmed (2014) noted the increased domestication of sustainably designed offices and the impact on energy and resource use. Domestication was observed in case study buildings, with facilities and fit out supporting understandings of office life. Andrews (2014) contended that such facilities, including the provision of in-office cafés, comfortable seating and the merging of social and professional lives aim to support productivity and health and well-being. Whilst clubs were found to support organisational ethos of cohesion and integration, inconspicuous consumption was noted. The existence of many clubs relied upon supporting facilities, for example the running club in organisation A was facilitated through in-office showering and changing facilities, which have implications for energy use. However, it was also found that the demonstration of a social and forward looking organisation, who actively engaged in health and well-being, contributed to the attraction and retention of staff.

The provision of in-office cafés on site is not only bound up with practices of flexible and collaborative working, but is also implicated in everyday rituals of office life. In this way, the provision of the café, shaped the practice of office life, creating new rituals and subsequently new 'peak' use of energy. Moreover, whilst the cafés were in-office in both organisation A and C, both were treated as distinct from the office with organisation A reporting that energy use from the café had not been considered in wider issues of resource efficiency. As noted above, the scope of this research does not extend to the analysis of catering practices but is focused on office workers and contemporary working practices.

Finally, identification with the organisation was found to be central to taking part in office life. The occupation of a sustainably designed office inferred status and a sense of community, this was found to be collegiate in nature in organisation C. This may suggest that the aesthetic

of the building and features associated with visible demonstrations of sustainability, for example, large atriums, full height glazing may provide a proxy for sustainable ways of working. This in turn is linked to meanings that at the heart of corporate life is a desire to demonstrate 'sustainability' as a commercial concept. Whilst initiatives to promote sustainability are frequent, there is a focus on changing behaviour. Social practice theorists hold that there is a need to change the way we aim to reduce energy use and narrow the performance gap.

7.17 Chapter summary

This chapter has considered empirical research through the lens of social practice theory and conceptualised contemporary working practices. The physical context and background to the case study buildings have been presented, setting out sustainable features and design intent. In taking a social practice approach, contemporary working practices have been deconstructed into materials, competencies and meanings (Shove et al. 2012). Findings have demonstrated the implications for energy use and the performance gap, which are both conspicuous and inconspicuous and are the outcomes of social practices in sustainably designed buildings.

Chapters six and seven have addressed research question two, by conceptualising contemporary office working practices using the lens of social practice theory through literature and empirical studies. This chapter has also addressed research question three by considering the relationship between contemporary working practices and sustainably designed office buildings.

The following chapter continues to respond to research question three, in undertaking a further analysis of working practices and sustainable offices to draw together elements of practice and consider the wider implications of the findings. This thesis does not seek to present generalisable conclusions, which could be applied to any sustainably designed office building, but presents a context-specific snapshot of case study buildings and examines the potential for social practice theory to be applied, presenting suggestions for further research. Such

limitations notwithstanding, this research aims to contribute to the growing body of literature and empirical research examining the future direction of social practice theory in the context of the achievement of sustainability in the built environment.

Chapter 8: Analysis and discussion

8.1 Introduction

This chapter seeks to draw together elements of the contemporary working practices identified in chapter seven and demonstrate the dynamic nature of the relationship between contemporary working practices and sustainably designed office buildings, and the implications for energy use and the performance gap. The chapter then seeks to respond to research question four, considering the implications of findings for practice and future sustainable office design.

Warde (2005) notes that patterns of consumption are formed by those practices in which carriers of practice are engaged. Taking this as a starting point for analysis, it could be contended that the consumption patterns of working lives can be viewed as those practices people are engaged in at work. Thus every day, mundane activities converge to create contemporary working practices, which have implications for energy use and demand.

Chapter seven has analysed each practice in depth, deconstructing conceptualised practices set out in chapter six, through the social practice three elements model (Shove et.al. 2012). Hargreaves (2012) argues that looking at single practices in isolation limits the understanding of those bundles of practices building occupants are engaged in. This research, while focusing on energy use and the performance gap, does not seek to isolate practices and exclude wider understandings of bundles of practices. Applying a social practice theoretical approach allows routines, habits and interactions involved in the workplace to be identified. Moreover, it is by deconstructing the practices and examining the various elements, that it is possible to gain a deeper understanding of “*the dynamics of practice from different angles*” Shove et.al. (2012) p. 43. This chapter considers conceptualised practices with reference to empirical research undertaken, discussing the relationships between practices, sustainable design, energy use and the performance gap.

8.2 Contemporary working practices and sustainable design

The starting point for the case study buildings was underpinned by a focus on methodological individualism. Zuo and Zhao (2014) define sustainable buildings in terms of higher environmental performance compared to traditional buildings. Occupants in this context, are considered as rational individuals and if appropriately instructed and motivated, will comply with building systems. Thus behaviour of occupants in sustainable buildings is considered predictable, based on assumptions grounded in methodological individualism. However, as is discussed in chapter two, the role of occupants is considered a key factor in understanding discrepancies between predicted and actual operational building performance.

Applying a social practice approach aims to reframe how occupants are considered within the performance gap. Such complexity may be understood in terms of the 'behavioural iceberg' (figure 4.3), in that what is observed behaviour is merely the performance of a practice. Underpinning elements of meaning, competency and material lie beneath the surface; the practice as entity. By deconstructing practices, the underlying elements of practices are revealed, providing a new perspective on energy use and the performance gap. Table 8.1 below summarises key findings:

Table 8.1: Summary of research findings

Contemporary working practice	Implications for energy use and the performance gap
The practice of flexible working	<ol style="list-style-type: none"> 1. Sustainable building design and culture have adapted in parallel, expectations for design to support flexible working may not reflect organisational practices; 2. Flexible working potentially increases energy use through device use at multiple sites, enabled by the building infrastructure and supported by meanings and competencies of contemporary working; 3. The unpredictability of occupancy resulting from the practice of flexible working may contribute to the performance gap; 4. Material artefacts supporting flexible working may be used as an unnecessary and energy consuming backdrop to support contemporary working; 5. Infrastructure to support flexible working may exceed necessary requirements and lock in energy intensive practices;

Contemporary working practice	Implications for energy use and the performance gap
	<ol style="list-style-type: none"> 6. Meanings around flexible working, 'only for senior management' and the persistence of former workplace practices, may impact on office worker engagement in the practice. This may contribute to the performance gap as predictions around performance are contingent on in-use assumptions, including levels of anticipated use of common areas for flexible working; 7. Insufficient communication and engagement of office workers in operational competencies for flexible working may lead to unintended energy consumption and thus contribute to the performance gap; 8. Flexible working may be associated with a shift in peak working times which is not accounted for in predictions of building performance; 9. Flexible working may result in energy use through lighting and heating of large common areas for small numbers of office workers outside of traditional working hours; and 10. Business strategies may impact on energy use and the performance gap, for example strategic contractual decisions.
The practice of collaborative working	<ol style="list-style-type: none"> 1. The practice of collaborative working was observed to impact on impromptu change of office work location, leaving workstations 'on charge' whilst plugging in devices to participate in informal collaboration. Device use at multiple sites, as with flexible working, was enabled by building infrastructure, materials and understandings of collaborative working; 2. The use of informal areas for collaboration rather than intentional, more formally designed collaborative spaces were found to potentially impact on the performance gap as energy is used in unintended and unexpected ways by office workers in performing the practice of collaborative working; 3. Definitions and understandings of the meaning of collaborative working have an impact on the performance of the practice and subsequently, an impact on energy use which could potentially contribute to the performance gap; and 4. The performance of the practice of collaborative working implicates multiple physical and infrastructural characteristics as well as material artefacts. The provision of such characteristics and artefacts support collaborative working, however may also create demand. For example, the provision of small power loads in meeting rooms was found to enable the 'plugging in' of devices whilst collaborating. The subtleties of consumption implicated in the performance of the practice are relevant to the performance gap.
The practice of getting to and from work	<ol style="list-style-type: none"> 1. Understandings and strategies around getting to and from work are relevant to the performance gap as the

