Developing SMEs towards Environmental Businesses:

A Study of Sustainable Building Energy Service Companies

By

Tochukwu Ben C. Onyido

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GLOSSARY AND ABBREVIATIONS

Glossary

Capacity: The resources, abilities, skills, understandings, and relationships that enable business organisations to meet a given market demand or achieve other corporate objectives and results.

Capacity development: The planning, building and management of capacity.

Competitive advantage: A business organisation's potential superiority over its competitors due to a unique ability, resource and/or strategy.

Economies of scale: The reduction in business costs due to increase in the size of a business activity.

Energy Company Obligation (ECO): A scheme accompanying the Green Deal (see *Green Deal* below) in which big energy supplier companies in the UK fund energy-efficiency home improvements at no upfront costs to the customer. The costs are instead deducted from savings that the home improvements make on energy bills.

Environmental business: The concept of a business organisation that produces environmental goods and services in a manner that solves existing social and environmental problems without creating new ones. The organisation adheres to environmental business values and practices, i.e. it implements socio-environmental responsibility whilst observing environmental business values (see *Socio-environmental responsibility/ Environmental and social business practices* and *Environmental business values* below).

Environmental business values: The environmental and social values maintained by a business organisation that produces environmental goods and services, in order to ensure that new negative environmental and social impacts do not arise from the production, and that the goods and services achieve their intended level of performance.

Green Deal: A major UK government initiative aimed at improving the energy performance of UK residential buildings.

Market differentiation: A business organisation's creation of a distinct corporate identity that sets the organisation apart from its competitors.

Retrofitting: The introduction of sustainable energy products (see *Sustainable Energy Products/Goods* below) into existing buildings in order to improve the buildings' energy performance.

Small and Medium Enterprises: A commercial organisation that has less than 250 employees (according to the UK Department for Business Innovation and Skills)

Socio-environmental responsibility/ Environmental and social business practices: Activities conducted by a business organisation for the purpose of creating positive environmental and social impacts.

Sustainability: The concept of achieving economic prosperity without causing harm to environment and society.

Sustainable energy products/goods: The range of goods produced to alleviate environmental and social problems arising from energy use during the construction and operation of buildings. Examples include renewable energy technologies, insulation, window glazing, and low-energy lighting.

Sustainable energy services: The procurement, distribution, installation, maintenance and other services concerned with the application of sustainable energy products to buildings.

Sustainable energy service companies: Companies that provide sustainable energy services for buildings.

Notable Abbreviations

BES: Birmingham Energy Savers

BIS: United Kingdom's Department for Business, Innovation and Skills

CESP: Community Energy Saving Program

CHP: Combined Heat and Power

CSR: Corporate Social Responsibility

ECO: Energy Company Obligation

EPC: Energy Performance Certificate

FIT: Feed-In Tariff

HVAC: Heating, Ventilation and Air Conditioning

JV: Joint Venture

KTN: Knowledge Transfer Network

MCS: Microgeneration Certification Scheme

MEBC: Midlands Environmental Business Council

NEET: Not in Education, Employment or Training

PV: Photovoltaic

RGF: Regional Growth Fund

RHI: Renewable Heat Incentive

SHAP: Sustainable Housing Action Partnership

SME: Small and Medium Enterprises

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ABSTRACT

As business organisations, Small and Medium Enterprises (SMEs) constantly strive to achieve success in the form of good financial performance, expansion and growth, and positive corporate reputation. However, growing concerns about climate change and other environmental and social issues require companies to have a socio-environmental response as well. The term 'Environmental Business' describes the concept of a commercial organisation that provides environmental goods and/or services in such a way that it addresses intended environmental and social problems whilst avoiding the creation of new ones. The built environment is a major location of energy conservation and carbon emissions reduction efforts, and companies are expanding to take advantage of this market. To expand as environmental businesses, these companies need to develop their business capacity whilst minimising environmental and social problems caused by their operations. This requires a significant adjustment of the traditional capacity development process in order for companies to become more environmentally and socially inclined.

In order to study this adjustment, research was conducted on SME business organisations that provide sustainable energy services for the built environment. This involved an investigation of these companies' approach to capacity development in relation to their realisation of being an environmental business. The research first investigated via participant observation and interviews the values, consequences and barriers associated with the development of capacity in this manner. Using these results, scenario planning cases for major capacity development situations were created, and the extent to which companies were willing and able to function as environmental businesses in these scenarios explored.

The research findings show that companies that provide sustainable energy services implement environmental business values and practices mainly due to potential economic benefits, rather than out of particular regard for environmental protection and social accountability. Companies were found to view capacity development as a singular, economic-led process. Nevertheless, these companies were found to have latent socio-environmental potential in a number of capacity development activities. To exploit this potential, the research utilises systems modelling to describe how companies can adjust traditional capacity development to become more inclusive of environmental business values and practices. Activities that aid adjustment include the localisation of supply chains, sharing of capacity development to similar organisations through collaboration, and using partnerships in their supply chain that pay similar attention to socio-environmental responsibility. The research proposes that an adjusted capacity development process can be achieved by companies understanding these actions better (e.g. through the use of the systems model produced in the research), thus presenting social and environmental business practices as a strategy, rather than simply as a symbolic, goodwill or publicity gesture.

CHAPTER 1

INTRODUCTION

1.1 RESEARCH SCOPE AND BACKGROUND

This research explores how Small and Medium Enterprise (SME) companies that provide sustainable energy services for buildings can develop their capacity to do so in a manner that addresses existing energy-related problems within the built environment without creating new environmental and social ones. Sustainable energy services refer to the supply, installation and maintenance of energy conservation and carbon emissions reduction products such as insulation and renewable energy technologies. Capacity refers to a business organisation's staff, knowledge, systems, relationships with external parties, and financial and physical resources that enable the organisation to achieve its development objectives over time.

As a dominant form of social organization, business enterprises are significant contributors to the impacts of human socio-economic activity on the environment and society (Melville and Ross, 2010). These impacts are not always positive, and they often cause environmental and social damage. Climate change and its attendant issues of energy consumption and atmospheric pollution are significant instances of this damage, along with other occurrences such as soil and water contamination, land degradation, loss of habitats, social inequalities, and the displacement of populations due to conflict over resources (Ekins, 2000). Companies' role in mitigating these adverse impacts of human activity typically includes the provision of environmental goods and services (Brand, 2012; Isaksson et al., 2010; Placet et al., 2005; Elkington, 1998). According to the Organisation for Economic Cooperation and Development, environmental goods and services refer to 'cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use' (OECD/Eurostat, 1999). Within the built environment, which refers to buildings and man-made spaces where people live and work (Mallack et al., 2003), environmental products being developed to address the issue of climate change include sustainable energy goods and services (Khasreen et al., 2009; Comakli & Yuksel, 2004). These range from physical systems, such as insulation and renewable energy technologies, to intangible measures such as public awareness, education and training on the need for responsible energy behaviour by building users (Balaras et al., 2007; Chweiduk, 2003).

While sustainable energy products have the potential to conserve energy and reduce carbon emissions in buildings (Balaras, 2005), previous research suggests that new products alone do not offer a complete solution, and that the use of traditional business, financial and production models could inadvertently increase the negative socio-environmental impacts of companies. This is because these models deterministically assume readily available energy, materials and labour, and do not always take full account of resource conservation and other socio-environmental implications of expanding production (Beamon, 2008). They place only limited obligation on companies to internalise environmental and social costs; instead, the costs are passed onto society in the form of dirty air, unsafe products, labour

exploitation and other adverse socio-environmental effects (Carroll & Buchholtz, 2012; Simpson et al., 2004). Consequently, if companies apply these models, they may not fully take into consideration the new environmental and social problems that their production activities generate (Tolciu, 2010; Gintis, 2009). This situation is further worsened by the risk that the inadequate integration of sustainable energy products into existing buildings, coupled with environmentally irresponsible behaviours of building users, could prevent the products from fully delivering environmental and social benefits upon their installation (Schmidt, 2003; De Simone and Popoff, 2000). The limited success of the products in conserving energy and reducing fuel bills could in turn serve as a disincentive for their further uptake in a still-evolving UK sustainable energy products market characterised by uncertainty (Plows, 2008). The net outcome of the scenario described above is that new environmental and social problems may be created, while existing ones associated with energy use and carbon emissions in buildings may not be significantly reduced, thus leading to an overall intensification of environmental and social damage.

The need then arises for companies to provide goods and services in a way that minimises the creation of new environmental and social problems. Companies that operate in this manner are often referred to as 'environmental businesses' within literature (Hernesniemi, 2007; Schaper, 2005; Chopey & Ondrey, 1997). Over the years, there has been growing emphasis on the need for a sustainable approach to business and economic development which defines success not just in terms of material and financial wealth created, but also in terms of environmental protection and social responsibility (Mendonca et al., 2010; Milani, 2000). By 1985, the prominent American philosopher, Robert Heilbroner, had projected that 'the more successful capitalisms of tomorrow' would be the ones that address 'extreme social and ecological vulnerability' (Heilbroner, 1985). Towards the end of the last century, Dunbar and Foster (1996) reported that a critical judgement of 'what works and what does not' in terms of achieving socio-environmental success alongside economic growth has developed over time. By the turn of the new millennium, within academia and some industries there was a distinct acknowledgment of the need for economic progress to be secured without neglecting accompanying ecological and social issues (Clark, 2000). According to Stanfield and Carroll (2009), 'a serious backlash' had emerged against neoclassical economic assumptions such as global economic integration, or globalisation, 'concomitant increasing inequality, social instability, and cultural discontinuity'. More recently, Bosworth and Clemens (2011) critiqued the view that socio-environmental responsibility limits financial performance, suggesting that there is actually a positive relationship between environmental performance and financial success, and predicting that in the long run firms with poor environmental performance will fall to environmentally superior competition.

In spite of these developments, the overall trend in business and production models has remained economic and has largely overlooked the broader social context (Folmer & Johansson-Stenman, 2011). Business ethics are not regarded as having returns in financial terms, and the intention to achieve a more environmentally and socially responsible form of business is put under pressure when it provides no

benefit to a company in the form of public relations improvement, risk reduction, or paybacks (Isaksson et al., 2010). Consequently, traditional entrepreneurship sees the social responsibility as only a by-product of the creation of economic value (Seelos & Mair, 2005). Placet et al. (2005) acknowledge the practical challenge of developing a sustainable business strategy that incorporates economic, environmental and social goals, stating that it could be met with scepticism within a commercial organization. This is because strategy development within a business setting typically focuses on the expansion of revenue-generating activities and the reduction of non-essential costs, with environmental protection and social responsibility often viewed as costly and undesirable and measured as 'a negative quantity' (Bosworth and Clemens, 2011).

This significance of this issue to SME firms is particularly crucial. SMEs utilise less formal, structured strategy development mechanisms than large organisations (Sluismans et al., 2009). This puts them at risk of competitive disadvantage in a liberalized market system, as they might capture a lower proportion of new demand and face increased monopolization and crowding out by large-scale firms (Zonooz et al., 2011). Within this context, SMEs might be even less inclined than larger firms to pay more attention to environmental protection and social responsibility if they perceive that these do not provide economic benefits for them (Simpson et al., 2004).

In all, despite the increasingly favourable connotations attached to social and environmental business practices, there still remains a significant degree of ambiguity about exactly how traditional business success can be integrated with environmental protection and social responsibility on a consistent basis. It is not always clear in literature the extent to which a company can feasibly implement environmental and social business practices in the light of volatile business climates. Neither is it always clear the exact degree of divergence that exists between traditional business models and an 'environmental business' one.

Since focus is on the prevention of new environmental and social problems, the capacity development stage of companies' operations is crucial, as it represents the preparatory stage before the eventual provision of goods and services (Hall, 2005). Capacity development is described as the process by which organizations improve their human and non-human resources, knowledge, systems, and linkages to other organisations, in order to carry out their functions and achieve desired results over time (Gray, 2006; Morgan, 1997). Based on the background described in this chapter up to this point, the research looks into how SME companies that are involved in the sustainable energy services sector of the building and construction industry can develop their capacity in the manner of an environmental business. It also seeks to create a systems model of how companies can go about transiting from a traditional to an environmental business form of capacity development. The visual representation (via systems modelling) of the transition proposal is beneficial as the use of images communicates meaning and understanding in a more vivid manner (Lozano, 2008).

As indicated above, the research investigates service companies in particular, partly due to the nature of the industrial activity in the location in which the research was conducted: West Midlands, UK. At the time of conducting this research, most of the sustainable energy products installed in the West Midlands County are not manufactured in the UK but are procured from other countries, and there is a relative prevalence of supply, installation and maintenance companies within the region compared to their manufacturing counterparts. The companies investigated in the research are mainly insulation and solar photovoltaic (PV) service companies. This is because at the time this research was conducted, more companies in Birmingham invest in insulation and solar PV systems than in other sustainable energy products, and this translated into greater availability of, and better ease of access to them.

1.2 RESEARCH AIM AND OBJECTIVES

The aim of the research is to analyse how SME companies, that provide sustainable energy service companies for buildings, can carry out capacity development whilst maintaining the values and practices of an environmental business. In order to achieve this aim, the following objectives were set:

Objective 1: Critically review theory concerning capacity development and the environmental business concept.

Objective 2: Investigate the capacity development process in SME companies that provide sustainable energy services for buildings.

Objective 3: Determine the implications of operating as an environmental business for companies' capacity.

Objective 4: Determine the extent to which companies are prepared to adhere to environmental business values and practices in different capacity development situations.

Objective 5: Develop a model of how capacity development can be adjusted from a traditionally economic perspective to an environmental business one.

1.3 RESEARCH RATIONALE

Due to their role in addressing the issue of climate change within the built environment, companies that provide sustainable energy goods and services for buildings are commonly associated with sustainability by default (Brand, 2012; Isaksson et al., 2010; Placet et al., 2005; Elkington, 1998). However, as has been explained in Section 1.1 above, the mere provision of environmental goods and services is not wholly adequate for tackling the climate change problem and preventing the creation of new environmental and social problems by companies. Product provision needs to be combined with the right kind of business processes, and companies need to be able to effectively align the economic goal of business success with the socio-environmental role of their operations. Despite this, there is an

assumption within several literature sources that sustainable energy products always achieve their intended environmental and social benefits once they have been installed in buildings. In addition, as mentioned earlier in Section 1.1, there are gaps in previous research as to how economic success can remain integrated with environmental protection and social responsibility in the face of an ever-changing business environment. Previous studies also do not confirm whether the transition from a conventional business approach to an environmental business one involves large-scale transformation or just an incremental improvement. This thesis attempts to address these outstanding research areas. If environmental and social responsibility can be implemented in such a manner that it adds to, rather than detracts from, a company's economic performance, companies will become more encouraged to lead socio-environmental progress in a way that even the best-intentioned governmental and social sector organisations can rarely match (Porter & Kramer, 2011).

The research's focus on SMEs in particular is justifiable on the basis that there is 'a lack of study' regarding the integration of SME firms' 'interdependent objectives' – economic, social and environmental – and the allocation of limited resources (Tsai & Chou, 2009). While there is empirical evidence to indicate that larger companies are increasingly seeing environmental performance as a strategic issue, SME environmental behaviour is relatively limited and compliance-driven (Worthington & Patton, 2005). Previous attempts by authors such as Hilary (2004) to study SMEs' environmental performance and their adoption of environmental management systems indicate very limited success. Hilary describes it as 'patchy at best and downright miserable at worst'. This is in spite of SMEs being responsible for up to 70% of all carbon dioxide emissions and commercial waste (Worthington & Patton, 2005; Hilary, 1995).

The research investigates capacity development in companies because capacity development represents the preparatory stage of companies' operations. Thus, it serves as the most ideal point at which companies' negative environmental and social impacts can be prevented. The use of models to show how companies can move from a traditional to an environmental business style of capacity development is necessary due to the ability of models (when compared to written words) to provide a faster, more engaging description of what the move involves.