Contemporary working practice	Implications for energy use and the performance gap
	<p>provision of appropriate, and sufficient, facilities may impact on the recruitment of carriers to this practice;</p> <ol style="list-style-type: none"> 2. Understandings of an 'office hotel' Gyford (2014) are relevant to the performance gap as predictions around energy use may not recognise such subtleties; and 3. Meanings around getting to and from work and health and fitness, are linked to notions of rewarding physical effort with cultural conventions of freshness and luxury associated with showering practices (Shove, 2003). Social conventions in cycling culture may also be inferred. This is relevant to the performance gap as it may imply greater energy use than predicted at design stage.
The practice of effective working	<ol style="list-style-type: none"> 1. Working effectively implicates energy consumption through the use of multiple electronic devices. Patterns of consumption facilitated by building technology and infrastructure have enabled effective working for office workers to evolve in this form. The increased use of ICT devices in the workplace has implications for energy demand and is relevant to the performance gap; 2. Effective working involves the use of ICT equipment, which is frequently supplemented by other electronic devices. This has implications for energy use and could contribute to the performance gap; 3. Effective working is associated with the ability to retreat from open plan offices and seek physical barriers to noise and interruption. This is of relevance to the performance gap as the reality of occupying office buildings differs from anticipated use. This may impact on energy use as the configuration of case study office buildings changed over time and could contribute to the performance gap; 4. All case study buildings were found to adhere to BCO standards. Such adherence impacts on potential issues of overprovisioning and may contribute to the performance gap, consistent with existing research (Cass et.al., 2016); 5. Behaviour change initiatives undertaken to reduce energy use related to the practice of effective working relied on cognitive approaches. Findings support earlier discussions of literature around the limitations of behaviour change initiatives as a means to reduce energy consumption and improve building performance, which may not achieve savings required and therefore may impact on the performance gap; 6. The inconsistency of office building induction was observed across all case study buildings as office workers demonstrated varied levels of understanding of building systems, leading to subversion of systems, which may contribute to the performance gap;

Contemporary working practice	Implications for energy use and the performance gap
	<ol style="list-style-type: none"> 7. Office workers were found to display confusion around 'rules' of automated systems and manual control of building systems, and levels of competency required. This could contribute to higher levels of energy consumption and the performance gap; 8. Building commissioning and handover was found to be inconsistent and inadequate in case study buildings with implications the practice of effective working and subsequently for energy use and the performance gap; 9. Understandings of thermal comfort were implicated in the practice of effective working and the provision of 'normal' conditions could contribute to energy use and the performance gap; and 10. Paternalistic approaches to energy use in case study buildings were found to have unintended consequences of subversion and result in little change in demand and consumption patterns.
The practice of taking part in office life	<ol style="list-style-type: none"> 1. The practice of taking part in office life encompasses a domestication of office work. A blurring of the lines between work and home was found in case study buildings, with the transfer of energy use from the workplace to home, which could contribute to the performance gap; 2. Disconnection between office workers and FMs who are directly involved in building management and energy use, may impact on energy consumption as office workers delegate relevant competencies to expert members of staff. Such disconnection resonates with systemic notions of the removal of individual agency. However findings demonstrate that disconnection may be implicated with higher levels of energy use as engagement with systems and design features is hindered. This could contribute to the performance gap; 3. Taking part in office life was found to vary across case study buildings in terms of schedules and routines. The scheduling of breaks throughout was observed to create peak moments of energy consumption and may contribute to the performance gap; and 4. Expectations around practice of taking part in office life are associated with highly controlled internal environments which has implications for energy use and the performance gap.

The practices of flexible, collaborative, effective working and taking part in office life were bound up with resources use related to thermal comfort. As noted in section 7.10, habitual and routine behaviour of diverse tenants in sustainable office buildings has been found to impact

on energy demand, however, taking a social practice approach allows a more complex perspective to be uncovered.

Shove et.al. (2008) succinctly summarise the argument made by Strengers (2008):

“...the carbon intensity of indoor environmental control is bound up with the temporal ordering and organisation of everyday life – the details of which are surprisingly little known.”

The findings across case studies resonate with this argument. Practices of flexible working, collaborative working, effective working and taking part in office life dictate requirements for controlled indoor environments and, by consequence, energy intensive buildings. Case study office buildings were required to operate at ‘comfortable’, ‘normal’ and standardised temperatures, facilitating more diverse working hours than the conventional nine to five working.

Accepted temperature ranges and temporal requirements are often based on understandings and assumptions of conventions of normal operation (Strengers, 2008). Taking part in office life, in the case study buildings, meant participation in collaborative and flexible working which has implications for energy use and the performance gap as noted in table 8.1 above. Moreover, the socialisation of the office space, the merging of home and work lives, again leads to the necessity for controlled temperatures. The technological proficiencies which have developed and altered the dynamics of practices, have enabled and reinforced expectations; a sustainable office building by implication is technologically capable of holding these practices in place and fundamentally dictating office life.

Shove et.al. (2008) suggested that there is a “recursive” relationship between energy used and the practices energy is implicated in. Such everyday practices, are subsumed into expectations of normal life and reflected in the design and technological capability of the built environment: buildings are designed to support what are considered ‘normal’ practices which occupants are expected to engage in. Shove. (2003) argue that this relationship leads to the

pushing upwards or 'ratcheting' of provision expectations which holds unsustainable practices in place.

The use of multiple workspaces and duplicated and dual resource use was found to be a key implication of flexible and collaborative working. Such workspace and resource use implicated in these contemporary working practice was found to have important impacts on energy use and could contribute to the performance gap. The practices of flexible and collaborative working were also embedded in the practice of taking part in office life and understandings of office life itself. The development of a knowledge based economy has supported increased emphasis on creating offices facilitating innovation, thus the recruitment of carriers of practice to collaborative and flexible working has followed. Open plan office design has also emerged to support contemporary practices, however evidence of overload and lack of privacy were also found to be implicated in energy use with under occupancy of spaces used to escape the open plan office environment.

The impact of standards and guidance is also important to note in this context. The BCO office specification guidance demonstrates the convergence of meanings of sustainably designed offices and Grade A office space. The market structure of commercial offices has impacted on the desire for a certain aesthetic associated with sustainably designed offices: high levels of glazing; large atrium; open plan offices and so on. However, as noted, this may lead to the 'designing in' of high specification technology to provide the most flexible office building, not necessarily meeting the actual needs of tenants and triggering issues of overprovisioning (Cass *et.al.* 2016).

The practice of taking part in office life has also impacted on sustainable design, notions of the merging of social and professional life have led to increased facilities within office spaces. However, as noted, this has led to the development of new energy intensive rituals and habits and may draw energy use from domestic to office environments. Many activities relied upon building facilities and led to inconspicuous energy use, for example running clubs and cycling

to work. This increased domestication of offices is considered to contribute to the attraction and retention of staff, demonstrating organisational commitment to health and well-being.

Hot desking or hoteling (booking desks) contrasts to a degree the domestication of the office, as considered in the practice of taking part in office life. FM World (2013b) contend that:

“Hot-desking [is contingent upon] as system that will ensure desks are available when people need them...a clear-desk policy...that people don’t have fluffy toys on the computer screens or photographs on the desk.”.

This contention, however, is in opposition to the findings noted in case study B, where a number of employees resisted and subverted the de-domestication of desk space, moving personal artefacts, such as calendars and photographs from desk to desk ‘setting up camp’. Moreover, reclaiming desk space in this way has led to an unspoken ownership of workspaces, with team members and teams laying claim to particular spaces as hot-desking initiatives become ‘normalised’, recreating conventional office layouts. It is useful to consider here, the limitations discussed in the literature review with reference to behavioural interventions; the adoption of initiative driven behaviours may be limited and reduce in efficacy over time. The Better Buildings Partnership (2017) and Menezes *et.al.* (2012) identified a number of ‘behaviours’ in offices which subverted design intentions, for example adjusting and resetting heating and cooling ranges, opening and closing windows.

The informal structure and practices identified in the case study buildings demonstrated some tension between the organisational intentions to promote collaborative working, whilst reducing real estate costs, and the removal of personal space.

Chapter four briefly discussed the practice of showering in the context of DfSB. The case studies demonstrated meanings associated with showering at work as a ‘reward’ for a hard cycle or run to work. Thus by engaging in wider networks of social practice, getting to and from work sustainably, subtleties around energy use are revealed. However, it could be argued that the focus must be widened if the true source of energy use is to be steered more sustainably,

that is the practice of showering itself, both the technological development which allows the provision of readily available hot water and understandings surrounding cleanliness and freshness (Shove, 2003). In office work, the rise of sustainable travel to work and the spillover consumption of energy through showering, has also been seen to hold some degree of social capital (Bourdieu, 1999) Meanings surrounding cycling and running to work are associated with middle class ideals of health and wellbeing (Spotswood et.al. 2015). Materials and products have developed to hold these practices in place – cycling equipment and clothing reflecting aspirational meanings, showering products and high performance showers, drying facilities and comfort.

The following section considers the role of technology in relation to contemporary working practices in more depth.

8.3 Contemporary working practices and technology

Technology has been framed in terms of socio-technical imaginaries (Jasanoff and Kim, 2013). Socio-technical imaginaries aim to examine the social implications of technological arrangements (Strengers, 2016). In this context, material artefacts or infrastructures are considered as a means of legitimising and normalising “...*particular ways of life*” Feenberg (1999). As such, Strengers (2016) contends:

“...an examination of socio-technical imaginaries...recognises that technological visions and enterprise contain within them deeply ontological and philosophical questions and predictions about how we should and shall live.” (Ozaki and Shaw, 2013 in Strengers, 2016, p.3).

Grounding such analysis in social practices and “...*the material arrangements they necessitate, integrate and transform*” is rare (Strengers, 2016, p.4). Reckwitz (2002), Schatzki (2001) and Shove et.al. (2012) argue that material arrangements, such as technology are implicated within social practices, and shape the direction of social order. Practices involve the “*arrangement*” of elements (Shove et.al. 2012, p.44). Those elements are not stable and are constantly changing, in line with technological innovation for example. The technology

within case study buildings was implicated in all contemporary working practices. Thermal regulation, ventilation, lighting, small power provision, provision of hot water and wireless internet access were all found to be implicated in the working practices analysed. All case studies employed the use of building management systems (BMS) which were overseen by facilities and building managers. High levels of automation were a common feature across case studies.

Robinson *et.al.* (2016) assert that low levels of control in newly constructed non-domestic buildings are “*typical*” (p.34). Karjalainen and Lappalainen (2011) propose that the automation of energy consuming systems within buildings create the greatest opportunities for energy reduction. Moreover, high levels of user control may lead to frustration (Karjalainen and Koistinen, 2007). However, confusion, suspicion and frustration around control was found in case study buildings, leading to the subversion of systems and subsequently increased or inadequate energy use.

Robinson *et.al.* (2016) suggest that the specialised operation of BMS, which is undertaken by estates and facilities specialists in all case study buildings discussed in Chapter seven, creates a conflict of interest between management and occupants. Estates or facilities management personnel seek to satisfy requirements of occupants, whilst reducing resource demand. The study also found confusion around knowledge and understanding of systems.

Decoding knowledge in this way depends on previous experience and thus know-how can be uneven in its distribution (Shove *et.al.* 2012). Thus the decoding of know-how in sustainable buildings may depend on the experience of recipients, how expert knowledge held by facilities and building managers is transferred to occupants, the delivery of the know-how required in the building will be important in the recruitment of participants. Orr (1996) in his study of photocopy technicians, demonstrates that technical knowledge is a socially distributed resource stored and diffused primarily through an oral culture.

The impact of technology has shaped the practices of flexible and collaborative working, however as noted above, multiple device use was observed, suggesting a duplication of resource use. Infrastructure has developed in line with these practices, enabling and shaping their trajectories, however as noted in organisation C, these are often unpredictable in nature, again impacting on assumptions surrounding the performance gap.

The following section will consider wider issues of practice trajectories.

8.4 Sustainable office buildings and practice trajectories

As discussed in section 2.4, the continual evolution of the workforces occupying office buildings may impact on the potential of any building to perform to particular consumption levels and targets. This resonates with a social practice approach, the wider trajectory of practices should be taken into account. Moreover, it follows that the metrics used to stimulate building performance, may be considered somewhat arbitrary. BREEAM UK New Construction for Non-Domestic buildings includes a mandatory post-construction review, however, it is unlikely that this would take into account the evolution of occupancy (BRE Global Limited 2014). The question of how metrics should operate within the social practice three elements model is worthy of further research, however is beyond the scope of this thesis.

In examining the trajectories of social practices within the context of sustainably designed office buildings, it is important to note the issue of 'greenwash', the superficial demonstration of 'sustainability' which has arguably become embedded in the practice of taking part in office life. The commodification of sustainability has not developed in isolation in this context, but in conjunction with the structure of the commercial office market and with marketing and sales practices. Moreover, in providing diverse working environments to respond to market demand and accompanying infrastructure and technology expectations may, by implication be increased.

In the context of thermal regulation within contemporary working practices, taking into account practice trajectories implies a need to shift understandings and conventions around what constitutes comfort, as Shove et.al. (2008) posit:

“To build ‘green’ offices...that offer lots of control is to delegate the specification of comfort to occupants, but still within the frame of an existing infrastructure. Methods like those of increasing the efficiency of air conditioning sustain the very idea of living in refrigerated space. Initiatives to promote ‘outdoor living’ as climates warm up, or to encourage cooler styles of clothing...rest upon the distinctive but always contested understandings of the relationship between people and the indoor-outdoor environment.” (p.310).