A significant volume of literature already focuses on the manufacture of sustainable energy technologies and systems for buildings. This research on the other hand seeks to gain a better understanding of socio-environmental impacts that are created downstream of manufacturing, within the services sector. While these impacts may be less than those created during the manufacturing stage (Evans et al., 2010; Varun et al., 2009), a distinctive characteristic of environmental products – such as sustainable energy goods and services – when compared to non-environmental ones is that they are intended to achieve better environmental performance over their life cycle, not just at the point of creation (Schaper, 2005). Isaksson et al. (2010) points out that value as well as harm are created along

the entire supply chain, and so focus should be extended across the entire chain 'from the first supplier to the last customer'. By using the sustainable energy service sector as a reference point for the exploration of the environmental business concept in capacity development, the research's outputs complement those of previous studies that cover the area of manufacturing. In this way, the entire product value chain is covered. The sector has further relevance in the sense that while sustainable energy service companies are business organisations, the services they provide lend them environmental significance as well. In view of this research's focus on studying how SMEs can develop their capacity in the manner of an environmental business, sustainable energy service companies provide a case of economic considerations overlapping with socio-environmental ones, in terms of both services provided and processes adopted.

1.4 OVERVIEW OF THE PRIMARY RESEARCH

The research was conducted within the West Midlands County of the United Kingdom, which has the second-largest economy within the UK and is a leading UK city in the implementation of sustainable energy projects within the building and construction sector (Laughlin et al., 2012; AWM, 2009). The research utilised two stages of primary data collection to achieve its aim and objectives. The stages are described in sub-sections 1.4.1 and 1.4.2 below.

1.4.1 The study of capacity development and the effects of socio-environmental practices on capacity:

The first stage involved a participant observation study of a major capacity development programme for the provision of sustainable energy services within the West Midlands, UK. The programme was organised by the Sustainable Housing Action Partnership (SHAP), a network initiative consisting of various small and medium business organizations from the building and energy sectors. The programme focused on the development of labour skills, supply chain, finance and other resources in preparation for the Green Deal. The Green Deal is a UK government scheme aimed at encouraging the widespread uptake of a diverse range of energy conservation and carbon reduction products in buildings across the country, from insulation to window glazing to low-energy lighting and heating systems to renewable energy technologies, and it officially commenced in January 2013 (Richards, 2013).

The participant observation study lasted from February-July 2012 and involved the observation of capacity development activities conducted during the programme, which included management-level representatives of 30 companies that made up the SHAP network. Data was captured via the recording of 23 field notes.

The participant observation study provided information on how the companies participating in the SHAP programme see capacity development and the barriers encountered in the process. Within this context of capacity development, information was also gained concerning how the companies go about minimising the risk of new social and environmental problems arising from their operations. Based

upon an analysis of their responses to this risk, a set of 'environmental business values' necessary for companies to address existing energy-related problems in buildings while preventing the occurrence of new environmental and social problems were inferred.

Alongside participant observation, 20 interviews were conducted for the purpose of finding out how companies' attention to environmental and social business practices can affect their business capacity. The interview respondents were management-level staff of companies that supply, install and maintain sustainable energy products, and the management level was targeted in order to ensure that the interviewees had expert perceptions of the subject matter. A semi-structured approach to interviewing was adopted; this is because semi-structured interviews are ordered but still allow freedom and adaptability in how responses are given by interviewees (Haigh, 2008).

1.4.2 The study of the degree to which SMEs can operate as environmental businesses: The first data collection stage provided information on the process of capacity development and the potential effects to companies of operating in a socio-environmentally responsible manner. The second stage went on to look at the practical extent to which companies are willing and able to implement environmental business values and practices in a range of capacity development situations. The findings obtained from the first stage were used to construct three scenarios that reflect current developments in the UK building and sustainable energy markets. The scenarios also reflect three major options by which companies develop capacity to meet both existing and expected demand for their services. These options are: capacity could lead demand; it could lag demand; or it could exist in approximate equilibrium with demand as demand arises.

Five case studies were done in which the scenarios were presented to management teams in different companies. In each case, the management team made decisions about how its company would respond to the three scenarios. The data obtained provides practical insight into the extent to which the companies are prepared to transform their awareness of environmental business values and practices into actual application.

The research findings were then used to model a transition strategy by which the traditional, economic-led view of capacity development can be broadened into one that is more environmentally and socially inclined.

1.5 THE THESIS STRUCTURE

As mentioned earlier in this chapter, there is a risk that the application of traditional business models by companies that provide sustainable energy goods and services for the UK built environment could inadvertently complicate existing environmental and social problems further. Based upon a review of existing literature, Chapter 2 explores this risk, as well as the organisational responses that have evolved

over time to prevent the creation of new negative socio-environmental impacts by companies. As part of its focus on these responses, the chapter discusses the environmental business concept, and it also highlights the limitations of existing literature concerning the minimisation of companies' negative impacts.

Before investigating how companies can develop capacity in the manner of an environmental business, it is important to gain an understanding of the process of capacity development. Chapter 2 thus goes on to review existing literature concerning traditional perspectives of capacity development and its role in achieving business success. It initially adopts a broad outlook on the topic but then narrows down to the level of SMEs. Likewise, it switches from a focus on businesses in general to sustainable energy goods and services in particular.

While Chapters 2 relies on studies previously conducted by other people, Chapter 3 shifts emphasis towards the primary research. The chapter focuses on the methodology by which the primary research is conducted. The philosophy underpinning the research is discussed, and the data collection and analysis methods used are identified and critiqued. Chapter 4 presents the results of the primary research. It shows data on how the companies investigated in the research develop capacity, the likely beneficial and detrimental effects of environmental and social business practices on companies' capacity, and the response of SME sustainable energy service companies in situations where their capacity exceeds, falls behind, or matches demand for their services. Chapter 5 analyses the findings of the research. It interprets environmental business values from the research results, identifies key capacity development themes and activities, and shows the degree to which companies used as research case studies are willing and able to apply an environmental business approach to capacity development.

Based on the research findings and their analysis, it becomes possible to propose how SMEs can transit from traditional capacity development to an environmental business approach. Chapter 6 conducts such a synthesis of the research outputs. It focuses on modelling how conventional, economic-led capacity development can be adjusted to reflect the environmental business philosophy. Chapter 7 brings the thesis to a conclusion, providing a summary of the research outcomes, identifying limitations of the study, and making recommendations for future research. All chapters in the thesis have an introductory section at their beginning and a summary section at their end.

CHAPTER 2

THE ENVIRONMENTAL BUSINESS CONCEPT AND CAPACITY DEVELOPMENT

2.1 INTRODUCTION

Authors such as Dahmen and Rodriguez (2014) and Yusuf (1995) describe business success as a company's continued stay in operation, while Headd (2003) adds that it also refers to the closure of a business while it is making a profit and before losses accumulate. Within literature the conventional goals of a business appear to be the expansion of market reach, the reduction of business costs, and the enhancement of internal competencies and processes. There is little indication that conventional business models actively consider the impact of companies' operations on the wider environment and society in which they operate and are a part of. Consequently, traditional business is useful for optimising a company's economic performance, it may be less ideal for optimising positive environmental and social impacts of a company's products and processes. For business organisations that provide environmental products, such as sustainable energy services for buildings, it is important for them to adopt a system which ensures that the socio-environmental potential contained within their operations is not eroded by economic considerations. This chapter explores an 'environmental business' approach with which sustainable energy service companies can operate. This approach is intended to enable companies to address energy-related problems in buildings without inadvertently creating new environmental and social problems due to a high level of focus on economic considerations. It is also geared towards ensuring that sustainable energy services deliver optimum environmental and social benefits, as well as ensuring the company's economic success. As part of this discussion, the chapter looks at efforts that have been made by organisations and individuals in recent time to make existing economic, business and production models more inclusive of environmental protection and social responsibility. Limitations of these efforts are identified, such as their limited consideration of the influence of different business climates on companies' socio-environmental performance, and their assumption that environmental goods and services would automatically achieve their intended socio-environmental effects upon their usage.

Regardless of whether a company operates a traditional or environmental business model, the successful maintenance of a business organisation as a viable entity requires a preparatory, capacity development process by which companies' capabilities are strengthened, long-term solutions are put in place, and business opportunities are identified for exploitation. This chapter looks at the role of capacity development in preparing commercial organisations to address market demand and achieve success. Also, capacity development as a deliberate, formal and organized process appears to occur more at the level of multinational corporations and other large-scale business organisations, rather than at the level of SMEs (Sluismans et al., 2009). SMEs are constrained from embarking on well-defined capacity

development programs due to factors such as resource constraints and risk adversity. In this light, it is relevant to study how SMEs can develop capacity in a way that takes account of operational challenges that are peculiar to this class of firms. This chapter explores what capacity and its development entails for business organisations in general and SMEs in particular. It highlights the extent to which small and medium business enterprises formally acknowledge capacity development as a crucial strategy, the circumstances that lead to this extent of acknowledgment, and the relevance of a well-formed capacity development strategy to SMEs.

In all, the rest of this chapter is divided into three main sections: 2.2, 2.3 and 2.4. Section 2.2 introduces the need for businesses to pay greater attention to environmental and social issues affecting the earth. The focus shifts from the earth in general to the built environment in particular, and to the environmental and social benefits that sustainable energy services provide. However, Section 2.2 also draws attention to how traditional business systems could undermine the socio-environmental potential of sustainable energy services for buildings within the UK.

Section 2.3 examines how business models have evolved over time from neoclassical to more multifaceted types, including those which attempt to take greater account of environmental protection and social accountability. It goes on to explore the environmental business concept. In Section 2.4 the chapter's scope is narrowed from business as a whole to the capacity development stage of operations, and from companies as a whole to SMEs. Capacity and its development are discussed, and issues which are particular to SMEs, and which can prevent them from being environmental businesses, are examined. The issue of how companies can transit from a traditional to an environmental business form of capacity development is also looked at from a systems perspective. An additional section of the chapter, 2.5, provides a summary for the chapter as well as highlights areas that the primary research will focus on.

2.2 SOCIO-ENVIRONMENTAL CONCERNS AND THE RESPONSES TO THEM: SUSTAINABLE ENERGY SERVICES FOR BUILDINGS AS A CASE IN POINT

At government, academic, organizational and individual levels on both global and local scales, there is increasing awareness that the earth's ecological system is being damaged by human socio-economic activities. The increasing utilisation of materials and energy to meet the consumption wants and needs of a burgeoning human population is causing environmental and social problems. Carroll & Buchholtz (2012) and Ekins (2000) identify some of these problems as climate change; energy depletion; soil contamination; land degradation; air, water and noise pollution; loss of habitats; social inequalities; and the displacement of populations due to conflicts over resources. Boulding (1991) states that this has given rise to concerns about whether the biosphere, and the human race within it, can respond to the ecological changes that are being produced so rapidly.

Negative environmental and social impacts of human activities can be felt in both the natural and built environments. As was indicated in Chapter 1, this research is mainly concerned with the latter. In describing the built environment, several authors – such as Kostova (2011), Haigh and Amaratunga (2010); Mallack et al. (2003), and Srinivasan (2003) – emphasize that it is human-made or modified, providing a setting for humans to live and work in, and comprised of components such as homes, schools, workplaces, parks, industrial areas, farms, and roads. The built environment can thus be said to encompass buildings and spaces where people live, work and otherwise undertake residential, commercial and industrial activity. While it provides protection and comfort and facilitates human activity, the built environment uses considerable resources and energy in doing so and gives rise to problems concerning waste and water management, habitat preservation, climate change, and energy and land usage, during its construction and use. Eichholtz et al. (2010) states that at a global level, the construction and operation of buildings account for at least 30% of greenhouse gas emissions. Clarke et al. (2008) focus on the UK in their work and mention that nearly half of total UK emissions are ascribed to buildings and their usage, with the built environment also accounting for about 40% of total UK energy consumption. A similar pattern is detected in other parts of the developed world stretching over the past two decades. At the turn of the new century, Rohracher (2001) attributed about 40% of energy consumption and 25% of materials movement in most industrialised countries to the construction of buildings. The United Nations Environment Programme (UNEP /CIB, 2002) noted that the built environment accounted for about 40% of world greenhouse gas emissions and was the largest source of greenhouse gases in Europe. The same organisation (UNEP, 2003) reported that an average of a third of energy end-use in the developed world was reported to go towards heating, cooling, lighting, appliances and general services in residential, commercial and public buildings. Von Paumgartten (2003) provides specific figures for the United States in particular, reporting that non-residential buildings in that country are responsible for the consumption of 30-40% of the country's energy, the contribution of 30-40% of the country's hazardous emissions, the usage of 60% of electricity and 25% of water, the generation of 35-40% of solid waste, the consumption of 25-30% of materials, and the exploitation of large amounts of land. By the middle of the last decade, Roper and Beard (2006) wrote that the built environment was consuming up to 40 per cent of generated energy and extracted resources in most industrialized countries. Construction, maintenance and demolition projects are responsible to a high degree for overall waste generation and materials consumption (e.g. global building construction consumes about 25% of all harvested wood), and the preservation of natural areas and historically significant structures is continuously threatened by the desire for new designs (Roper and Beard, 2006).

While there are a number of ecological and social issues associated with the built environment, the problems of energy consumption and carbon emissions in buildings occupy a conspicuous position. Authors such as El-Alfy (2010) and Banfill and Peacock (2007) identify these problems as the major

ones, while Omer (2008) explains that energy is 'the vital input for economic and social development', and that few activities affect the environment as much as the continually increasing use of energy. On a related note, Mithraratne and Vale (2004) suggest that a building's energy performance is a quick, 'shorthand' indicator of the overall environmental impact of the building. Eichholtz et al. (2010) further emphasise the significance of energy by stating that it represents 30% of operating expenses in an average office building, 'the single largest and most manageable operating expense in the provision of office space'. Cost aside, the extraction, processing and usage of fossil-based energy causes environmental damage, and these energy resources are declining as well (Omer, 2008).

In view of this situation, a variety of goods and services has been, and are being developed to address the energy resource depletion threat and carbon emissions. In the rest of this work, these goods and services are collectively described as sustainable energy products. They are characterised by their emphasis on reducing buildings' reliance on non-renewable energy sources and energy-intensive materials and processes. They include physical systems such as renewable energy technologies, insulation, window glazing, low-energy lighting, and automated heating and metering systems (Roberts & Sims, 2008; Jaber et al., 2004; Jones et al., 2000). They also consist of intangible measures such as sustainable building design, and public awareness and training on energy conservation and energy-responsible lifestyles for building users (Lackner et al., 2005; Hillier, 2004; Chwieduk, 2003). Sustainable energy products have also been categorised in previous research based on their different functions. Becerra et al. (2011) and Omer (2008) classify these products into those that reduce the need for energy by preventing energy loss from buildings (e.g. insulation and low-energy lighting), those that enable the conserved energy to be used more efficiently (e.g. automated energy control and monitoring systems), and those that source energy from low-carbon and renewable sources (e.g. biomass boilers, solar photovoltaic panels, wind turbines and other renewable energy technologies). Omer's work suggests that these 3 product categories can be further distinguished from each other based on their implementation costs (category 3 is the most expensive to implement while category 1 is the least costly) and their environmental benefit (category 1 is rated the most beneficial while category3 is rated the least).