Shove et.al. (2008) contend that discussions of comfort and climate change must include such *“hidden politics”* (p.310). Chapter six provided a brief overview of the history of air conditioning in the context of comfort. The bourgeois, middle class ideal of controlling indoor environment, retreating from *“sweaty labour”* (Shove et.al. 2008) played a role in the development and rise of climate controlled indoor environments. Shove et.al. (2008) suggest that in order to ensure sustainable future trajectories of practice, occupants and users must accept, rationalise and function effectively within more variable indoor environments. Conventions influencing policy and operational management must evolve, engaging with the context surrounding unregulated areas. Temporal and social conventions, hold Shove et.al. (2008) are key to this understanding, unlocking opportunities for adaptation and shifting views on seasonal variation. Moreover, it is widely acknowledged that rising technological efficiency, whilst maintaining current accepted standards of comfort will not only reinforce and sustain current expectations of a controlled indoor climate, but will not be insufficient in responding to issues of climate change and a lower carbon society (Shove et. al. 2008). There is a need to reframe and reconceptualise understandings of comfort. Acknowledging connections between supply and demand is critical *“...ambitions, discourses and problem definitions of powerful providers”* (Shove et. al. 2008, p.307) influence technological development, policy, standards, regulation

and understandings of comfort and provide opportunities to shape practices. Moreover, Shove *et. al.* (2008) emphasise the fluidity of future trajectories of comfort, that practices are dynamic, continually evolving and changing, thus providing opportunities for intervention in steering the contemporary working practices in more sustainable directions.

Spurling (2013) suggests that systems impact on practice trajectories, reproducing interpretations of need and entitlement, and of normal, acceptable ways of life. Thus the constitution of offices relate to understandings of office work and office life, which are embedded in contemporary working practices.

It could be contended that in order to reduce energy consumption and narrow the performance gap, it is necessary to disregard commonly held understandings of sustainability completely and focus on the mundane aspects of everyday life. In considering trajectories through the conceptualisation of practices and deconstructing practices using a social practice approach, an alternative analytical perspective is enabled. Trends implicated in everyday life thus shape and emerge as social practices (Strengers, 2016).

8.5 Bundles of practice

In discussing findings within the wider context of this thesis, it has become increasingly evident that the circular representation of the elements of social practice (Shove *et.al.* 2012), offers not only a means to deconstruct practices, but reflects what can be considered a cycle of practice. As elements of practice evolve, practice dynamics are impacted, at a superficial level a cause-effect cycle could be suggested. Social practice theory may reveal 'levers for change' (Hargreaves, 2012) and potential opportunities to redirect practice trajectories. Crucially wider networks or bundles of practice expand and represent wider social and working lives. It is, in understanding wider bundles of practice that significant steps towards more sustainable ways of working and living can be enabled through the steering of practices.

Wider networks of practice extend to the practices professionals are engaged in when the building design and fit out is undertaken. Architects, design professionals, building contractors,

engineers and facilities managers operate within the landscape of professional standards guidance, regulation, legislation, market expectations, inherent assumptions and understandings of need and normality, and cultural contexts. This impacts on the ratcheting effect (Shove et.al. 2008) which holds practices in place. Where practices are unsustainable and drive the consumption of energy, it may be problematic to steer practices in more sustainable directions through interventions alone if they are anchored by wider networks of practice.

Air conditioning within office buildings has been cited as an example of such tensions. Understandings of a need for air conditioned offices are held in place by professionals who believe that the provision of this service is an absolute requirement both in terms of operational and market requirements. However studies suggest that this is a negotiable service (Healy, 2008; Shove et.al. 2008; Walker et.al. 2004). LoPinto et.al. (1993) posit that the provision of small power loads in office buildings has rapidly increased in line with assumptions around what is required to undertake office work and understandings surrounding the future of office work (i.e. that new practices requiring more energy use will take hold). Cass et.al. (2015) asserted that such assumptions lead to over provisioning of offices. This is consistent with the findings of this research.

Analysing practices in this context, supports the contention that intervening in individual practices limits the efficacy of this approach (Hargreaves, 2012). Practices must be considered within the context of wider networks, although some criticism levelled at a practice approach argues that wider contextualisation renders analysis prohibitively complex in application.

The interlocking of practices suggests that many social practices are linked in bundles of practice. Thus an intervention effecting a change in one practice, may have a ripple effect for other, interconnected practices.

The process of knowledge abstraction and reversal is suggested by Shove et.al. (2012) to be useful in considering how competencies travel and circulate between practices “*the basic idea*

that knowledge has to be 'abstracted' from a local situation before it can travel, and that it needs to be 'reversed' when it arrives in some new destination, complicates popular interpretation of knowledge transfer as a simple process of sending and receiving.”(p.48)

This complexity is reflected in discussions of the application of social practice theory within climate change debates. Spurling and McMeekin (2015) propose an approach which is framed in terms of intervening in practices at different levels. This framing is discussed in the next section, considering the implications of findings for energy use and the performance gap.

8.6 Implications for the performance gap

In undertaking a deconstruction of practices and considering wider issues of design, technology, practice trajectories and sequencing suggests a level of complexity and “...*prescriptions for ambitious interventions*” (Welch, 2016). Such a contention renders the application of practice theory to the problem of the performance gap arguably prohibitively complex. However, the analytical value of practice theory can lie in its potential for *informed* intervention in practices and webs of practice (Welch, 2016; Hargreaves, 2012; Halkier, 2011). That is, understanding the trajectories and converging elements of practice provides an opportunity to shift and alter contextualised elements. Understanding practices as entities allows materials, competencies and meanings to be considered simultaneously, in contrast to conventional behaviour change approaches.

Spurling and McMeekin (2015) propose three approaches to intervention, grounded in conceptualisation of the three elements of practice (Shove et.al. 2012): recrafting practices; substituting practices; and changing how practices interlock, they suggest this framing illuminates:

“...*what it might mean to do policy when policy is approached from the perspective of theories of social practice.*” (Strengers and Maller, 2014, p.7). This approach allows the theoretical insights of practice theory to reframe issues of the performance gap.

8.6.1 *Recrafting practices*

Spurling and McMeekin (2015) suggest that practices may be 'recrafted'. Such recrafting is grounded in the deconstruction of the elements of practice, elements may targeted and changed to intervene in the practice. It could be contended that such an approach, resonates with the dynamics of social practice, as Shove et.al. (2012) note "*Understandings, meanings and types of expertise are discarded as practices evolve*" (p.44).

In the context of the performance gap, the deconstruction of practices has provided insights into resource use. For example, thermal regulation is an underpinning factor across practices and impacts on the performance gap. Deconstructing the practice of effective working reveals contextual considerations to the adoption and use of air conditioning including changing conventions and expectations around comfort, technological development and know-how, security and safety requirements, guidelines and market standards (Shove, 2003). Recrafting the practice of flexible working could suggest for example, changing guidance or market standards to reshape expectations and technological approaches. This challenges approaches of placing the individual consumer at the centre of debates around indoor climate (Parkhurst and Parnaby, 2008).

However, in recrafting practices, it may be argued that current ways of living are sustained, that crucial issues of demand are not addressed.

8.6.2 *Substituting practices*

Substituting practices involves the replacement of one practice with another, more sustainable practice, which accomplishes the same ends. Welch (2016) notes this approach "*draws attention to how different practices compete for time, space and resources, and how infrastructures and conventions lock the evolution of social practices into particular paths.*" (p.246). In deconstructing the practice of getting to and from work, initiatives were noted which aimed to shift the mode of transport occupants employed in the practice, from driving to cycling to work. Substituting the practice of driving for that of cycling, hold Spurling et.al. (2013) engenders a requirement for improved infrastructure, not only associated meanings, spread

of competence and material innovations in bicycle technology (for example electric bikes and lighter bikes). A deconstruction of practices, however revealed inconspicuous consumption associated with substituting practices which impacted on the performance gap. Moreover, substitution of practices does not consider wider webs of interlocking practices and ripple effects discussed above.

8.6.3 *Changing how practices interlock*

Section 8.5 discussed the sequencing and synchronising of practices which is of particular importance to framing practices in terms of interlocking practice. Everyday working and social lives are determined by institutions, conventions and infrastructure. Infrastructure has developed to support temporal rhythms and in turn shapes the trajectories of practices. For example, infrastructure developing to support the practices of flexible and effective working has developed and arguably established new temporal rhythms.

Southerton et.al. (2011) posit that such temporality suggests potential to intervene between practices: “*the form of duration, periodicity, sequence, tempo and synchronisation represent readily identifiable features of the practice as an entity.*” (p.34).

In understanding wider webs and networks of practice it is possible to shift the co-ordination of daily practices and ‘shift’ policy orientation (Southerton et.al. 2011). In the context of the performance gap, a social practice approach has demonstrated the close interlocking of contemporary working practices. The practices of getting to and from work, flexible working, collaborative working and taking part in office life are underpinned by the practice of effective working. Effective working is bound up with understandings of normality, conventions, expectations, infrastructure, technological development, design and market standards. Intervening in one practice alone is unlikely to create the shift in everyday life required to address issues of the performance gap.

8.7 Implications for practice and future sustainable office design

Findings from this research have been discussed, considering the dynamic nature of the relationship between contemporary working practices and sustainably designed office buildings, and the implications for energy use and the performance gap. This section seeks to suggest the potential impact of findings for current practice and future sustainable office design.

Findings have demonstrated the need to understand organisational culture and practices prior to design and occupation. This resonates with the 'soft landings' approach discussed in chapter two which aims to integrate occupants into design team discussions. However, findings suggest that involvement must aim to fully understand organisational culture and not merely functionality, as culture impacts on contemporary working practices. Understanding the suite of contemporary working practices which occupants are engaged in, has the potential to provide such depth.

Multiple device use and subsequent implications for energy use is key to the performance gap and was identified as integral to the practices of collaborative, flexible, effective working and the practice of taking part in office life. Better understanding some of the key issues around duplication provides opportunities to redirect practices in less energy intensive ways. For example, much duplication found was grounded in the necessity to 'retreat' from open plan offices to find privacy, confidentiality or focus. This is important to consider in terms of how sustainable office buildings are occupied with potential to reconsider office layout and provisioning supporting multiple device use and potentially contributing to the performance gap.

Unpredictability of office occupancy was found to be relevant to the performance gap, particularly in the context of the practices of flexible and collaborative working. Flexible working was found to be associated with a shift in peak working times and the provision of comfortable conditions in large common areas for low occupancy levels. The practice of collaborative working was also associated with unpredictability as prescribed collaborative areas were

found to be subverted with occupants using more informal areas and lead to unintended energy use. Such unpredictability has implications both for current and future practice with a requirement for occupants and design teams to understand the subtleties of formal and informal collaboration and to provide strategies which take this into account while reducing energy use.

Implications for practice and future design were also associated with design for contemporary practices. Case study buildings were found to integrate design for collaborative and flexible working, however recruitment to these practices was impacted by a number of issues. Meanings around seniority, definitions of collaborative and flexible working together and operational competencies, including inadequate induction processes, were found to be associated with the performance of these practices. A disconnection between office workers and building systems was also found to be relevant. Office workers were found to defer to building managers and recruitment to practices was hindered by meanings of requirements for specialist knowledge, such subtleties are revealed through a social practice approach and can feed forward into future design and existing practice, potentially contributing to the narrowing of the performance gap.

Standards and norms were found to play an important role in energy use, understandings of appropriate and normal thermal comfort conditions, for example were revealed. Compliance with BCO standards was also found to be present in case study building, consistent with Cass *et.al.*'s (2016) findings around overprovisioning which in turn may contribute to the performance gap. Understanding the role of standards and norms in sustainable office buildings and their contribution to the performance gap, contextualises the need for change in existing standards and norms for future design.

Commissioning and handover issues were found in case study buildings, with handover inconsistent and inadequate resulting in higher levels of energy use. Targeting commissioning at a practical and design level was found to be relevant to the performance gap, although it is beyond the scope of this practice to analyse facilities management practices.

Finally issues of culture were found to be relevant for practice and future design of sustainable office buildings. Cultural conventions around office working, getting to and from work were found to impact on energy use. Understanding wider bundles of practice revealed issues around the blurring of lines between domestic and office life and the potential transfer of energy use. This may help in the future design of office use and in understanding how current practice may be impacted.

Having provided an overview of implications of findings for practice and future design of sustainable buildings, this chapter is now summarised before moving to final discussion and conclusions.

8.8 Chapter summary

This chapter has drawn together elements and webs of contemporary working practices identified in chapter seven and has demonstrated the dynamic relationships between practices and sustainably designed office buildings. The chapter has considered the relationship between sustainable design and technology, practice trajectories and the temporal nature of practices. Implications for the performance gap have been considered through reframing analysis and intervention, considering recrafting, substituting and changing how practices interlock. Finally implications for current practice and future design of sustainable office buildings were discussed.

This analysis has demonstrated the importance of wider networks or bundles of practice, and the interlocking nature of contemporary working practices. In this context it is those webs of practice which are tangled up with the performance gap which hold the greatest potential for narrowing the gap.

Chapter 9: Conclusions

9.1 Introduction

The previous two chapters have presented a discussion of research findings. This chapter concludes the thesis by highlighting key results, evaluating the study, considering the implications for the performance gap and the relevance of the work to methodological and theoretical discussions. Whilst acknowledging some limitations, the findings are held to be sufficiently robust to provide a useful contribution to debates around the performance gap and the application of social practice theory. The study has addressed four research questions:

1. How is the performance gap between sustainable building design and operational performance considered in literature?
2. How can contemporary office working practices be conceptualised using the lens of social practice theory?
3. What is the relationship between contemporary office working practices and sustainably designed office buildings?
4. What are the implications for the performance gap in terms of practice and for future sustainable office design?

The first section of this chapter reviews the key research findings, addressing research questions before considering the implications of findings. Finally, the chapter discusses the limitations of the research approach and suggests potential scope for future research.

9.2 Overview of the rationale for the research

The literature review in chapter two presented the background to the performance gap, discussing attempts to narrow the gap through legislation, guidance and environmental assessment mechanisms. A shift in focus from a design and technological perspective to understanding 'patterns of living'. A number of variables contributing to the performance gap

were identified through literature including the role of building occupants, framed conventionally in terms of 'behaviour change'.

Chapter two presented the theoretical underpinnings and limitations of methodological individualism which dominate climate change mitigation strategies in the built environment. Such social-psychological approaches to 'changing' behaviour are contentious, and a need to move beyond this framing of occupants as rational and deliberative, was identified.

Chapter three set out alternative approaches, including a detailed discussion of the theoretical underpinnings of SPT. It was posited that while social practice theory was a well-established theoretical approach, only limited empirical work had been undertaken. Often such work focused on individual, rather than suites of interlocking practices. It was contended that in applying social practice theory to understanding occupants in sustainably designed buildings, new perspectives on the performance gap could be investigated.

This research did not seek to measure energy use or the performance gap. It aims to understand contemporary working practices and their implications for energy use, providing novel insights which may inform future office design and improve the efficiency of current sustainably designed office buildings.

The second part of this thesis conceptualised contemporary working practices through a literature review. Practices conceptualised were then deconstructed using Shove *et.al.*'s (2012) three elements framework, framing practices as comprising converging materials, competencies and meanings.