Regardless of how individual products are classified, growth trends postulated within academia and industry indicate a future rise in the value of the sustainable energy goods and services market. Several authors – including Plows (2008), Renner et al. (2008), Schmidt (2008), and Jakob (2006) – suggest that increasing public consciousness about sustainability, government environmental targets and policies, and the effect of economies of scale in lowering product costs, would serve to build demand in the long run. A 2008 report by the United Nations Environment Programme (UNEP) adds that the building sector will be among the highest contributors to the sustainable goods and services market. There exists a very large potential for lowering energy requirements of the current building stock,

ranging from an average of 30% to 80% depending on the building component (e.g. walls, windows, roofs etc.) being targeted (Jakob, 2006), and this potential translates into product sales. Analysing the market potential of some major renewable energy technologies, Renner et al. (2008) state that the manufacture and installation of solar PV modules and components could grow to about £34.7 billion by 2016, while the biofuels market could grow to more than £40 billion by that same time. Renner et al (2008) also estimate that the global market for these products could reach a value of £1370 billion by 2020. Hernesniemi et al. (2007) report a more optimistic version, stating that the global market for sustainable technologies and services is projected to reach about £1900 billion by 2015. Figures by AMA Research (2010) indicate that within the UK, by 2010 there were 95000-98000 micro renewable technology installations, up from 82000 installations in 2004. A report by a (now-defunct) government agency, Advantage West Midlands (AWM, 2009), puts the potential value of the country's retrofitting market at around £6.5 billion.

This growth will have wide-reaching social effects, prominent among them the creation of jobs. Sullivan (2008) states that efforts to make buildings more energy-efficient will create 'millions' of new jobs and will also have a 'greening' effect (i.e. promote greener work practices) on the job responsibilities of an estimated 111 million people worldwide who already work in construction. A report jointly commissioned by major international development institutions including the United Nations Environment Programme and the International Labour Organisation (UNEP/ILO/IOE/ITUC, 2008) state that new-build projects and building upgrades could generate up to 3.5 million additional green jobs annually in Europe and the United States alone by 2020. In the United Kingdom, AWM (2009) estimates that the retrofitting of existing buildings in the UK with sustainable energy products could create up to almost 80000 jobs by 2050. These predictions are lent some credence by current employment trends which suggest that the sustainable energy sector already contributes significantly to job creation. For instance, Fitzgerald et al. (2013) report that the solar thermal industry alone already employs at least 624,000 people.

However, while the future seems positive, the present looks unclear. Literature sources such as Miller & Buys (2008) and Dincer (2000) suggest that current customer attitudes within and beyond the UK have been creating a significant degree of market uncertainty. Giving a specific example, Roberts & Sims (2008) write that UK property developers are reluctant to adopt micro-renewable technologies because of high initial costs, long payback periods, market immaturity, and issues surrounding product reliability. Consequently, they tend to install sustainable energy products mainly in public sector housing – local authority and Registered Social Landlord housing – which receive government subsidy (Roberts & Sims, 2008). While public opinion towards sustainable energy continues to show support, this does not always translate into actual demand for sustainable products.

In the midst of this situation, sustainable energy goods and services are widely acknowledged as a significant contributor to the lowering of the environmental impacts of human activity within the built environment. Companies that provide sustainable energy services for buildings are commonly associated with the green economy and its focus on ecosystem preservation and social development, according to authors such as Brand (2012), Isaksson et al. (2010), and Elkington (1998). This is because of the socio-environmental relevance of these products in terms of energy conservation and carbon emissions reduction. The question then arises about whether mainstream business systems, which traditionally focus on profit maximisation, cost reduction, and the elimination of activity that does not add economic value, are wholly suitable for companies that produce sustainable energy goods and services. Literature is not clear on whether traditional models with a basic inclusion of business ethics are adequate, or whether sustainable energy goods and services require an equally sustainable business model that is not entirely economic-led but conforms highly to environmental and social principles. Neither is it clear whether the companies consider themselves as anything more than a regular business with no more responsibility towards environment and society than the average commercial organisation.

In looking at these issues, the research focuses particularly on companies that provide sustainable energy services for buildings (hereafter referred to as sustainable energy service companies), rather than manufacturing companies. By 'sustainable energy service companies', the thesis refers to companies that are involved in the supply, installation, and maintenance of physical sustainable energy systems, and companies that specialise in intangible sustainable energy measures such as those listed earlier in this section of the chapter. A significant volume of literature already focuses on the manufacturing stage of the provision of sustainable energy products for buildings. Consequently, this research seeks to gain greater insight into additional socio-environmental impacts created downstream of manufacturing, within the services sector. While these impacts may be less than those created during the manufacturing stage (Evans et al., 2010; Varun et al., 2009), a distinctive characteristic of environmental goods and services – such as sustainable energy products – when compared to non-environmental ones is that they are intended to achieve better environmental performance over their life cycle, from the first supplier to the last customer, and not just at the point of creation (Isaksson et al., 2010; Schaper, 2005). The interest in sustainable energy service companies is also due to the nature of the industrial activity in the location in which the research was conducted: West Midlands, UK. At the time of conducting this research, most of the sustainable energy products installed in the West Midlands County are not manufactured in the UK but are procured from other countries, and there is a relative prevalence of supply, installation and maintenance companies within the region in comparison to their manufacturing counterparts.

Researchers have previously conducted environmental and social impact assessments of the development, transportation, installation, maintenance and decommission of various sustainable energy

products. Various studies, such as those conducted by Evans et al. (2010), Fthneakis & Kim (2009), Papaefthimiou et al. (2009), and Papadopoulous and Giama (2007), indicate that major products, such as renewable energy technologies, insulation products, and sustainable fenestration products (e.g. multiple-glazed windows), are materials and energy intensive at the production stage, from raw materials extraction to the installation of the finished products in buildings. From a social angle, the cost of energy generated from sustainable sources is generally higher than of fossil energy (e.g. Evans et al., 2010; Akella et al., 2009). In all, the provision of sustainable energy goods and services appears to have negative socio-environmental impacts that are comparable with other industries to a significant extent.

Against this backdrop, there are attendant issues within the UK market that may further worsen the environmental and social impacts of companies that provide sustainable energy goods and services for buildings. These are discussed in subsections 2.2.1, 2.2.2 and 2.2.3 below.

2.2.1 Conventional Economic Models and their Limited Consideration of Socio-environmental Impacts:

Work by Carroll & Buchholtz (2012) and Daly (1991) suggests that in order to minimise negative environmental and social impacts of their activities, companies may need to internalize environmental and social costs, rather than pass them onto society in the form of dirty air, unsafe products, labour exploitation and other adverse socio-environmental effects. A notable early literature reference to the issue of internalising externalities (environmental and social costs) was made by James Meade in 1973. Meade refers to an externality as 'an event which confers an appreciable benefit' or 'inflicts an appreciable damage on some person or persons who were not fully consenting parties in reaching the decision or decisions which led directly or indirectly to the event in question'. Meade's definition, which by his own admission is 'straightforward and innocuous', suggests that externalities do not necessarily have to be negative, and that humans (as opposed to other living and non-living components of the ecosystem) are the principal subjects of the benefit or harm that an externality produces.

Subsequent literature sources since Meade's book (e.g. Carroll & Buchholtz, 2012; Placet et al., 2005; and Stock et al., 1997) include the entire ecosystem, rather than just humans, as victims of negative externalities; however, like Meade also alluded in his work, they state that the internalisation of socio-environmental costs increases production costs, and that this raises product prices and makes them less competitive in the marketplace. Jaffe et al. (2005) indicate that internalisation of costs can involve the replacement of products or production methods that cause externalities, the purchase of specialised equipment or other resources to reduce externalities, or even a reduction of production levels by a company. Companies could thus look at internalisation as an economic burden, more so since Meade (1973) concedes that a moderate amount of an externality may only do little damage to society, whereas

the cost of complete elimination of the externality might be exceedingly high. However, the central argument in literature is not that socio-environmental considerations should take overwhelming pre-eminence over economic realities. Rather, it is that traditional economic and business models make only limited allowance for companies' internalisation of social and environmental costs. Indeed, according to Lozano (2008) and O'Boyle (1999), an opposition could well be set up between the 'value-laden' philosophies of environmental protection and social responsibility on the one hand, and traditional perspectives of business success on the other. This is because socio-environmental responsibility does not always have a strong, immediate, beneficial link to business productivity and economic performance within the traditional context (Schmidt, 2003). Thus, the traditional business perspective may not provide a true picture of the advantages of socio-environmental measures to a company (Mithraratne & Vale, 2004).

With the primary emphasis of conventional economic models being on financial success, environmental and social responsibility may be regarded by companies as something of an inconvenience (Andrews, 1998). A study by Simpson et al. (2004) indicates that traditional SMEs are of the view that since environmental costs are not transferable to customers, they do not contribute to competitive advantage. Growth is promoted over sustainability, and by implication the consequences of the finite nature of resource supply is understated (Beamon, 2008). The placing of value on external stakeholders such as society and the ecosystem, rather than just on internal company growth, could be viewed as costly and unnecessary (Placet et al., 2005). Conventional business systems do not place ownership of, and accountability for, the environment on the business community, and sustainability issues are often viewed as problems to be handled by government bodies rather than as opportunities for growth (Tebo, 2005). Traditional objectives of cost and risk reduction dominate business decision-making, and regulatory intervention by government, rather than voluntary action, often drives businesses' environmental decisions (Andrews, 1998). Sovacool (2009) and Brower (1990) write that the mainstream market ignores to a significant extent the social and environmental costs and risks associated with fossil fuel use, and thus relatively harmful energy sources are lent market advantage over relatively benign, sustainable ones. Companies may insist on social and environmental investments being justifiable in terms of higher revenue, lower expenses, or other forms of financial payback, rather than on external social and environmental benefits (Isakkson et al., 2010). In trying to balance economic success with socio-environmental obligations, they may prefer to direct spending towards newer, less capital-intensive efforts, such as new construction, rather than towards the more complicated problem of retrofitting existing buildings (Isakkson et al., 2010).

Thus, for sustainable energy service companies, the environmental and social potential of their services are at risk of being undermined by the limited attention traditionally paid to companies' environmental and social performance. There is a counterargument by some researchers, including Varun et al. (2009),

Zhu et al. (2009), and Huberman and Pearlmutter (2008), that negative environmental and social impacts of companies' activities would ultimately be erased by the eventual deployment of sustainable energy products in buildings and the environmental and social benefits that would arise as a result, such as the enhanced environmental performance of buildings and an increase in energy cost savings for building users. However, this argument does not always take into account other complicating factors that arise from technical and social causes and the UK market, as discussed in 2.2.2 and 2.2.3 below.

2.2.2 Technical and Social Limitations of Product Performance:

There are limitations in the technical understanding of companies that produce, install and maintain sustainable energy products, about how to make the systems perform at an optimum level within buildings (Dombayci, 2007). Brown and Vergragt (2008) write that there appears to be a 'disconnect between the technical know-how and the availability' of energy-saving products on the one hand, and 'their incorporation into the daily practices, routines and professional norms' of would-be users of the products. Other authors such as Smith (2007), Walker & Cass (2007), and Elzen et al. (2004) support this view. This is particularly pertinent in the case of retrofitting existing, older buildings with modern sustainable energy products.

Omer (2008) states that the incorrect installation of sustainable energy products in buildings, as well as failure to implement the right solutions for a specific building, can lead to the failure of products to achieve energy efficiency in buildings. Compatibility issues exist in the form of negative visual impacts of add-on technologies such as solar PV, and in the damage of older building structures, such as where the vibration of wall or roof-mounted wind turbines result in the toppling of chimney stacks and gable ends (Roberts & Sims, 2008). Intermittency problems are also well documented in literature. For instance, Celik et al. (2007) writes that the energy generation potential of solar photovoltaics is limited during nights as well as cloudy days, while Evans et al. (2009) mention that geothermal power comes with a risk of short-circuiting if an inappropriate site is chosen for the reinjection process. Verbung & Geels (2007) state that small-scale turbines hardly produce energy when wind speeds are lower than 3 m/s, and due to the risk of damage they may not be operated at wind speeds higher than 25m/s. Jakob (2006) suggests that the less space there is in a building, the lower the efficiency of ground source heat pumps. Dombayci (2007), Comakli and Yuskel (2004), Huijbregts et al. (2003) and Peuportier (2001) indicate that the use of insulation products that fall below the adequate insulation thickness for a given region prevents the products from performing to their full potential. Conversely, increasing insulation above the adequate thickness deteriorates the useful share of 'free' heat (solar heat gains plus heat from people and electrical appliances), and thus the overall energy efficiency gained through insulation decreases (Jakob, 2006). A study by Gross (2004), which estimates the performance of various renewable energy technologies in the UK by 2025, indicates that the practicable output of technologies is on average only about 3-21% of their technical potential. More recent authors such as Evan et al.

(2010) and Omer (2008) similarly draw attention to the inadequacy of renewable energy technologies to provide UK's energy needs.

In the light of this situation, two courses of action are apparent: the current supply capacity of renewable energy sources could be increased, and/or overall energy consumption could be reduced. However, the second route, the reduction of energy consumption, is hindered by poor environmental behaviours of building users and their inability to use sustainable energy products according to the system design, according to authors like Folmer and Johansson-Stenman (2011) and Stern (2000). Energy consumption has become an ingrained part of modern society that people do not always think about how it is produced, how it gets to them, and how to value it (Sovacool, 2009). Omer (2008) points out that quality of living standards and energy demand rise together, as evidenced by the consumption of 75% of the world's energy supply by the wealthy industrialised economies, which contain 25% of the world's population. Sovacool (2009) and Kemp & Rotmans (2005) indicate that historically plentiful sources of natural resources, including fossil fuels, have led to a public expectation that energy supply should be both cheap and never-ending. Lester et al. (2005) acknowledge this situation by stating that sustainability proponents need to consider how to economically preserve the services and lifestyles in developed countries that have historically been provided by high per-capita fossil energy consumption. Similarly, Omer (2008) states that it is 'unlikely' that consumers would tolerate any reduction in the quality of service, even if this were the result of the adoption of sustainable energy measures. Such an attitude towards energy has led to a shift from self-restraint and moderation to a habit of 'sheer abundance and limitless consumption' (Sovacool, 2009).

In addition to the availability of sustainable energy products, the knowledge of the public about the existence of the products, and the motivation of the public to purchase them, the proper utilisation of installed products is another pivotal condition for the realisation of energy savings (Boonekamp, 2006). Work by Sinha (2009) and Forsyth (2005) indicate that while favourable public perceptions of sustainable energy products have risen as awareness about their potential advantages have increased, intended users have not properly understood new technologies or principles of sustainable energy use. Sovacool's (2009) extensive research project involving diverse stakeholders in the electricity utility sector provides insight into public energy consumption behaviour. His research findings indicate, for instance, that people do not often utilise the option of saving fuel by closing off unused rooms, and that since many apartment and office buildings are designed with windows that cannot open due to safety reasons, this makes it impossible to rely on natural heating and cooling. In addition to technical improvements in the development of energy conservation and carbon reduction products, changes in human lifestyle are necessary to effect a transition towards the improved environmental performance of buildings (Brown & Vergragt, 2008). A more rational use of energy and the effective use of energy-efficient products are important bridges to help transition from fossil to non-polluting forms of energy,

according to Omer (2008) and Ueno et al. (2006). Sovacool (2009) advises that such a change is more likely when people acknowledge that their own energy consumption is wasteful and accept personal responsibility, rather than blaming utility companies, politicians, other consumers, and foreign countries that produce crude oil and other fossil energy sources.

2.2.3 UK Market Uncertainty: In the still-evolving UK sustainable energy products market, the technical potential of the products is further limited by market issues. Sinha (2009) mentions that there is a lot of uncertainty over 'costs, economic benefits, reliability and ...performance' of sustainable building technologies. Foxon et al. (2005) similarly emphasise the uncertain nature of the UK renewables industry, while Wustenhagen et al. (2007) describe the UK as being 'only at the beginning of the diffusion curve' for renewable energy. Consequently, in a liberalised market system in which consumer choice is lauded as the best support mechanism, there is a risk that consumer and investor apathy towards sustainable energy products could play a greater role than governmental environmental targets and intervention in deciding the fate of the products (Batley et al., 2001).

Despite growing favourable general opinion about sustainable energy products, getting the public to purchase remains a significant challenge (Forsyth, 2005). Brown and Vergragt (2008) warn that 'the observed growing interest in green buildings does not guarantee that such a change is imminent', and that green buildings may ultimately 'become monuments to short-lived fashion or a prestige-seeking behaviour by some well-financed enterprises'. Professional building assessment standards used in the market, such as the UK's Code for Sustainable Homes and Building Research Establishment Environmental Assessment Method (BREEAM), could 'become no more than a checklist for developers seeking public recognition and government subsidies' (Brown & Vergragt, 2008). Research conducted by Foxon et al. (2005) into the market penetration of various renewable energy technologies indicate that relatively mature technologies such as biomass combustion systems and Combined Heat and Power (CHP) systems still record penetration levels below what would be ideally expected based on their level of market maturity.

Sovacool (2009) attributes the limited purchase of sustainable energy products to the inadequate ability of individuals and firms to 'use, store, retrieve, and analyse information about energy', arguing that the public benefits provided by the products are not well valued. Brown and Vergragt (2008) write that building location and appearance, as well as the nature of the host community, often take precedence over building energy performance in the public's home purchase decisions. Where the ownership of a building does not last over a long period, investment in sustainable energy and other green products becomes difficult to justify (Brown & Vergragt, 2008). The limited nature of the public's purchase intentions in turn result in real estate agents, who see themselves as serving customers' wants, not using energy performance as a selling point (Brown & Vergragt, 2008). Green buildings are often regarded as expensive to set up (Bartlett & Howard, 2000). Schmidt (2008) wonders why this is so, arguing that

there are already existing cost-effective options (e.g. insulation and the construction of a new building in such a manner that it takes advantage of natural light and heat), and that implementation costs reduce as more experience is gained over time and mass production methods are employed. Schmidt's view is supported by Sinha (2009), who states that there has been a decreasing trend in costs as economies of scale becomes more prevalent, while Kats (2003) agrees that costs drop steadily further as the number of green buildings increase, experience in green building design is gained, and green products are incorporated into buildings earlier, i.e. at point of construction rather than as retrofits in existing buildings.

The limited penetration of, and underinvestment in, sustainable energy products even in the face of their potential benefits and dropping costs of implementation, is described by Jaffe et al. (2005) as an 'apparent paradox', and it has been the subject of analysis by several authors. Earlier literature related to this includes Shove's (1998) work, which reasons that if those who are in a position to invest in energy-saving technologies don't directly benefit from lower fuel bills (e.g. landlords who don't live in the same building as their tenants, or owners of rented office buildings or shop malls), their motivation to do so is reduced, despite the energy-saving potential of these products. The same situation applies where a building design contract utilises a fees structure in which the designer is provided with little financial incentive to factor energy-efficiency into the building's design (Shove, 1998). Subsequent studies by Boonekamp (2006) and Roper & Beard (2006) support Shove's position. Another earlier work by Simon Guy (1998) provides further instances of the influence of market factors in limiting product diffusion. It points out that in times of economic boom within the UK, property developers tend to increase building specifications, with energy-intensive technologies spreading to 'become the norm'. In times of recession, however (such as in the case of the recent global economic downturn which started in 2008), it is building users rather than developers who have greater influence, as issues of running costs come to the fore, with 'immediate consequences for energy-related design' (Guy, 1998).

Like Guy, Jaffe et al. (2005) refer to the principal-agent relationship between a builder or landlord on the one hand, and a purchaser or tenant on the other. If the purchaser has incomplete information about the magnitude of the energy savings that may result from sustainable energy products, the builder or landlord may not be able to recover the cost of investment in these products, and hence might not undertake them (Jaffe et al., 2005). Gray and Talberth (2011) warn that a reliance on natural market forces such as the economies of scale may further limit the diffusion of sustainable energy products and contribute to market uncertainty. This is because an unexpected rise in the cost of energy, coupled with the products' unfavourable reputation for limited technical performance, could influence consumers to opt for energy sources that they perceive to be cheap and reliable – fossil fuel-based energy sources – and stagnate or revert whatever growth has been recorded in the uptake of sustainable energy products (Verbung & Geels, 2007). Another instance of limiting market circumstances is provided by

Boonekamp (2006), who writes that decisions on implementing a more energy-efficient system are taken only at the 'natural moment', that is, when old equipment must be replaced, as the earlier investment in equipment is not yet depreciated. In this manner, economic considerations override the need for immediate energy-efficiency action.

2.3 CHANGING BUSINESS MODELS AND THE ENVIRONMENTAL BUSINESS CONCEPT

Subsections 2.2.1 to 2.2.3 show that the usage and effectiveness of sustainable energy products in buildings can be limited by the following factors: the creation of new negative socio-environmental impacts during the production of the products, the limited performance of the products in buildings due to technical and social reasons, and the low uptake of the products in an uncertain UK market. A combination of these factors could create a situation in which energy conservation, carbon reduction and energy cost savings are not significantly achieved, while new environmental and social problems arise, thus leading to an overall intensification of environmental and social harm. This view is echoed by Chappells and Shove (2005), who warn that in the UK 'a real danger' exists that responses to the climate change problem could only 'increase energy demand and CO_2 emissions even further'. It is thus necessary for companies that provide sustainable energy goods and services to operate in such a manner as to minimise their adverse socio-environmental impacts, in addition to achieving optimum product performance and raising market demand for their products. However, as mentioned in the previous section of this chapter, conventional business systems do not fully allow companies to perform in this manner.

This section is therefore divided into two parts. The first, 2.3.1, examines economic and business models and how they have developed over time, particularly with respect to the issues of environmental protection and social accountability. The second part, 2.3.2, explores the concept of an 'environmental business' system that can achieve optimum balance between companies' economic and socio-environmental roles.

2.3.1 Evolutionary Trends in Business and Economic Systems

Table 2.1 presents a timeline of significant developments that have influenced economic and business thinking over the last few centuries. This is then discussed in subsequent paragraphs.

Pre-19th century:	1890-1940:	1940-1980:	1980-2000:	2000-2010:
Thomas Malthus writes about the limits to population growth which are caused by resource scarcity (Mebratu, 1998).	The Social Gospel Movement emerges in the 1890s and eventually declines (Bateman, 1998). Max Weber criticises the '*Homo Oeconomicus*' concept in 1904. Institutional economics emerges and is later overshadowed by Keynesian thinking (Bateman, 1998).	Intellectual criticism of neoclassical economic thinking grows (Folmer& Johansson-Stenman, 2011). Environmental Economics and Social Economics emerge as distinct economic sub-disciplines (Pearce, 2002; O'Boyle, 1999; Dugger, 1977). The term 'Corporate Social Responsibility' comes into use (Carroll & Buchholtz, 2012). The 1972 UN Human Environment conference acknowledges the importance of using environmental assessment as a management tool (Mebratu, 1998). The Club of Rome group draws attention to the limits of industrial growth (Mebratu, 1998). Sustainable Studies emerges as a formal discipline in 1974 (Lozano, 2008). In its 1978 review, the United Nations Environment Programme (UNEP) uses the term 'Eco-development' to refer to the process of balancing environmental concerns with industrial growth. Ernest Schumacher publishes 'Small is Beautiful' in 1979.	The International Union for the Conservation of Nature produced the World Conservation Strategy (Mebratu, 1998). The use of 'appropriate technology' was championed in the 1980s (Mebratu, 1998). The Brundtland Commission report on Sustainable Development was released in 1987. John Elkington introduces the term 'Triple Bottom Line' (Suggett & Goodsir, 2002).	The United Nations Environmental Programme (UNEP) releases a report on the development of a green economy.

Table 2.1: Significant Environmental Literature Over Time

Traditional business, economic and production models have constantly come under close scrutiny over the years, with new concepts emerging. This is partly due to the tendency of industry practitioners and

academics to sometimes think wider than the normal scope of their disciplines. Even classical thinkers like Adam Smith, Thomas Malthus, and Karl Marx, all widely regarded as founders of modern economic systems, did not always analyse economic problems within a strict economics perspective (Folmer & Johansson-Stenman, 2011). They sometimes bounded this analysis within the framework of moral philosophy, religious studies, psychology, political science, sociology, and law (Folmer & Johansson-Stenman, 2011). According to Mebratu (1998), Thomas Malthus is considered the first economist to foresee the limits to human population growth caused by the scarcity of resources. While belonging to the classical economic tradition, Malthus was at variance with some basic principles, and his 'theory of population', which was a response to the unpleasant effects of the industrial revolution (such as poverty, unemployment and disease), ran contrary to the ideas of other classical philosophers such as William Goldwin and Marquis de Condorcet (Mebratu, 1998).

By the early 20th century, the portrayal of humans within traditional economics as *'Homo Oeconomicus'*, a creature driven absolutely by economic motives and rationality, untiringly dedicated to the purpose of acquiring economic goods, was being critiqued (Oakley, 1997). For instance, the German philosopher Max Weber (1904) counters the *'Homo Oeconomicus'* viewpoint, describing it as limited, and arguing that man is also influenced by non-economic motives, and that humans as agents in economic processes are 'endowed with the capacity and the will to take a deliberate attitude towards the world and to lend it significance'. It was not only in Europe that classical economic foundations were being challenged. In the United States between the late 19th century and early 20th century, a campaign for a more ethically-conscious economic system gained significant prominence. According to Bateman (1998), the driving forces behind this included the Christian-inspired Social Gospel movement of the 1890s, which advocated the addressing of social issues, relying on an evangelical, non-empirical standpoint. Another driving force was the promotion of institutional economics, led by John Commons, which was more scientific and empirical but was also based on activism (Bateman, 1998). However, the onset of the Great Depression in the 1930s, and the rise of Keynesian neo-classical economics, led to the decline of what Bateman (1998) calls 'ethical economics' in favour of 'scientific economics'.

During the mid-to-late 20th century, limitations in neoclassical economic thinking began to be highlighted within intellectual circles. Conventional neoclassical assumptions that humans always exhibit stable and consistent preferences, possess complete market information, and are entirely driven by self-interest were increasingly criticized for not taking account of human subjectivity, social relationships and the role of intuition and emotion in decision making (Folmer & Johansson-Stenman, 2011). For instance, the Nobel-prize winning social scientist, Herbert Simon (1957), states that individuals only have limited information and limited capacity for processing it, and that they tend to make good enough choices rather than optimal ones. Consequently, according to Sovacool (2009),

humans are only as rational as their limited computational capabilities and incomplete information permit them to be, a condition which Simon (1957) describes as 'Bounded Rationality'. A new economic sub-discipline, social economics, also emerged during this period, described by O'Boyle (1999) as an incorporation of moral questions into economic analysis, and a rejection of the mainstream economic 'Invisible Hand' proposition that the common good is served whenever individuals pursue their respective economic self-interests. Dugger (1977) defines a social economist as an economist who studies the problems of the disadvantaged – the poor, the unrepresented, the sick, the aged, and broken families – and uses the acquired understanding to propose remedies. Social economists affirm that the primary goal of the economy is meeting human material need, with human wants subordinate to this need, thus raising up the challenge of integrating poverty into consumer behaviour theory (O'Boyle, 1994). While mainstream economics recognizes competition between producers as the single organizing principle behind the achievement of equilibrium between the forces of supply and demand, social economics recognizes cooperation as well, which can be achieved by 'marketplace agreement' between buyers and sellers (O'Boyle, 1999).

In the early 1970s in Rome, a group of prominent scientists and concerned citizens, which later came to be known as the Club of Rome, produced a report stating that the economic growth model of the 1960s and 70s looked set to cause industrial activity to exceed ecological limits (Mebratu, 1998). Institutional terminologies aimed at reconciling the environment with industrial development ranged from 'Environment and Development', 'Development without Destruction', 'Environmentally-sound Development', and eventually became 'Eco-development' (Mebratu, 1998). The practice of Corporate Social Responsibility (CSR) similarly emerged out of concerns that business organizations are not showing enough care for social, environmental and ethical issues, and it requires companies to consider their actions in terms of a whole social system and their effects anywhere in that system (Carroll & Buchholtz, 2012). Davis (1973) defines CSR as ' *the firm's consideration of, and response to, issues beyond the narrow economic, technical, and legal requirements of the firm*' in order to '*accomplish social benefits along with the traditional economic gains which the firm seeks*'. Husted (2003) adds that CSR could be governed in-house – e.g. via charitable contributions – or through outsourcing or collaborative arrangements – e.g. partnerships between a business firm and a non-profit organisation. By 1979, notable economist Ernest Schumacher had published his book '*Small is Beautiful*', which bemoaned the failure of traditional economics to bring 'non-economic factors' into the policy-making process, and which introduced the concept of 'appropriate technology' in response to the rapid depletion of natural resources and the devastation of the environment (Mebratu, 1998). The promotion of appropriate or intermediate technology – technology that pays particular attention to availability of natural resources, human population levels, and extent of labour skills – carried on into the next decade (Mebratu, 1998). This took place alongside other noteworthy events such as the development of the

World Conservation Strategy by the International Union for the Conservation of Nature (IUCN) in a bid to integrate industrial growth and environmental concerns (Mebratu, 1998).

During this period, the idea of sustainability began to be shaped into a formal and well-defined concept. Various definitions of sustainability, such as by Dunphy et al. (2007) and Waage et al. (2005), refer to the amount of consumption that can be continued indefinitely without degrading the soil, atmosphere, plant and animal resources that collectively form the basis of all ecosystems. Attendant concepts include the Triple Bottom Line, attributed to John Elkington, which seeks to encapsulate for business the three key spheres of sustainability: economic (the firm's creation of material wealth, including financial income and assets), environmental (the protection and conservation of the natural environment), and social, which is about the quality of peoples' lives (Wiedmann & Lenzen, 2009; Suggett & Goodsir, 2002). By 1985, a prominent philosopher, Robert Heilbroner, was predicting that '*over the long run, it …seems probable that the more successful capitalisms of tomorrow will be those that address …extreme social and ecological vulnerability*' (Heilbroner, 1985).

Carroll and Buchholtz (2012) state that the concept of sustainability was derived from the notion of sustainable development. An often-quoted definition of sustainable development in literature is that which was made in the UN Brundtland Commission Report 'Our Common Future' in 1987, which states: *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs* (Brundtland, 1987). Brand (2012) states that sustainable development was a '*strategy of global environment and resource management, of ecological modernization and – at least at the beginning – an attempt to reconcile environmental problems with those of development*'.

In the 21st century, business, economics and production can be said to have moved decisively beyond neoclassical assumptions, and there is a conspicuous opposition to neoclassical thinking (Gintis, 2009). Other authors support this position. Stanfield and Carroll (2009) describe conventional economic analysis as 'static and ahistorical'. They go on to state that '*a serious backlash has arisen*' to challenge '*neo-liberal*' global economic integration (or globalization) and its '*concomitant increasing inequality, social instability, and cultural discontinuity*'. Lozano (2008) mentions that '*conventional scientific traditions based on reductionistic cause-effect relationships fail to explain and address the complex dynamic inter-relations among economic, environmental, and social aspects*'. Clark (2000) notes that the current economic challenge lies in securing economic progress alongside addressing accompanying ecological and social issues. O'Boyle (1999) states that since human action in economic affairs frequently has ethical dimensions, it follows that economics should be a 'moral science'. Likewise,

Zafirovski (2000) alludes to the influence of moral dimensions and 'ethical components' in defining the parameters of market transactions in modern economies. Further concepts have evolved in the wake of sustainable development. According to Carroll & Buchholtz (2012), in more recent times CSR has widened into the broader term 'Corporate Citizenship', which incorporates not only CSR principles of accountability and obligation, but also the actions (termed 'corporate social responsiveness') and outcomes (termed 'corporate social performance') that evidence CSR. Another of the more recent major terminologies in the sustainability discourse is the Green Economy, which has emerged within the last decade. Based on literature sources such as Barbier (2011), Mendonca et al. (2010), and Makower and Pike (2009), the green economy can be said to view economic growth not as a barrier to environmental protection and social balance, but rather as a necessary route to, and opportunity for, the alleviation of poverty and other social disparities, and the preservation of the earth's ecosystem.