The ethnographic study undertaken indicated that contemporary practices conceptualised were in evidence within three case study buildings. An initial analysis of practices served to identify elements of practices and implications for resource use. Material artefacts and infrastructure provided the context to hold practices in place, technology supporting practices of flexible working by establishing diverse work spaces, mobile and wireless technology. Scheduling, changing rules around work and the workplace and technical knowledge

converged with meanings of organisational identity associated with cutting edge practices and sustainably designed office buildings converged to shape flexible working practices.

Collaborative working was found to be closely aligned to flexible working in the designing-in of physical characteristics and supporting material infrastructure and artefacts to shape the practice. Tacit understandings and rules of collaboration were found to be bound up with meanings of innovation and the knowledge economy.

The practice of getting to and from work was supported indirectly by sustainable building infrastructure, routines and schedules and the evolving nature of work and organisational identity. The practice of effective working found to be deeply embedded in sustainably designed offices in terms of material infrastructure and artefacts. The materiality of elements of this practice were framed in very technical terms, with building systems, in turn supported by management expertise and know-how. Issues of automation and control were also found to be important in shaping the practice, and meanings of subversion also emerged.

The practice of taking part in office life found the domestication of workplaces and conflation of contemporary, cutting edge organisations and sustainable, Grade A buildings to be of importance in shaping the practice.

This first analysis suggested the overlapping nature of elements and practices which was discussed in greater depth in chapter eight. Deconstructing practices revealed complexities of elements shaping practices, which may not have been uncovered through, for example, questionnaires. Moreover, the importance of considering practices as interlocking and enmeshed in wider webs or bundles of practices was also identified. The second analysis discussed the integrated and overlapping nature of practices. The practices of effective working and taking part in office life, were seen to underpin practices of flexible working, collaborative working and getting to and from work. Powerful meanings around office work and contemporary practices, converged with technological development and competency to shape these practices. The creation of new rituals and schedules were found to lead to new

'peak times' within offices. The domestication of office life, bound up with understandings of office work, was found to have underlying issues of resource use, with the provision of cafés, for example, failing to be fully integrated into, and potentially subverting sustainability and resource efficiency strategies. Importantly, practices as entities with dynamic trajectories was found to be central to analysis and resource use and to contribute to understandings of the performance gap.

9.3 Implications of research findings

This research has reframed arguments around the role of occupants in the performance gap and it is proposed, has made significant contributions to changing perspectives. Firstly, the research has demonstrated that in conceptualising contemporary working practices and their evolution over time, new insights are provided into the dynamics of office working. A deconstruction of practices has armed research into the performance gap with novel insights which, crucially, move beyond isolated elements and practices and demonstrate that it is a convergence of elements of practice which leads to resource use as an *outcome* of accomplishing practices.

9.3.1 Implications for practitioners and policy

Applying a social practice approach offers practitioners key insights into the true needs of occupants, moving away from assumptions, standards and issues of overprovision. Current research into the performance gap, centres around changing the rational choices of individuals following occupation of sustainably designed buildings. However, a key insight from this research is that any intervention should consider all interlocking elements of practices.

There is a need to consider policy beyond simple efficiency aims. Wider networks and conventions, for example working hours, need to be considered. If for example, financial institutions shifted conventional expectations around nine to five working hours, this would have an impact on issues of peak demand. A social practice theoretical approach could be applied to inform sustainable design. The dynamics of social practices must be understood if practices are to be steered in more sustainable directions.

9.4 Contribution to the body of knowledge

The following section summarises the contribution to knowledge this research has made with reference to the research questions.

Research question one: How is the performance gap between sustainable building design and operational energy performance considered in literature?

A review of literature contributes to the body of knowledge in providing focused insights into the role of occupants in the performance gap within sustainable buildings. Insights contributed to understandings around design for contemporary working, and underpinned the conceptualisation of working practices.

Research question two: How can contemporary office working practices be conceptualised using the lens of social practice theory?

The conceptualised working practices underpinning this research form a key contribution to the body of knowledge around the performance gap. A review of literature around contemporary office working informed the conceptualisation of five contemporary working practices. A social practice approach enabled the reframing of the role of occupants in sustainably designed offices, drawing focus to collective activities, the social practices, occupants are engaged in. This approach enabled the reframing of arguments around occupants, contributing to existing research in this field. Moreover, the five contemporary working practices proposed and subsequent empirical work provide novel conceptualisations of working practices.

Research question three: What is the relationship between contemporary office working practices and sustainably designed office buildings?

The empirical research undertaken demonstrates the relevance and implications of conceptualised working practices for operational energy use and the performance gap in sustainably designed office buildings. This research is situated in the wider context of existing

approaches to understanding the performance gap and provides novel insights into the complex issues of operational energy use and the role of occupants in the performance gap.

Research question four: What are the implications for the performance gap in terms of practice and for future sustainable office design?

This research finds a number of implications for the performance gap in terms of current practice and future sustainable office design. Implications for reframing analysis of occupants in the performance gap are drawn out of this research. Important subtleties of practice are revealed through the lens of social practice theory, impacting on recruitment to practices and on design for contemporary working. Issues of unpredictability of occupancy, multiple device use, shifts in peak energy use, design for functionality, handover and commissioning, standards and norms and cultural shifts have emerged from this research, as discussed more fully in section 8.7. This research therefore draws out implications which contribute to knowledge on current issues of the performance gap and future design of sustainable office buildings.

The ethnographic approach taken in this research has moved beyond potential limitations of socially desirable responding and enabled the researcher to generate rich insights into office life and the constituent elements of practice. Moreover, this approach also enabled the researcher to move beyond self-selecting participants and those for example engaged in sustainable initiatives or building services to the everyday office occupants.

This research has challenged established approaches to the performance gap in respect of occupants, that is, a framing of occupants as deliberative and rational individuals whose behaviour can be changed. Such an approach is limited as it does not take into account the full context and culture in which office occupants are implicated and the practices performed which make up their daily lives. This research has demonstrated that understandings of webs of interlocking practices provides deeper and broader insights into how ways of living and working may be rendered more sustainable. The research provides new knowledge on how

social practice theory can be applied to understand the contemporary working practices occupants are engaged in within sustainably designed office buildings, and the implications of these practices for energy use and the performance gap.

9.5 Research limitations

Research limitations are considered in the following sections.

9.5.1 *Reflections on researcher's experiences*

Chapter six presented the research design, ethical criteria and provided a reflection on methodological approaches. Research rigour was noted in chapter five, to ensure that findings are credible and robust (Hammersley, 1990). It is proposed that this research has demonstrated research rigour and credibility through a theoretical underpinning which has supported the analysis of findings. However, it is important to consider some of the limitations of the research and implications for the empirical study.

The importance of researcher reflexivity was noted in chapter five (Hammersley, 1990). Reflexivity takes into account researcher bias and how this may have impacted on findings. This section explores this issue in greater detail.

9.5.2 *Researcher reflexivity*

The role of the researcher, as discussed in chapter five, in an ethnographic study is one which must be continually reconciled as the researcher may be considered a constructor of knowledge generated from data. Researcher subjectivity is implicated throughout the research process.

The researcher was aware of participant desire to 'say the right thing' and demonstrate socially desirable responses. This was particularly noted in the case studies as participants were often anxious to ensure the 'correct' responses were given, with fear that the researcher would report back to management. In order to counter this, the researcher was careful to develop an atmosphere of trust and non-judgemental responses. Moreover, the use of projecting and enabling techniques encouraged respondents to describe their own actions and views through

the prism and anonymity of someone else. However, as Rapley (2001) notes the researcher is never “neutral” within the context of conducting empirical work, therefore this was considered a limitation of this research.