However, despite progress in the emergence of social and environmental concepts in response to the shortcomings of mainstream economic systems, these concepts are not without criticisms of their own. Earlier criticisms include the difficulty of measuring sustainable development (Pearce & Atkinson, 1993) and the lack of adequate human ability and knowledge to implement sustainability to its full potential (Kates et al., 2000). Nagpal and Flotz (1995) allude to the difficulty of arriving at a universal approach to pursuing sustainability, stating that '*a single, globally acceptable end-point will either be so general*' as not to alleviate criticism of the sustainability concept, or it would be '*so culturally specific that it will be rejected by many who do not identify with it*'. A more recent argument against the manner in which socio-environmental thinking is carried out is offered by Folmer and Johansson-Stenman (2011). They point out that socio-environmental concepts are prone to the same vulnerability of which mainstream economic thinking is accused of: the assumption that humans always make rational and informed decisions. Previous empirical studies on human consumption behaviour suggest that the reverse of this assumption is the case; that human behaviour is often irrational and is limited by the social setting in which a human exists and the behaviour of other individuals and institutions within that setting (Tolciu, 2010; Brennan & Buchanan, 1985). This disconnection between theory and empirical evidence regarding human behaviour leads to an oversimplification of reality (Folmer & Johansson-Stenman, 2011).

Holmes (2007) mentions that despite sustainability being presented as an antithesis to mainstream economic systems, it endorses capitalism and '*lessens the force of more purely moral arguments to engage in conservation behaviour*'. Holmes' argument suggests a criticism that due to practical expediency, sustainability may deviate from its philosophical ideals. Somewhat ironically with regard to this point, another major criticism of the environmental-social paradigm is that while it is adept at identifying the drawbacks of mainstream economic, business and production models, it does not always come up with practical and workable solutions to address these drawbacks. Instead, its proponents often

make the assumption that environmental protection and social responsibility can be pursued largely independent of the specific local conditions in which the pursuer operates. Lozano (2008) suggests that many models of sustainable development are as guilty as traditional business, financial and production models in not achieving integration and interrelatedness among social, environmental and economic aspects. Tsai and Chou (2009) mention that the general objectives of sustainable development may be understood through theories, but a consistent methodology to achieve and maintain sustainable development is difficult in practical terms. Kemp and Rotmans (2005) state that there is a conflict between the short-term goals of environmental policy and the long-term change required for sustainability, and that while the goal of sustainable development has been accepted, there is a paucity of 'concepts and tools' to work towards it. Mebratu (1998) points out that the pro-sustainability camp often tends to over-rely on values and ethics-based arguments, portraying ethics as the means to the end, rather than as just an important attribute of a given means to the end. He suggests that a call for a change in human attitudes cannot be conducted in isolation to a wider examination of the physical, institutional and intellectual contexts within which humans make choices and decisions.

Carroll and Buchholtz (2012) argue that in industrialized countries, the cost of environmental protection and social responsibility is often passed onto consumers by way of higher product prices. Unless firms in other parts of the world follow suit, there could be a dissipation of industrialised countries' competitive advantage in the international market, which was previously gained through technological advancement (Carroll & Buchholtz, 2012). Brand (2012) goes so far as to state that sustainable development 'has failed' due to the absence of relevant socio-economic actors needed to significantly push this strategy. In a similar vein, Haberl et al. (2011) and Rockstrom et al. (2009) suggest that within the past two decades there has not been a decline in the rate at which the earth's resources are being consumed globally. Omer (2008) notes that emission of carbon dioxide (CO2), the most significant contributor to potential climate change, occurs primarily from fossil fuel production, and as a result efforts to control CO2 emissions could have negative consequences for economic growth, employment, investment, trade and standard of living. Overall, while there is support in literature for greater attention towards environmental protection and social accountability, a significant level of pessimism about the success potential of socio-environmental practices can also be detected.

2.3.2 The Environmental Business: Achieving Balance between Economic and Socio-environmental Aspects

Attempts have been made within literature to present companies that produce environmental goods and services as having a distinct identity from other business organisations. Environmental goods and services, according to the Organisation for Economic Cooperation and Development (OECD/Eurostat, 1999), refer to 'cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use'. A notable classification used to categorise companies that are involved in

the production of environmental goods and services, such as energy conservation and carbon emissions reduction products, is the term 'Environmental Business'. For instance, Hernesniemi et al. (2007) write that an environmental business can be defined as a business that performs any of the following activities: the production of clean technologies; the production of environmentally-friendly products and materials; the provision of waste conversion and recovery services (such as recycling); the production of renewable and low-emission energy; the provision of energy-efficiency services; the provision of environmental management services (such as water management, air pollution control, soil protection, and noise abatement); the collection and monitoring of environmental data; and the conducting of public relations and administrative duties regarding environmental protection. Hernesniemi et al. (2007) further write the following:

'*The environmental business strives to prevent, reduce, offset or completely eliminate as well as correct negative environmental externalities spawned by economic activities. The environmental business also includes ancillary activities related to training, research, consulting and financing as well as measurement, monitoring and certification. The aims of the environmental business can be fostered by reducing use of natural resources, limiting pollution, preventing creation of waste and emissions and by clean-up of environmental accidents*'.

Schaper (2005) uses the term 'environmental business' in the same manner as Hernesniemi et al. He writes that an environmental business is classifiable under at least one of the following segments: the development of environmental technology, the provision of environmental management services (i.e. providing advice on how to utilize environmental excellence as a source of competitive edge), the preservation of wildlife habitat, and the production of environmentally friendly products. Earlier works by authors such as Chopey & Ondrey (1997) and Dunbar and Foster (1996) adopt similar positions.

However, this emphasis on categorising companies solely on the nature of the goods and services they produce raises up a number of questions. It is unclear whether a company that produces energy conservation and carbon emissions reduction goods and services should be termed an environmental business even when these goods and services are being produced in an unsustainable manner. In addition, what if the company also produces goods or services that are non-environmental? Does this perspective of an environmental business exclude organisations that utilise sustainable products and practices for their own internal purposes and do not disseminate them commercially to external parties?

In this regard, another school of thought places less emphasis on *product* and more emphasis on *process* in its characterisation of a company as an environmental business. In other words, an environmental business is *any* business that utilises some form of environmentally-friendly practices, regardless of the good or service that it produces (e.g. Schmidt, 2003; Nowak, 2001; North, 1997). This perspective introduces issues that have been previously referred to in this chapter, such as sustainability, ethics, the

Triple Bottom Line, and Corporate Social Responsibility. In this manner the social dimension to an environmental business is highlighted. However, this second view of an environmental business is not without its own ambiguities. Is the term 'environmental business' then just a byword for 'sustainable business' or 'green business'? Also, it is unclear how many or how few environmentally and socially-friendly practices a company should adopt before it qualifies as an environmental business. Thirdly, an increasing number of companies across different industries have green and social responsibility statements included in their corporate policies (Powell, 2011), and it is debatable how much of this is merely a bureaucratic or compliance exercise and how much is an actual ambition of the company.

A joint consideration of the two major environmental business perspectives described above leads to this research proposing a third, which is based on an amalgamation of the first two across four themes, for the benefit of companies that provide sustainable energy goods and services for buildings. The themes are outlined below:

Products: The concept of an environmental business can be narrowed down to companies that are involved in the design, development and/or dissemination of environmental goods and services, either as the end product or as materials or components for the creation of a secondary product which is also sold commercially. Conversely, it excludes businesses that merely use these goods and services after production to become more environmentally responsible, but which themselves do not make environmental products.

Profit: Companies should aim to make profit from the development and sale of goods and services that would minimise the environmental impact of human and non-human activities. By this reasoning only commercial organisations, either privately owned or state-run, are included. Organisations that generate revenue on a non-profit basis, such as third sector advocacy groups, are excluded.

Specialisation: The company could come from any specialisation – design, manufacture, distribution, installation, research, consultancy, etc. – as long as it adds direct value along the product life cycle. A distinctive characteristic of environmental goods and services when compared to non-environmental ones is that they are intended to achieve better environmental performance over their life cycle, not just at the point of creation (Schaper, 2005). Isaksson et al. (2010) points out that value as well as harm are created along the entire supply chain, and so focus on these issues should be extended across the entire chain.

Dunbar and Foster (1996) mention that since the 1980s the environmental business has gradually progressed from a position of merely struggling to avoid loss to a more ambitious one of achieving higher value creation. However, within this period many organisations that were clients of environmental businesses also evolved, increasingly tending to hire their own internal experts (Dunbar

& Foster, 1996). Consequently, environmental businesses began to face more competition in their consultancy role. However, this situation also recorded a positive fallout. There was an increase in the purchase of environmental products due to increased environmental awareness within environmental businesses' former client base (Dunbar & Foster, 1996).

Sustainability: An *environmental business* should be a *sustainable business*, but based on the previous themes above (Products, Profit, and Specialisation), not all sustainable businesses can be classed as an environmental business. Sustainability is particularly crucial for companies that provide environmental goods and services, since their products are differentiated from others by virtue of better environmental performance over their life cycle (Schaper, 2005). Without a clear net positive contribution of these companies to the environment, it follows that there would not be any real difference between their products and non-environmental ones. Likewise, the social contribution of the companies is important, since humans are a very significant component of the environment. However, sustainability is contingent on a company's capacity to remain commercially viable while at the same time meeting their environmental and social obligations; failure to achieve the former goal will make the latter unfeasible, since only commercially successful businesses can keep embarking on community development and other social and environmental programs (Renner et al., 2008). In turn, improvements in consumer trust and brand equity as a result of a company's pro-environmental and social policies serve as an incentive for the company to maintain these policies – as long as they do not significantly hike operational costs, Nowak (2001) is quick to add.

As has been discussed in Section 2.2, if companies view the provision of sustainable energy goods and services solely through an economic prism, there is a risk that the environmental and social dimensions to the products might become underemphasised. However, companies are more likely to apply socially and environmentally-oriented practices if they perceive them as useful for delivering some form of direct or indirect economic gain. Self-interest, rather than altruism, is the working assumption of most firms that undertake Corporate Social Responsibility, based on Husted's (2003) work. Similarly, Revell and Blackburn (2005) and Green et al. (1998) identify cost savings, and compliance with regulation and legislation, as the major forces that drive environmental management in firms. Likewise, Schaper (2005) and Randjelovic et al. (2002) refer to the reluctance of investors to support business concepts that contain positive environmental arguments but not enough economic ones. Despite a concerted attempt by UK policy-makers to portray environmental business practices as cost-reducing, most small firms view environmental measures as expensive to undertake and tend to be highly resistant to voluntarily improving their environmental performance (Revell & Blackburn, 2005; Andrews, 1998). Even authors such as Porter and Van Der Linde (1995), who are among the early writers to begin drawing attention to the economic benefits of environmental and social innovation, caution against the belief that companies will pick up on these economic opportunities without a regulatory push. They

observe that company managers often have incomplete information and limited time and attention to doggedly pursue the economic potential within environmental and social innovation, and that there already exists significant resistance and barriers to change in the first place. Other authors such as Renner et al. (2008), Tebo (2005), and Chopey and Ondrey (1997), provide further evidence that companies are more inclined to adopt socio-environmental business practices when these are justifiable in terms of higher revenue, lower expenditure, reduction in risk, improvement in public relations, or other forms of measurable benefits and payback.

Holmes (2007) reports that in response to this situation, publications by scientists and economists alike are increasingly focusing on the practice of sustainability not in socio-environmental terms, but rather as an active generator of monetary profit. The motivation to amass wealth through sustainable business has long been viewed as a possible means of inspiring companies to be more environmentally and socially responsible (Holmes, 2007). For instance, in the late 20th century prominent Economist Stuart Hart remarked: '*Properly focused, the profit motive can accelerate the transformation toward global sustainability, with non-profits, governments, and multilateral agencies all playing crucial roles as collaborators*' (Winett et al., 1978). Porter and Van Der Linde (1995) question why socio-environmental issues are pitted against economic ones in business discourse. According to Porter and Van Der Linde (1995), if technology, products, processes, and customer needs were all static, the conclusion that social and environmental responsibility must raise costs would be inevitable. But since companies operate in the real world of dynamic competition, they constantly find innovative solutions to overcome competitor, customer, and regulator-related pressures associated with all sorts of issues, including environmental protection and social stewardship (Porter & Van Der Linde, 1995). Bosworth and Clemens (2011) suggest that far from being an operational burden, the inclusion of environmental concerns in business strategy can be a source of economic advantage. Since a firm would demonstrably weigh the environmental impact of its activities, it might be able to generate more accurate, risk-adjusted cash flow forecasts than one that does not, as such projections would take greater account of fewer wasted resources, increased customer satisfaction, superior employee retention and other environmental and social considerations that could otherwise have been overlooked (Bosworth and Clemens, 2011). Porter and Kramer (2002) mention that a company's implementation of socio-environmental responsibility does not put the company at a competitive disadvantage to non-responsible rivals, and that it would instead the build a superior reputation for the company.

However, Porter & Kramer (2002) add that a company's socio-environmental responsibility leads to economic benefits only when the social and environmental improvements brought about relate particularly to a company's business. Where a company actively distances its philanthropy from the business, believing that this will lead to greater goodwill in the local community, this may not necessarily guarantee the firm's long-term competitive potential in relation to its rivals (Porter &

Kramer, 2002). The futility of tokenistic gestures is emphasised by Porter and Kramer in another publication (Porter & Kramer, 2011) in which they comment that ironically, the more business has begun to embrace corporate responsibility, the more it has lost legitimacy and been blamed for society's failures. The diminished trust in business leads political leaders to set unrealistic socio-environmental policies that undermine competitiveness and sap economic growth, thus trapping business in a vicious circle in which they gain little benefit from their social responsibility (Porter & Kramer, 2011).

Thus, in order to maximise the economic benefits attached to environmental and social business practices, these efforts should be tightly aligned to the company's particular business and strategy. Porter and Kramer (2011) propose the concept of 'shared value', which holds that emphasis should not just be on the redistribution of wealth or other form of value from businesses to society. Instead, it should focus more on improving existing company processes and strengthening the business stakeholder network in order to increase efficiency, output, and quality for the company in addition to sustainability (Porter & Kramer, 2011). According to Porter and Kramer (2011), businesses should as well act '*as businesses, not as charitable donors*', in their approach to socio-environmental responsibility; social purpose '*should arise not out of charity but out of a deeper understanding of competition and economic value creation*'; and the closer a socio-environmental issue is tied to the company's business, the greater the opportunity for the company to leverage its capabilities and resources. Churchill (1997) supports Porter's and Kramer's advice by suggesting that skills and work experience placements, a social business practice, should be based around the specific competences on which a company's business success is founded. In this way a virtuous cycle is created in which by identifying the philanthropic areas most relevant to its operations, and by helping beneficiaries to create greater value within this context, companies achieve economic benefits while generating positive social impacts, and social responsibility becomes embedded in organisations' long-term goals to the extent that resources required for it are protected (Porter & Kramer, 2002). Porter and Kramer (2011) add that companies should also address the issue of socio-environmental responsibility from the position that societal harm frequently creates internal costs for firms. According to Porter and Kramer (2011), these costs take the form of wasted energy and raw materials; an increase in training and logistics costs due to the social problems of poor public education and poor transportation infrastructure respectively; a reduction in the pool of capable labour due to gender or racial discrimination; a reduction in market demand and an increase in security costs due to poverty, and other similar instances. Companies should also seek opportunities for collective action, especially with partners that do not compete directly with them (Porter & Kramer, 2002).