9.5.3 *Methodological challenges*

Another limitation of the study relates to the limited sample size and issues of generalisation. However, as discussed in chapter five, the aim of the study was not to generate generalisable findings, rather to provide in depth and rich description of context, critical in social practice approaches. Hammersley (1990), moreover, notes that smaller sample sizes characteristic of ethnographic approaches, allow depth of research to be undertaken over breadth of quantity. Whilst the contextualised and specific nature of the study means that findings and interpretation would not be easily replicable, the use of robust theoretical underpinning to analyse results and reflexivity counters this to some extent.

Whilst the ethnographic approach has provided a deep insight into the case studies, it is important to note that the length of the study and time spent in case study buildings was limited in comparison to conventional longitudinal ethnographic studies. However, the frequency and intensity of researcher visits did enable the researcher to establish a ‘natural’ presence (Eriksen, 2001). This was supported to a large extent by the transient nature of office working cultures across case study organisations.

During the coding period, the researcher also observed some limitations of the selected strategy, namely using qualitative analysis software. Whilst such coding facilitated a meticulous approach and enabled flexibility in inductively developing new codes, the ‘bigger picture’ was at times obscured. It became evident that it was necessary to retreat from the systematic, granular approach to coding and revisit data in a less structured context in order to ensure context was taken into account. This is of particular importance when taking a social practice approach, the researcher considered a broader overview of data was vital to ensure a robust analysis.

Southerton (2006) contends that the synchronisation of practices may bring about more or less sustainable ways of living and working. For example, temporal patterns of eating three meals a day, may shift as a result of a change in institutional arrangements, for example, family life or working hours.

Peak working hours and days were observed in organisation A suggesting tension between flexible working and peak electricity use, a concept well documented in existing literature. Addressing such peak use from a practice perspective raises a number of interesting points. A practice perspective generates questions around altering schedules or distributing resource use over space and time.

9.6 Scope for further research

Scope for further research and future directions of this PhD lie in the development of applying social practice approach to the challenges of the performance gap *in situ*. The conceptualisation of contemporary working practices and the deconstruction of practices have demonstrated the complexity involved in understanding energy use in sustainably designed office buildings. The role of occupants in this context is the carriers of practices which continually evolve, shaped by dynamic materials, competencies and meanings.

Wider issues also emerged around the future implications for the practice of getting to and from work and the consideration of the role of metrics in a social practice approach. Whilst beyond the scope of this thesis, both areas merit further research.

The direction of this research could be shaped by undertaking empirical work around the most compelling finding; the importance of interlocking practices. In utilising conceptualised practices, a web of practice could be explored and shifts within that wider interlocking web understood. Here, potential to narrow the performance gap could be tested and wider issues of energy use in the built environment developed.

In undertaking a social practice approach, this research has offered novel insights into the issue of the performance gap. The methodological approach has drawn out subtleties in the

everyday contemporary working practices office workers perform. The performance of practices was observed, and wider understandings of practices as entities were considered. Insights into how the performance gap may be narrowed in current sustainably designed offices were revealed, together with consideration for future sustainable office design. This research has contributed to the growing body of knowledge around building design, standards and the performance gap, and seeks to move forward the pursuit of true sustainability in the built environment.

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Appendix A: Contact email

Dear xxxxx

I am a second year doctoral research student at the University of the West of England and am writing to invite you to participate in a research study I am currently undertaking. I am investigating sustainability in office buildings, looking at how sustainability fits into everyday office life. The study will involve participant observations and more formal interviews. Observations would involve spending 10 to 14 days in your office, observing and informally chatting, when appropriate, to members of your organisation to understand views on sustainability and working practices. I will ensure that no member of staff is disrupted or prevented from working and will carry out my observations in a professional, sensitive and appropriate manner. Interviews would be arranged with around five participants at your convenience and would take no more than one hour.

The results of the study will be reported to *****. Findings will form part of the final PhD thesis and may be included in academic journal papers or presentations, however all findings will be completely anonymised. This is strictly confidential research. All observations will be anonymous and any quotes will not be attributed to any participant. All names, roles and office locations will be anonymous and in no way will any participant be identified.

All research carried out by the University of West of England is scrutinised by the University Research Ethics Committee. The Committee protects the safety, rights, wellbeing and dignity of all participants. This study has been reviewed and given permission to proceed.

I would be hugely grateful if you would be interested in participating and would be delighted to meet with you to provide further details and discuss the study in more depth.

I look forward to hearing from you.

Kind regards

Louise King

Email

Telephone

Appendix B – Observation information and consent form

Information and Consent form participant

observation: Workplace practices and sustainability

What is this study about?

I am investigating sustainability in office buildings, looking at how sustainability fits into everyday office life.

As part of my PhD research, I will be undertaking a case study at **** to understand links between BREEAM Excellent designed office buildings and sustainable practices *in situ*.

Who is organising the study?

I am a 2nd year PhD Researcher in the Department of Architecture and the Built Environment.

What will happen during the research?

I will be spending between 10 and 14 days at the ***** office over the course of 8 months, carrying out some simple workplace observations. I may be chatting to you and your co-workers informally to understand your views on sustainability and working practices in the **** office. I will answer any questions you have either prior to or during my research.

There is no obligation to answer anything you feel uncomfortable with, and can stop the discussion at any time and leave. I will at no time disrupt or prevent you from working and will carry out my observations in a professional, sensitive and appropriate manner.



This is strictly confidential research. All observations will be anonymous and any quotes will not be attributed to any participant. All names, roles and office locations will be anonymous and in no way will any participant be identified.

Are there any disadvantages in taking part in this study?

We do not expect there to be any downsides or risks if you take part. But, if you are worried about anything please contact Louise King at the University of West of England, Tel 0117 32 ***** or email louise.king@***** or my PhD Supervisor, *****.

Confidentiality

All information I collect during the study will be kept strictly private. Information about you and any co-workers will not be stored in conjunction with any names, only the researcher will be aware of identities. All information will be kept in secure premises at the University of West of England. A password protected computer will be used to store notes.

Ethical Approval

All research carried out by the University of West of England is scrutinised by the University Research Ethics Committee. The Committee protects the safety, rights, wellbeing and dignity of all participants. This study has been reviewed and given permission to proceed.

What will happen to the results of the study?

The results of the study will be reported to *****. Findings will form part of the final PhD thesis and may be included in academic journal papers or presentations, however all findings will be completely anonymised. If you would like a full report from the study, the completed thesis or have any further questions please contact Louise King at The University of the West of England, Tel 0117 32 ***** or email louise.king@*****.

Your participation in this study is entirely voluntary. There will be no negative impact should you decide not to participate. If you decide to take part, you are still free to withdraw without giving a reason and with no negative impact. At your request to withdraw from the study, all data and information provided will be removed from the study and destroyed. Should you wish to withdraw from the study your request would need to be received by [date to be finalised following confirmation that ***** wish to participate in the case study].

If you decide not to participate in the study, you will at no time be included in any observations, even if the researcher is observing people working in close proximity to you.

If you do not wish to participate in this research or have any further questions, please email me at ***** or my PhD Supervisor, *****.

Signature of participant

Name

Title

Email

Dates of observations

Signature of researcher

Name

Title

Email

Dates of observations

Appendix C – Interview schedule

Interview schedule

Research aim:

To evaluate and generate insights into contemporary working practices in sustainable office buildings and implications for resource consumption.
To understand the complexity of elements involved in performing practices.