An overview of how a firm can progress from mitigating social and environmental harm to creating new economic value from its focus on socio-environmental issues is presented in Table 2.2 below.

Generic socio-environmental issues	**Socio-environmental issues related to a company's operations**	**Integration of economic and socio-environmental contexts within a company**
Increasing economic value →		
Issues that are not related to a company's long-term competitiveness or/and are not significantly affected by the company's operations. Company demonstrates good citizenship and responsive Corporate Social Responsibility.	Issues that are significantly affected by the company's operations. Company mitigates harm from its activities and transforms its operations to better benefit society.	Issues that significantly affect the underlying drivers of a company's competitiveness in the location where it operates. Company undertakes strategic philanthropy that leverages capabilities to improve business performance.

Table 2.2: Socio-environmental Issues and the Creation of Economic Value for a Firm (Based on Porter & Kramer, 2006)

In view of the literature examined, companies that provide sustainable energy goods and services for buildings should, as environmental businesses, be able to resolve adverse energy-related issues through the provision of their products, and they would make profit from doing so whilst avoiding the creation of new environmental and social problems. They would employ entrepreneurial creativity to turn environmental and social issues into opportunities for growth, rather than viewing them as constraints (Tebo, 2005; North, 1997). They would integrate climate protection, resource efficiency, emissions reduction, wellbeing of stakeholders (employees, community, business partners, and the wider society), and innovation, into their strategies and practices (Placet et al., 2005). Table 2.3 is thus a basic representation of how companies that provide sustainable energy goods and services can qualify to be environmental businesses.

Specialisation	Products	Processes
Manufacture (Isaksson et al., 2010; Dunbar & Foster, 1996) Installation (Isaksson et al., 2010) Distribution (Isaksson et al., 2010) Maintenance (Isaksson et al., 2010) Research (Hernesniemi et al., 2007) Training (Hernesniemi et al., 2007) Consultancy (Hernesniemi et al., 2007; Dunbar & Foster, 1996) Monitoring (Hernesniemi et al., 2007) Advocacy (Hernesniemi et al., 2007)	Energy usage reduction products (Becerra et al., 2011; Omer, 2008) Energy efficiency products (Becerra et al., 2011; Omer, 2008) Renewable energy generation products (Becerra et al., 2011; Omer, 2008)	Profit generation (Porter & Kramer, 2011; Renner et al, 2008; Schaper, 2005) Emissions reduction (Placet et al., 2005; Schmidt, 2003; Nowak, 2001; North, 1997) Energy conservation (Schmidt, 2003; Nowak, 2001; North, 1997) Waste minimisation (Schmidt, 2003; Nowak, 2001; North, 1997) Resource conservation (Placet et al., 2005; Schmidt, 2003; Nowak, 2001; North, 1997) Community development (Placet et al., 2005; Schmidt, 2003; Nowak, 2001; North, 1997) Employee welfare (Placet et al., 2005; Schmidt, 2003; Nowak, 2001; North, 1997) Responsible sourcing (Schmidt, 2003; Nowak, 2001; North, 1997)

Table 2.3: Sustainable Energy Companies as Environmental Businesses

However, there is an underlying assumption within literature that once environmental products have been purchased and utilised, they will deliver their intended benefits to environment and society. In the case of sustainable energy products in buildings, technical limitations and irresponsible energy behaviour of building users render this assumption invalid, as discussed in Section 2.2. As also previously discussed, the existing high level of uncertainty in the UK sustainable energy market could jeopardise the uptake of the products in buildings to a scale that achieves major energy conservation,

carbon reduction, and energy cost reduction targets. These factors need to be taken firmly into account when designing an environmental business approach.

2.4 CAPACITY AND ITS DEVELOPMENT

Having discussed traditional and environmental business and economic systems, this chapter now looks at how companies develop their capacity to operate under these systems. Capacity development is particularly important as it represents the point at which companies prepare their resources before going on to produce goods and services. It is thus the ideal stage at which companies can move from a traditional system of business to an environmental business system. However, capacity and its development may mean different things to different classes of businesses, and so this chapter goes on to look at the relevance of capacity development to SMEs in particular, due to the unique business challenges they face in terms of limited size and resources.

This section of Chapter 2 is divided into 3 parts, 2.4.1 to 2.4.3. The first part discusses what capacity means to business organisations, while 2.4.2 looks at what the development of capacity involves, and the implications for SMEs. Part 2.4.4 looks at the issue of shifting from a traditional to an environmental business system.

2.4.1 Capacity in Business Organisations

Various literature sources identify different resources that companies need to achieve business success. These include human capital, machinery, work premises, vehicles, technology, tools, materials inventory, and funding, and these human and material elements are also referred to as being constituents of a company's capacity (e.g. Zonooz et al., 2011; Morin and Stevens, 2005; Horton, 2002). There is thus a strong link between a business organization's capacity and its resources, but the question then arises about whether these two terms, capacity and resources, are wholly synonymous with each other. In this regard, Zonooz et al. (2011) are at pains to point out that human and material resources form only a company's *tangible* capacity. On a related note, other literature perspectives suggest that while capacity consists of an organization's tangible resources, the resources alone do not constitute capacity. There are references to intangible elements as well. These include an organization's structure, management systems, and linkages with other organizations (e.g. Strigl, 2003; Cosio, 1998). Several studies include the intangible component of knowledge (e.g. Hall, 2005; Tsai, 2001; Cohen & Levinthal, 1994). Azadegan (2011) and Zonooz et al. (2011) indicate that tangible resources often have their origins outside the firm, and so are more likely to be imitated and less likely to create competitive advantage than intangible, firm-specific knowledge, which can generate value in a relatively unique and inimitable way.

Beyond the description of capacity as a combination of human, physical and intangible resources, other perceptions of the subject exist. Capacity is also defined within literature not just within the context of a resource, but also within the context of an ability. Cosio (1998) broadly describes capacity as the ability to act upon problems and respond to changing economic, cultural, political, social and technological circumstances. Other earlier works by authors such as Bolger (2000) and Morgan (1999) support this perception. This view is particularly distinct when the knowledge element of capacity is focused on. Capacity in terms of knowledge is severally described as 'absorptive' within literature. For instance, Cohen and Levinthal (1994) use the term 'Absorptive Capacity' to refer to '*the ability to recognize the value of new information...and apply it to commercial ends*'. More recently, Azadegan (2011) describes absorptive capacity as an organization's learning ability to recognize, assimilate and replicate external knowledge. Similarly, Zonooz et al. (2011) define absorptive capacity as the capability to understand and use new knowledge, stating that it results from '*prior related experience*' and the relatedness of the new knowledge to a firm's existing stock of knowledge.

Continuing in the theme of capacity as an ability, Tan and Alp (2009) refer to capacity as the total productive capability of all '*permanent and contingent*' productive resources. This brings up another dimension in which capacity can be viewed: a temporal dimension. Tan and Alp (2009) describe 'permanent capacity' in terms of the use of a company's 'internal resources' in 'regular work time'. They list workforce on the steady payroll, and machinery owned or leased by the company, as examples of permanent capacity. 'Contingent capacity' on the other hand refers to additional capacity acquired temporarily. Tan and Alp (2009) list temporary workers hired from external labour supply agencies, subcontracting, overtime, and rented work premises, as examples of contingent capacity. Interestingly, while using the term 'capability' to describe capacity, in another part of their work Tan and Alp (2009) also refer to capacity as '*the maximum amount of production possible*'. They are not alone in doing this. Various other authors express capacity as a volume-based concept. For instance, Zaeh and Mueller (2007) refer to capacity as '*a measure of the number of units produced by a resource in unit time*' and '*the maximum level of value-added activity over a period of time*'. Like Tan and Alp (2009), Morin and Stevens (2005) use the words '*full production capability*' to describe capacity, but also go on to refer to it as a measure of volume. They state that it is the maximum level of production that an establishment could reasonably expect to attain under normal and realistic operating conditions, and fully utilizing the machinery, equipment, labour, materials, utilities, and other resources that are in place (Morin & Stevens, 2005).

Sopariwala (2006) similarly states that capacity represents '*maximum possible production*', but he also proceeds to classify capacity in terms of how much of it is actually utilised. Capacity is thus categorized into productive, non-productive, and idle capacity (Sopariwala, 2006). Productive capacity is what results in the actual delivery of goods and services and provides value to the customer, while idle

capacity represents unused capacity. Non-productive capacity represents capacity that is used but which does not add value to the good or service being produced; for instance, maintenance, scheduled downtime, scrap, and standby capacity. There is precedence for this sort of classification in an earlier work done by Thomas Klammer in 1996, titled 'Capacity Measurement and Improvement'. Sopariwala (2006) goes on to sub-divide idle capacity into idle not-marketable capacity (capacity to be abandoned due to either lack of a market for a good or service or the company's decision to withdraw from the market), idle marketable capacity (capacity is idle due to a company's inability to exploit the existing market as a result of, for example, a faulty product distribution system), and idle off-limits capacity (capacity unavailable for use due to management decisions, governmental regulations and contractual agreements that prevent it from being used, e.g. during mandatory public holidays).

Definitions that provide a robust incorporation of all the various dimensions of capacity identified above are limited within literature. The most comprehensive description is that given by Bolger (2000), who states that capacity encompasses the 'abilities, skills, understandings, attitudes, values, relationships, behaviours, motivations, resources and conditions' that enable an organisation to carry out its functions and achieve its development objectives over time. However, the major different areas in which companies develop capacity can be interpreted from the literature reviewed. These are finance; labour; materials; knowledge; supply chain and relationships; and equipment and infrastructure (Figure 2.1). There is significant overlap between these different areas. Finance in the form of money, for instance, is usually used to purchase labour, equipment and materials, foster and maintain business relationships, and generate knowledge. Likewise, labour, materials, equipment and knowledge can be contracted externally via an organisation's business relationships, rather than just internally within the company. In the same vein, knowledge is often the product of the thinking and experiences of a company's staff (labour) and is crucial to the effective utilisation of an organisation's other capacity resources (Sinha, 2009). However, based on the literature evidence, there is also scope for the capacity areas to be presented as distinct elements. Thus, within this research, finance within this context refers to an organisation's capital base after recurrent expenditure has been deducted. Labour refers to human resources. Equipment and materials together constitute the physical, non-human resources. They can be distinguished from each other in the sense that equipment is used to convert materials into a finished good or service. Supply chain and relationships refers to the company's links with its supply chain and other business partners, as well as with its direct clients, eventual end-users of its products (if they are different from its direct clients) and wider industry stakeholders such as policymakers. Knowledge refers to the company's intellectual inputs into the design and development of its products and processes.

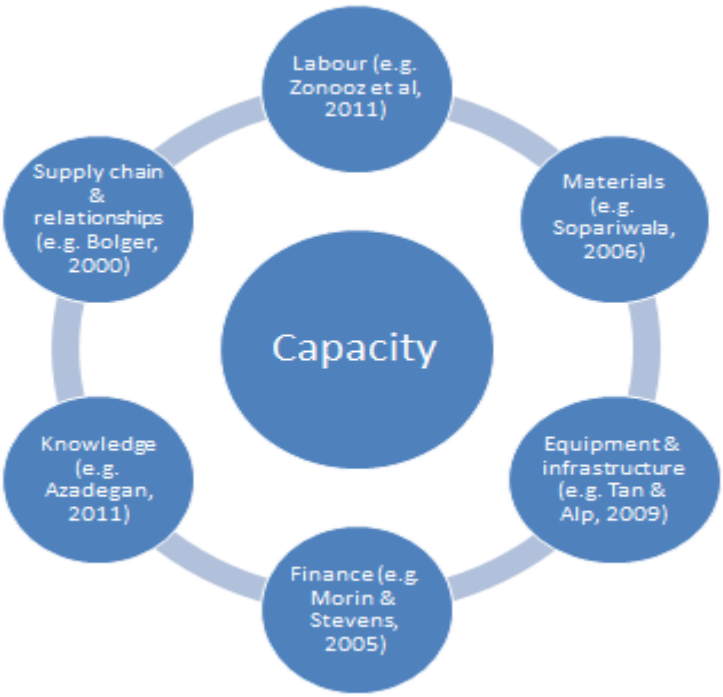


Figure 2.1: Literature of Sub-concepts of Capacity Development

2.4.2 Capacity Development and SMEs

Given that there are many aspects of capacity, capacity development is a complex activity. Lusthaus et al. (1999) point out that the term capacity development is 'elastic' and 'elusive', lending itself to different socio-economic sectors, from business to government to the third sector. Lusthaus et al. (1999) trace the origins of capacity development as a formal concept to the late 1980s and 1990s in the field of international development, when it emerged as an aggregate of many other developmental approaches that were prevalent in that time. These include institution building, human resource development, community development, and development management/administration (Lusthaus et al., 1999). Since then it has been adopted in various other fields and various descriptions of it have been developed. Descriptions that are more applicable to the realm of business include Gray's (2006) statement that capacity development is a preparatory stage of an organisation's operations in which capabilities are strengthened, long-term solutions are put in place, and opportunities are identified for exploitation. Various other authors support this position; for example, Hall (2005) states that capacity development is the process by which organizations improve their abilities to perform functions, solve problems and achieve desired objectives. Similarly, Bolger (2000) writes that 'capacity development refers to the approaches, strategies and methodologies used …to improve performance at the individual, organizational, network/sector or broader system level'. Horton (2002) mentions that capacity development is 'a largely internal' process of 'organic growth'.

Allied concepts that are frequently used in literature include capacity building, which Cosio (1998) describes as the process of improving systemic conditions, by which the abilities to identify and solve problems are developed. It involves the building of abilities, relationships and values that will enable an organization to improve performance and achieve development objectives, and it is achieved through the strengthening of processes, systems and rules that influence performance and behaviour, and through the enhancement of technical ability and the willingness to play new roles and adapt to new demands and situations (UNEP, 2002). While there are obvious similarities between capacity building and capacity development, the former term appears to remain rooted in the domain of international/institutional development rather than in the production of goods and services. Terminologies such as 'capacity management' and 'capacity planning' are closer to capacity development in this regard. For instance, Ashayeri & Selen (2005) describe capacity management as the function of planning, establishing, measuring, monitoring, and adjusting capacity levels so that sufficient capacity is available to permit execution of production schedules. Zaeh & Mueller (2007) refer to capacity planning as the making of decisions about the optimal timing and level of capacity acquisition or allocation. However, these terms appear mostly in manufacturing literature, accompanied by mathematical capacity models, and are not often applied to service companies.

Literature indicates that there are some differences between the capacity development approaches utilised by manufacturing companies and those used by service firms. Manufacturing companies often rely on deterministic models, which often take the form of mathematical formulas. Nyaga et al. (2007) and Reid & Bullich (1996) point to Traditional Capacity Analysis, which calculates capacity utilisation rates of resources, as a basic and long-standing example of such a model. The work of Riedewald (2011), Koch (2007), Karri (2000), and Balakrishnan et al. (1996) all suggest that deterministic models often assume that market demand and other significant factors such as costs, supply availability, product reliability, and external operating conditions, can be known with certainty and can be continuously satisfied, and they also assume a constant cycle time between capacity additions. Capacity expansion often requires a long lead time, but since companies have to respond to customer orders within a far shorter time window, they often need to plan their capacities based on forecasted rather than realized demand (Zaeh & Mueller, 2007). In this regard, a deterministic model is useful for developing capacity expansion programs for the future whilst satisfying already existing demand (Aghezzaf, 2005). However, they may not always be able to fully take into account the influence of dynamic markets and other uncertainties such as demand and supply shortages, and this limits the extent to which they can mirror reality (Aghezzaf, 2005; Lucas et al., 2001). Neither can they always be relied upon to predict the impact of market uncertainties on a company, as the financial cost of supply shortages to a company is nonlinear and difficult to estimate, particularly in the case of uncertain demand (Ryan, 2004).

Riedewald (2011) and Ryan (2004) indicate that service companies tend to rely more on models that are more qualitative than quantitative, display less certainty and more variability in their parameters than deterministic models (i.e. are more stochastic), and in which the timing of capacity expansion is more random. Riedewald (2011) and Ryan (2004) are not clear about the reasons for this. The literature does show, however, that deterministic models focus mainly on the performance and output of physical, non-human resources such as machinery. Service companies are less reliant on these resources than manufacturing firms and may prefer stochastic production models as a result. Lucas et al. (2001) suggest that stochastic models are useful for providing robust capacity-related decisions, but may not always establish relationships among various production variables. Zaeh and Mueller (2007) add that this makes such models vulnerable to addressing only one type of uncertainty and assuming a simple structure of the production process.

Regardless of what capacity models a company employs, literature provides an indication of what the root trigger of capacity development is for a business organisation. Lucas et al. (2001), for instance, suggest that capacity development is performed in order for an organisation to respond effectively to changes in customer demand for its products. Mueller (2007) and Karri (2000) similarly draw attention to the cardinal relationship between capacity and demand by indicating that a company develops capacity in order to fulfil market demand. Other authors such as Bish et al. (2005), Karri (2000), and Hayes & Wheelwright (1984), also point to market demand as the primary driver of capacity development for businesses, while Graddy & Kennedy (2010), Van Mieghem (1998) and Pindyck (1988) identify three main capacity development situations: capacity leading demand, capacity lagging demand, and capacity existing in approximate equilibrium with demand. Of the three situations, the third one appears to represent the ideal, as the other two come with significant problems. Graddy and Kennedy (2010) report that an increase in demand without a corresponding rise in supply capacity, which translates to capacity lagging demand, could have the consequences of disrupting the regular flow of research, development and knowledge transfer, and of creating inflationary pressure. On the other extreme, capacity leading demand can create a situation of excess capacity, which is undesirable as it represents idle capacity, results in capacity underutilisation, and ties up a business organization's resources (Sopariwala, 2006). Hence, the extent to which a business can gain competitive advantage, achieve market differentiation, reduce business costs, and expand or contract its market reach, is significantly dependent on how it can prevent the overutilization of capacity as well as its underutilization. It is similarly dependent on the ability of a company to readily expand capacity in response to an increase in market demand, reduce capacity in response to a decline in demand or a company's exit from the market, and substitute existing capacity for more effective and advanced options. Table 2.3 provides a summary of the main capacity development situations.

Capacity development situation (Van Mieghem, 1998; Pindyck, 1988)	**Interpretation**	**Implications**
Capacity leads demand	Capacity exceeds demand. Capacity is built for long-term goals and/or until the need for it develops (Hayes & Wheelwright, 1984). Investment is often reversible and/or future demand is known (Karri, 2000).	Capacity utilisation is less than 100%, which indicates under-utilisation. Idle capacity is generated (Sopariwala, 2006).
Capacity lags demand	Demand exceeds capacity	Capacity utilisation is greater than 100%, which indicates over-utilisation. Inflationary pressure could be created; knowledge transfer could be disrupted (Graddy & Kennedy, 2010).
Capacity is in equilibrium with demand	Capacity is directly proportional to demand	Capacity utilisation can be approximated to 100%.

Table 2.3: Summary of the Main Capacity Development Situations

Based on the capacity development descriptions and the six capacity areas that have been identified in this chapter, capacity development for a business organization can be regarded as a process of preparation and improvement by which companies can enhance their performance and influence their market reach. It would involve the modification of the capacity areas by way of expanding or reducing them, or through replacement/substitution (such as in the case of replacing obsolete or defective machinery, or when switching to new processes). However, Sluismans et al. (2009) suggest that capacity development as a deliberate, formal and organized process occurs more at the level of

multinational corporations and other large-scale business organisations. For Small and Medium Enterprises (SMEs), the situation appears to be rather different.

According to the European Commission, '*the category of SMEs is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million*' (European Commission, 2003). This definition of a SME is accepted by the UK's Department for Business, Innovation and Skills (BIS, 2010). SMEs are commonly acknowledged as being a significant contributor to national economies in terms of job and wealth creation and the fostering of entrepreneurship that leads to sustainable growth and development. For instance, Singh and Garg (2008) write that SMEs are considered to be the backbone of economic growth in all countries due to their contribution towards the provision of employment opportunities. Worthington and Patton (2005) state that in the UK, SMEs account for more than 50% of the country's economic activities, providing 56% of non-government jobs (excluding financial services) and 52% of overall turnover.

However, the potential of SMEs to trigger and sustain countries' economic growth and equitable development is often not fulfilled due to size-related issues. Harvie (2004) writes that while SMEs possess unique advantages – such as entrepreneurial spirit, flexibility, and resourcefulness – their small size means that they cannot develop easily. This is because they have limited resources and access to finance, they lack economies of scale and information on market opportunities, they lack awareness about private and governmental financing programs and may have difficulty articulating their financial needs, they have skill deficiencies, and they may be discriminated against relative to large firms when seeking access to business infrastructure support (Harvie, 2004). They may encounter difficulty in internalising functions which lend firms dynamism, such as training and market intelligence, and they could also experience inadequate internal division of labour for the improvement of productive capabilities (Ceglie & Dini, 1999).

Highlighting the relevance of absorptive capacity in particular to SMEs, Liao et al. (2003) state that the responsiveness and adaptability of SMEs to dynamic business climates would increase if they have well-developed capabilities in 'external knowledge acquisition' as well as internal and 'intra-firm knowledge dissemination'. However, while SMEs carry out various aspects of capacity development such as the adjustment of inventory levels, the expansion or reduction of work space, and the upgrading of equipment, this is often not on a clear strategic basis (Sluismans et al., 2009). To begin with, SMEs utilise simple systems and procedures which enable flexibility, immediate feedback, a short decision-making chain, and an understanding of and response to customer needs (Singh & Garg, 2008). While these are beneficial traits, SMEs also have less financial capacity than large organisations, and this negatively impacts on their absorptive capacity, i.e. their ability to gather and utilize knowledge (Bougrain & Haudeville, 2002). According to Muscio (2007) and Bougrain & Haudeville (2002), this

is because research and development projects are cost-intensive and uncertain, a large time interval exists between research and commercialization, and the irreversibility of the firm's commitment increases as time passes. Consequently, SMEs tend to be less innovative than large companies. They face further pressures in human resource development, supply chain management, and the achievement of high product quality (Singh & Garg, 2008).

These limitations do not in themselves denote that SMEs are less efficient than larger firms. According to Bougrain and Haudeville (2002), the key distinguishing factor between SMEs and larger firms is not the difference in size and turnover, but rather the management of SMEs by their owners, which increases the tendency towards risk adversity. This is because the owner-managerial focus at SME level is often centred on firm survival above every other objective (Pansiri & Temtime, 2008). Under this business climate – the fear of risk, compounded by limited time, resources and personnel to allocate towards development activities – there is a greater tendency to regard intellectual models as just abstract ideas (Sluismans et al., 2009), and so the practice of capacity development as a well-defined, structured concept could become less prevalent. This situation represents a vicious cycle, as the absence of a clear-cut capacity development mechanism at the SME level could in turn put small and medium companies at risk of competitive disadvantage with larger businesses (Sluismans et al., 2009). SMEs might capture a lower proportion of new demand and face increased monopolisation and crowding out by large-scale firms under a liberalised market system, which would translate to socio-economic strains such as job losses and a decline in income generation (Zonooz et al., 2011). Employees could become frustrated due to not being able to realise short-to-mid-term career goals, and it could be difficult to retain high-calibre staff (Singh & Garg, 2008).

Thus, while resource constraints and risk adversity limit SMEs from embarking on well-defined capacity development programs, such programs have the potential to improve SMEs' chances of business success. In this light, it is relevant to study how SMEs can develop capacity in a way that takes account of operational challenges that are peculiar to this class of firms. The primary research will focus more on this, but at this stage it is fair to say, based on the literature explored in this section of the thesis, that SMEs' successful improvement of capacity first requires a conducive environment of reduced business costs and increased access to capital.

2.4.3 The Transition from a Traditional to an Environmental Business System

Literature is not always very definite on the magnitude of the difference between traditional business models and an environmental business one. Brown and Vergragt (2008), for instance, suggest that a major condition for moving from one to the other is that all 'communities of practice' involved should 'fundamentally reconsider …their norms, practices, and problem definitions'. Tebo (2005), on the other hand, mentions that the business community is typically geared not towards wholesale transformational

change, but rather towards the ‘incremental and continuous improvement’ of existing systems and processes. The question thus arises whether, for a company wishing to transit from a traditional to an environmental business model, a slow-and-steady approach would be sufficient, or larger-scale reforms are required.

The differences between the realm of environmental business, and that of the traditional, make them both appear as individual systems with their own boundaries. These boundaries place limits on what may be changed or what must be taken for granted (Mingers, 2006). Organisational settings within these boundaries will be constrained by particular cultural norms and unquestioned assumptions about the nature of the situation (Mingers, 2006). The way the system is perceived by its stakeholders ultimately creates the criteria by which the success of that system is measured, according to Ison (2010) and Morris (2009). However, to learn more rapidly and increase flexibility in a world of growing complexity and change, firms are ever changing to new modes of organisation and values (Senge & Sterman, 1992). Such a change is dependent upon the overcoming of the system boundaries, and the ability to overcome boundaries is in turn influenced by whether the boundaries are set by the ‘overcomer’ (Mingers, 2006; Mingers, 1997). For SMEs interested in operating more like an environmental business and less like a mainstream company, the boundaries they would need to overcome are not entirely constructed by them but are also determined by other stakeholders and the external environment in which the SMEs operate. For instance, a SME wishing to migrate from a traditional to an environmental business model would have to take into account the hospitability of the business climate towards such a move. The company would be more confident of committing investment towards the change process if demand for its products is stable and strong rather than erratic and low. Essentially, the ability of the firm to fully effect change is constrained and conditional, and according to Shove and Walker (2007), such constraints make researchers in the area of systems transition hesitant to make definite claims about how organisations can steer trajectories towards pre-defined, normative goals.

A question also arises about whether the organisational change required for SMEs to shift from a traditional to an environmental business approach is less about jumping system boundaries and more about achieving only an adjustment of the existing system. Figure 2.2 illustrates this.

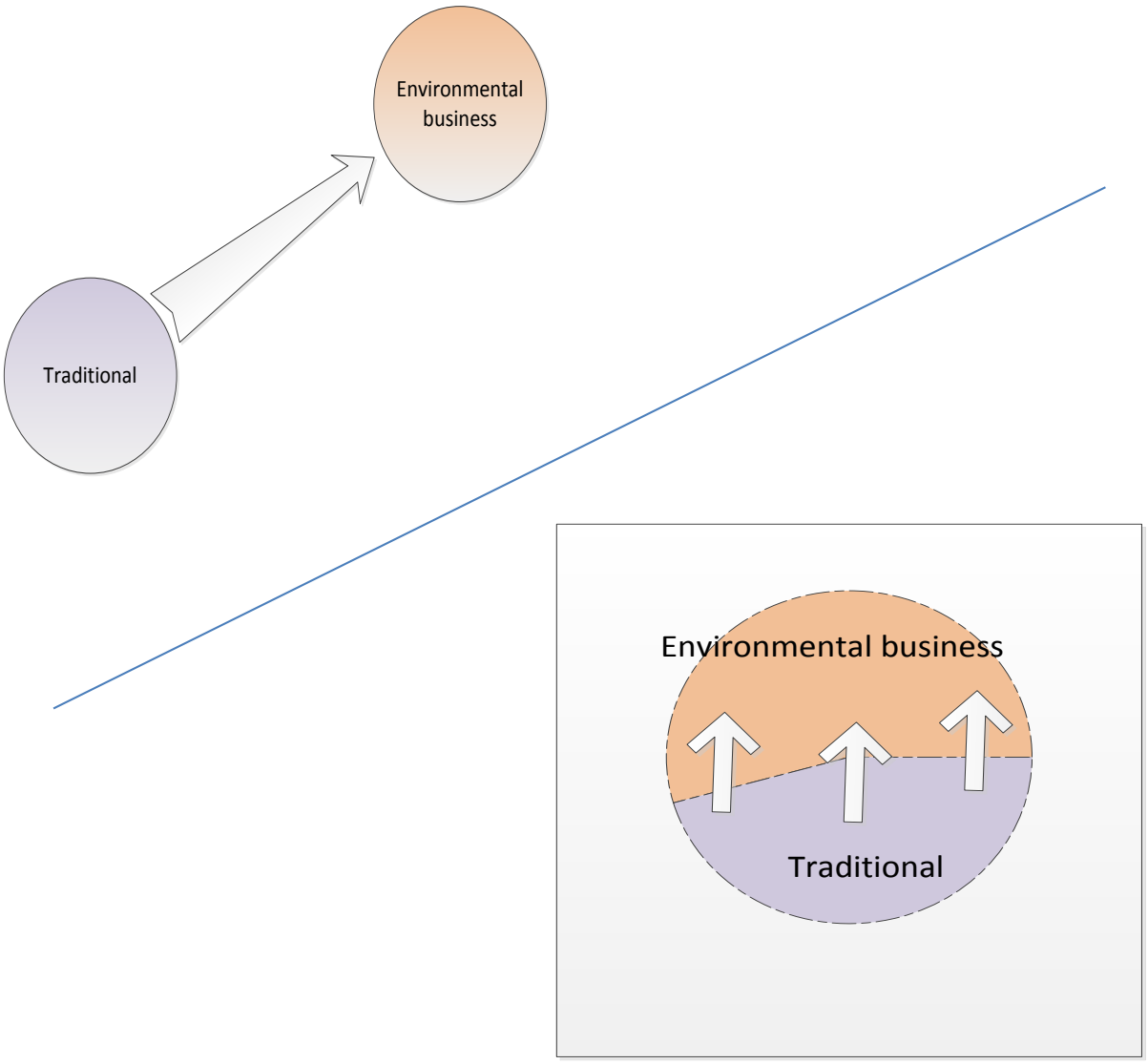


Figure 2.2: Does the Transition from Traditional to Environmental Business Involve Jumping Systems, or are Both Contained within a Single System?

If emphasis is not on describing traditional and environmental business as two distinct systems with their own separate boundaries, but rather, on regarding business in its entirety as an open system – *a la* the precepts of General Systems Theory (Midgley, 2006) – then the issue of transcending boundaries does not arise. Instead, the system could be transformed from traditional to environmental business through the restructuring of existing system components. In Shove's and Walker's (2007) words, while transition strategies focused on creating environmental and social change imply a '*radical overhauling of theory and orientation*', they can also be incorporated into '*business-as-usual, albeit with a little more frequent revisiting of goals and a somewhat longer term horizon*'. Emphasis should be placed less on competition between two supposedly differing systems, and more on possible areas of relation between them (Shove and Walker, 2007).

For the above argument to hold true, system components must be malleable enough. Concerning the process of capacity development, aspects of the process which are traditionally regarded as being economically beneficial to companies could be manipulated to produce socio-environmental value as well. Indeed, the economic or socio-environmental worth attached to a given aspect may not be real at all to begin with, but is instead only a reflection of how companies view their role in the world. Ulrich (1983) postulates, through his critical systems heuristics, that a system's boundaries are mainly a by-product of values held by the system's inhabitants, and that boundary setting is thus largely an ethical process. Midgley (2006) and Flood (1987) point out that the boundaries of a system merely reflect the limits of knowledge available to system stakeholders at any given time, and that people often come up with new ways of seeing things that challenge hitherto dominant subjective assumptions. However, Ulrich (1983) does not discount the influence of economic, social, political, technical and other challenges on boundary setting, as he acknowledges that these in turn constrain the values that can be adhered to. Ultimately, based on Ulrich's (1983) systems logic, SMEs' ability to migrate from a traditional, economic-led business model to an environmental business one is based on four main factors: their motivation to change, their control over system events, their expertise in achieving the desired change, and their legitimacy – are they widely viewed as change agents by other system stakeholders?