About the interviewee:

Job title:

Length of employment:

Topic	Questions
Welcome and Introduction	<ul style="list-style-type: none">• Introduce self• Introduce topic. The research is part of a PhD about sustainability in sustainably designed office buildings. I am interested in how sustainability fits into working life at [case study building]. • There are no right or wrong answers so please be honest we want to know what you really think.• Audio recording.• Interested in everything you have to say.• No vested interest. Independent research. Not here to persuade you to change your behaviour. • OK? Sign permission sheet.

Working collaboratively	
<p>Materials</p> <p>Competencies</p> <p>Meanings</p>	<p>Do you work with others regularly? <i>Frequency?</i></p> <p><i>Tell me about meetings in this building? Better/worse than previous offices? How?</i></p> <p><i>Do you use break out areas/meeting rooms/hot desks? What do you take with you/use when you work collaboratively?</i></p> <p><i>What is essential? Are meeting rooms/areas comfortable (clothing, temperature, workplace 'codes')?</i></p> <p><i>Can you describe features of this building that help collaborative working [or not]?</i></p> <p><i>Do you have access/know how to access and use collaborative facilities? Core hours? Hot-desking/meeting room systems?</i></p> <p><i>Does [organisation] encourage this kind of working?</i></p> <p><i>What does it mean to work for [organisation]?</i></p> <p><i>Do you know someone who works collaboratively? Can you describe them? Senior/Junior? Professional?</i></p> <p><i>What helps/hinders working together here?</i></p>

Working flexibly	
<p>Materials</p> <p>Competencies</p> <p>Meanings</p>	<p>What hours do you normally work?</p> <p><i>Where do you normally work? Desk/ hot-desk/ café/ meeting room/home/quiet zone?</i></p> <p><i>Do you work in different areas of the building when you are carrying out different tasks?</i></p> <p><i>Do you have access to all equipment/facilities that you need in different areas of the building? Anything missing?</i></p> <p><i>What is it like if you work early/late in this office? Busy/quiet, comfortable?</i></p> <p><i>What time can you get into/leave the office?</i></p> <p><i>Do you know how to adjust temperature if needed? Were operating systems explained to you?</i></p> <p><i>Do you have a routine if you work late/early – lights? Temperature? Small power loads?</i></p> <p><i>Do you eat/take breaks in the office?</i></p> <p><i>Personal commitments outside of work impacting on schedule?</i></p> <p><i>Does [organisation] encourage flexible working? Why do you think this is?</i></p> <p><i>Do you know someone who works flexible hours at [organisation]? Can you describe them?</i></p>

Getting to and from work	
<p>Materials</p> <p>Competencies</p> <p>Meanings</p>	<p>How do you get to work?</p> <p><i>Do you have access to car and car parking? Does anyone?</i></p> <p><i>Do you have access to a bike and secure bike storage?</i></p> <p><i>Do you share journeys?</i></p> <p><i>Do you use changing facilities/storage areas?</i></p> <p><i>Maps? Timetables? Intranet information? Proximity to public transport? Travel to work schemes?</i></p> <p><i>How do personal commitments impact on how you get to work?</i></p> <p><i>Do you know where to access information about different ways of getting to work e.g. travel to work schemes, car share, timetables, maps? How did you find out where to get this information?</i></p> <p><i>Does the organisation encourage ways of getting to and from work or doing out-of-office work?</i></p> <p><i>Is this part of being a [organisation] employee?</i></p> <p><i>Do you know someone who cycles/walks/takes public transport to work? Can you describe them?</i></p> <p><i>Do you know someone who drives to work? Can you describe them?</i></p>

Taking part in 'office life'	
<p>Materials</p> <p>Competencies</p> <p>Meanings</p>	<p>Can you describe 'office life' in this building?</p> <p><i>Did you fit into any existing groups or routines from previous offices/work?</i></p> <p><i>Are there any clubs/social events in [organisation]?</i></p> <p><i>Where do these take place?</i></p> <p><i>Do they impact on your daily working life e.g. noise levels/comfort levels?</i></p> <p><i>Are there any specific facilities in the building which help/do not help these types of activities to happen?</i></p> <p><i>Do you know where to access information about social activities? How did you find out about this?</i></p> <p><i>How do personal commitments impact on your involvement in events/activities?</i></p> <p><i>Are there any routines that your department/team have that brings you together e.g. tea run, cake day etc.</i></p> <p><i>Does [organisation] encourage you to get to know your colleagues personally as well as professionally/ create a team/department culture?</i></p> <p><i>What is the atmosphere like in your office? Why do you think it is like this?</i></p>

Summary and Close	Summarise with confirmation Review purpose and ask if anything has been missed or if they have any questions. Thanks and end.

Appendix D – Interview consent form

Information and Consent Form Interview: Workplace practices and sustainability

What is this study about?

I am investigating sustainability in office buildings, looking at how sustainability fits into everyday office life.

As part of my PhD research, I will be undertaking a case study at **** to understand links between BREEAM Excellent designed office buildings and sustainable practices *in situ*.

Who is organising the study?

I am a 2nd year PhD Researcher in the Department of Architecture and the Built Environment at the University of the West of England.

What will happen during the research?

You will chat to the researcher and answer questions they ask you. You do not need to answer anything you feel uncomfortable with and can stop the discussion at any time and leave. People generally enjoy taking part in research like this as the researcher is interested in their views.



The research will be recorded so that the researcher can remember what is being said, however what you say will always be reported anonymously. This is strictly confidential research. All recording and notes will be anonymous and any quotes will not be attributed to any participant. All names, roles, office locations will be anonymous and in no way will any participant be identified. No one will hear the tape other than the researcher. Should you wish to read the interview transcript, please contact Louise King at The University of the West of England, Tel 0117 32 ***** or email *****@uwe.ac.uk by [date to be confirmed].

Are there any disadvantages in taking part in this study?

We do not expect there to be any downsides or risks if you take part. However, if you are concerned about any aspect of this research please contact Louise King at the University of West of England, Tel 0117 32 ***** or email louise5.king@uwe.ac.uk or my PhD Supervisor, *****

Confidentiality

All information I collect during the study will be kept strictly private. Information about you will not be stored in conjunction with your name so no-one except the researcher will know it is about you. All the information will be kept in secure premises at the University of West of England. A password protected computer will be used to notes. A password protected computer will be used to store transcripts.

Ethical Approval

All research carried out by the University of West of England is scrutinised by the University Research Ethics Committee. The Committee protects the safety, rights, wellbeing and dignity of all participants. This study has been reviewed and given permission to proceed.

What will happen to the results of the study?

The results of the study will be reported to ****. Findings will form part of the final PhD thesis and may be included in academic journal papers or presentations, however all findings will be completely anonymised. If you would like a full report from the study, the completed thesis or have any further questions please contact Louise King at The University of the West of England, Tel 0117 32 **** or email *****

If you agree to take part in this study, your participation is voluntary and you are free to withdraw at any time without giving any reason.

If you decide to take part you are still free to withdraw without giving a reason and with no negative impact. At your request to withdraw from the study, all data and information provided will be removed from the study and destroyed. Should you wish to withdraw from the study your request would need to be received by [date to be finalised].

Please sign below to confirm you understand what this research is about and how it will involve you and that you give permission for things you say to be recorded and reported (anonymously). You are also signing to say you agree to take part in the research. You will be asked to sign two copies of this consent and information form, one will be retained by the researcher and one for your own records.

Signature of participant

Name

Title

Email

Dates of observations

Signature of researcher

Name

Title

Email

Dates of observations