It is intended that the primary data collection and analysis conducted as part of this research, and covered from Chapter 3 onwards, will shed more light on the nature of change from a traditional to an environmental business model of capacity development. Regardless of the way in which the transition of SMEs to an environmental business model is viewed (whether as a jump from one system to another, or as a modification of a single existing system) one observation from Robert Flood is noteworthy. Systems thinking should consider that the constituents and boundaries of a system are, to a great extent, socially constructed rather than real in the absolute sense of the word (Flood, 2010). Thus, a transition plan should sufficiently take into account the way people rely on their experiences and perceptions to make sense of the business world, and should not attempt to propose solutions that are independent of socially constructed meanings.

2.5 SUMMARY

The review of literature conducted in Chapter 2 has highlighted the limitations of conventional economic thinking in addressing the negative environmental and social impacts of business activity. For companies that are involved in the provision of sustainable energy goods and services for buildings, these limitations are particularly crucial as they could undermine the intended socio-environmental benefits of the companies' operations. The situation is further compounded when the products fail to perform up to their potential upon installation in buildings, due to issues such as technical limitations and the environmentally irresponsible behaviour of building users. Furthermore, the existing high level

of uncertainty in the UK sustainable energy market could prevent the uptake of sustainable energy products in buildings from reaching a scale that achieves major energy conservation, carbon reduction, and energy cost reduction targets.

In order to maximise the environmental and social potential of their services, companies that provide sustainable energy goods and services for buildings require an 'environmental business' approach that focuses on creating and delivering products in an environmentally and socially sustainable manner. Such an approach would also pay attention to the uncertain nature of the market in which the companies currently operate, and it would not rely on the assumption that products automatically yield their intended socio-environmental benefits upon their installation and usage in buildings.

Due to its focus on the preparation of resources ahead of the actual provision of goods and services, the capacity development stage of business operations is an ideal point for implementing a transition from a traditional to an environmental business system. A business' capacity constitutes the resources as well as abilities, understandings, behaviours, and relationships that would need to be developed in order to achieve success. This chapter identifies finance, labour, knowledge, supply chain and relationships, equipment and infrastructure, and materials, as the main areas in which capacity is developed by business organisations. The development of capacity is primarily driven by the need for companies to respond to market demand, and this results in three main capacity development situations, namely, capacity leading demand, lagging demand, and being proportional to existing demand.

In literature there is limited information concerning how capacity development as a formal, deliberate process is conducted in SMEs as opposed to large-scale organisations. Thus, the primary research, which will be covered in the remaining chapters of this thesis, focuses on SMEs in particular. SMEs are constrained by resource limitations and a tendency towards risk adversity, and these create a vicious cycle in the sense that while they prevent SMEs from pursuing a robust capacity development program, the absence of a well-defined capacity development strategy in turn further lowers SMEs' business performance. The primary research will also focus on sustainable energy service companies rather than manufacturing companies, because they are less represented in the literature and also because they are prevalent in the West Midlands County, where the research was conducted.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The primary research was guided by a pragmatist philosophy. It investigates the capacity development process in SME sustainable energy service companies in order to gain knowledge of how they can operate as environmental businesses. This chapter focuses on the methodology used to conduct the primary research. It begins by discussing the research philosophy, as well as methodological problems and ethical issues surrounding the research topic. The chapter then moves onto the various methods used to conduct the primary research. It offers a critique of them, providing a justification for them as well as identifying their limitations, and it describes the process of applying them within this research in such a manner that their limitations are minimised and their strengths utilised. Figure 3.1 illustrates the order in which the methods were applied.

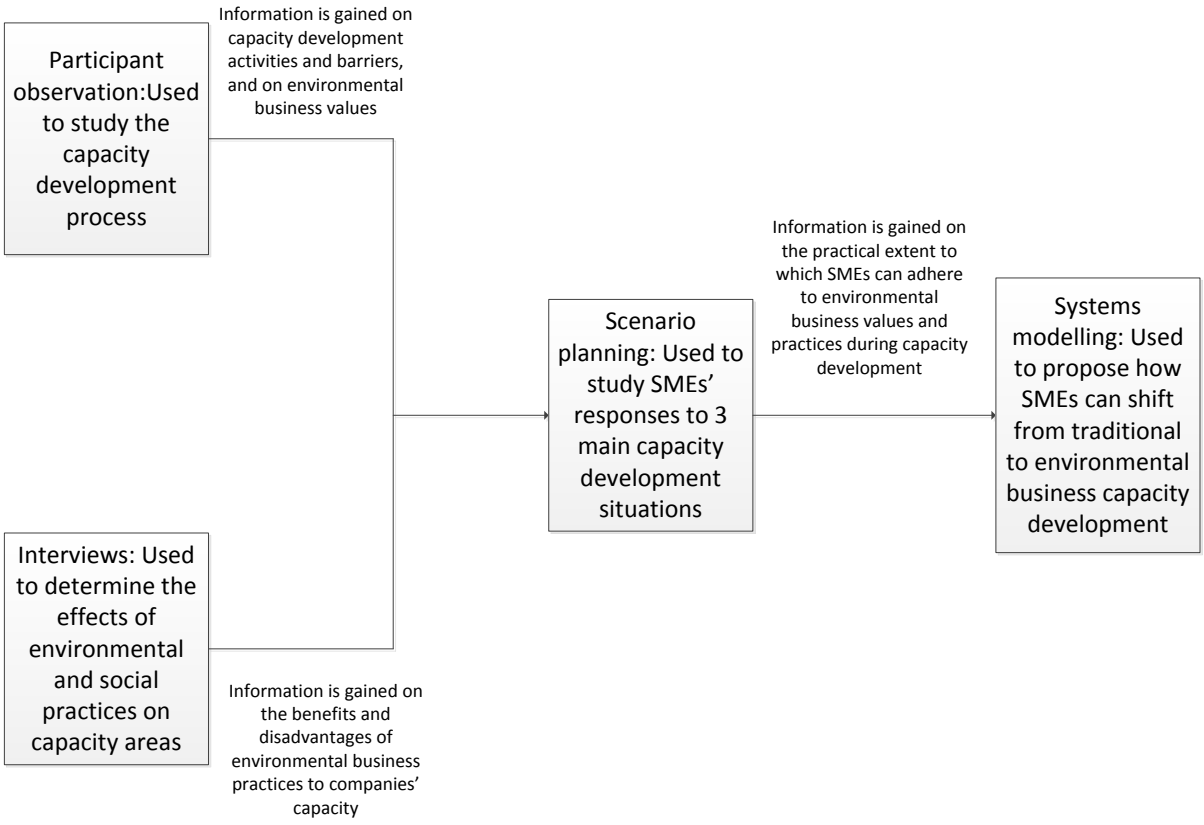


Figure 3.1: Flow of the Primary Research

3.2 THE RESEARCH PHILOSOPHY

The research focuses on addressing an issue of a practical nature, which is the development of capacity in the manner of an environmental business. In doing so, the research discovers knowledge by studying peoples' actions and perceptions and interpreting them. Since data is contained within these diverse and

subjective actions and perceptions, it was necessary to adopt a research philosophy that acknowledges that there are no 'right' or 'wrong' perspectives. However, the research does not only describe peoples' perspectives, but goes on to direct the information obtained from these towards addressing the identified practical issue. The study of how companies can function as environmental businesses could be viewed as not simply a theoretical output of the data collected and analysed, but also as an attempt to find practical solutions by which companies' negative socio-environmental impacts can be minimised.

This aspect of seeking practical change is key to the philosophy of the research. Consequently, this research identifies with the philosophy of pragmatism. In pragmatism, knowledge is viewed in terms of its practical usefulness and its success in action. The pragmatist research philosophy, which was first developed by William James and John Dewey (Meyers, 2005), posits that concepts such as 'reality' and 'truth' do not actually exist independent of the human mind (Kivinen & Piiroinen, 2004). Meyers (2005) and Avis (2003) indicate that consequently, there is no single perception of reality upon which knowledge can be regarded as 'true' and justified; the relevance humans attach to a given component of knowledge is based upon our interactions with the world and not upon the 'mind-independent' superiority of the component over a less relevant one. In this regard, pragmatism is in contrast to positivism and other absolutist philosophies. According to Goldkuhl (2002), Kukla (2000), Garrison (1995), and Easterby-Smith et al. (1991), it is similar to social constructivism, which holds that the world and reality are not objective, and that knowledge is a social invention which in itself has no absolute meaning, but is rather constructed through human activity and interactions and the environment that humans live in. Avis (2003) argues that pragmatism challenges positivism without conforming to the philosophy of scepticism and other post-positivist movements which hold that since humans can never be justified in having a belief which can be claimed to be true, the concept of knowledge can thus be refuted in its entirety. Instead, pragmatism seeks to validate knowledge by achieving consistency of evidence (Clarke, 1989). It is commonly viewed as being both epistemological and ontological. For instance, Powell (2003) mentions that pragmatism describes what humans do, and then creates a justifiable basis for further human action, while standing clear of ontology. Haas and Haas (2002) state that the pragmatic philosophical approach sidesteps 'ontological differences', while Sleeper (1985) similarly describes pragmatism as both a 'metaphysics' and an 'ontology'.

Secondly, while it refutes the idea of absolute knowledge, pragmatism does not completely refrain from knowledge labelling. It acknowledges that humans do need to make decisions in practical situations, and that without being absolutely true, knowledge and beliefs can nevertheless be useful for enabling people to understand connections between things in the world in such a way as to make effective choices about what actions to take to meet a particular purpose (Reybold, 2002). In this manner, pragmatism downplays the need for knowledge to be 'true' but also highlights the need for it to be 'useful'. Accordingly, the value of knowledge does not lie merely in its methodical and accurate interpretation from data, but in its usefulness as a basis for practical action (Rescher, 2005; Dewey, 1958; Sellars,

1939). Morgan (2007), Clarke (1989) and Rosenberg (1979) posit that the use of suitable and effective data collection and analysis methods is significant only in the sense that they place emphasis on the consistency of empirical evidence, which improves the validity and reliability of the 'useful' knowledge that is generated and allows for such knowledge to thus become rationally acceptable. In this particular research, the choice of primary research methods is based upon the nature of the research problem, and thus different methods are selected at different times, depending upon which research objective needs to be addressed. In addition, this research sticks to the view that knowledge generation should not simply focus on capturing reality, but should also be relevant to the practical purpose of problem solving. For example, if the research findings indicate that SMEs are uninterested in functioning as environmental businesses, the research would not stop at this discovery, but would go on to establish how SMEs could be enabled and motivated to adopt the environmental business philosophy. It should be acknowledged that this somewhat resembles a moral position, which nevertheless is recognised in pragmatism due to the nature of the philosophy.

However, it should be noted that while this research identifies with pragmatism, it does not rely on what McEvoy and Richards (2006) term 'methodological pragmatism'. This latter branch of pragmatism places few limitations on switching between qualitative and quantitative methods, as long as 'optimum results' are obtained (McEvoy & Richards, 2006). The logic of this position is that neither quantitative nor qualitative methods are sufficient to develop a complete research analysis, and so they could be used in combination to complement each other (McEvoy & Richards, 2006). However, this standpoint ignores the challenge of reconciling the divergences of positivism and interpretivism from each other. Modell (2009) cautions that such a reconciliation effort can result in abstractions that would distort situated meanings and become in effect a futile exercise. Researchers could wrestle with methodological tensions that are hard to resolve, and data obtained using methods that are based on conflicting epistemological assumptions could be rendered dissonant, according to McEvoy & Richards (2006) and Johnstone (2004).

The research considered the complications associated with 'methodological pragmatism' as described in the previous paragraph, and as a result only qualitative methods were used. As things stand, the form of pragmatism adopted in this research is not without its own challenges. Modell (2009) states that the notion of usefulness or workability as a measure of the value of knowledge remains unclear. What works in terms of empirical knowledge claims and theories depends on the social factors that shape consensus within a given research community (Modell, 2009; Greene & Caracelli, 2003).

3.3 PROBLEMATIC ASPECTS OF THE RESEARCH

A number of problems were encountered in designing the methodology for the primary research. The research topic is multidisciplinary, involving the fields of business, energy, the built environment, and environmental and social studies. This adds complexity to the research. In addition, while literature and

previous research exists on the separate disciplines, there is limited research that integrates them into a whole as this research seeks to do.

Another problem lies in the issue of identifying organisational values. As part of an effort to gain an understanding of what it means for a company to operate as an environmental business, this research attempts to identify 'environmental business values' with which companies can develop their business capacity in such a manner that addresses existing energy-related issues in buildings without creating new environmental and social problems. The term 'values' is based on Berry's (1999) description: the ideals, principles, and philosophy that especially underlie an organisation's strategies and day-to-day decisions. Clear, compelling, core values are typically at the root of a company's commitment to social development and making investments with distant payoffs (Berry, 1999). However, values are intangible, abstract qualities and as such cannot be directly detected and monitored, according to Onkila (2009) and Place & Hanlon (2009). Thus, they would need to be interpreted from a more easily measurable phenomenon.

Various techniques which have been used to evaluate values in previous research are largely based on the study of human and organisational actions and behaviour (e.g. Kim, 2011; Kachel & Jennings, 2010; Luck, 2003; Dunlap et al., 2000). This suggests that values are largely contained within actions and behaviour. Thus, this research seeks to infer values from the actions and behaviours exhibited within and among business organisations. This research's position is supported by authors such as Sinkula et al. (1997) and Dowling & Pfeffer (1975), who indicate that corporate values are implied by an organisation's business orientation evidenced by its activities and internal behaviours. Similarly, Khazanchi et al. (2007) state that organisational values are evidenced by practice. There also appears to be something of a 'virtuous cycle' element to the relationship between values on the one hand and actions and behaviours on the other, in the sense that values drive actions and behaviours as much as they are determined from them. Various researchers (such as Verplanken & Holland, 2002; Finegan, 2000; and Scott & Hart, 1989) propose that values give meaning to and regulate behaviour. Feather's (1992) use of 'expectancy-value' theory to define the relationship between values and actions produced the finding that values along with expectations determine eventual actions that are taken. Bansal (2003) describes organisational values as a critical factor in explaining organisational responses to environmental issues.

The identification of environmental business values raises up a further issue about Consequences. According to Kim (2011) and Kachel & Gayle (2010), values have favourable and/or unfavourable effects attached to them, and so they should not be studied in isolation from these effects. Also, while the literature explored in Chapter 2 points out that a company's focus on ecosystem preservation and high social performance is necessary for the minimisation of its negative socio-environmental impacts, it also indicates both positive and negative relationships between socio-environmental focus and

business success. This was taken into consideration when designing the methodology for this research. The research seeks to gain information on these relationships within a capacity development context, and it thus looks at the effects of environmental business practices on the different capacity areas inferred from literature (labour, equipment and infrastructure, supply chain and relationships, knowledge, finance and materials).

There is also the issue of whether the study of environmental business values and practices and their effects is sufficient to gauge the willingness and ability of companies to actually perform as environmental businesses when developing capacity. It was thus important to explore a number of situations under which SMEs make decisions regarding capacity development, and from the response of SMEs to these situations, develop a picture of the practical extent to which SMEs can implement environmental business values and practices. A second stage of primary research was conducted for this purpose, as will be discussed in section 3.5 of this chapter.

3.4 ETHICAL ISSUES

The research required human subjects for data collection purposes. To this end, the research abided by the British Sociological Association's Statement of Ethical Practice (BSA, 2004), as well as Birmingham City University's Research Ethical Framework. The informed consent of research subjects were sought before they got involved in the research. The subjects were aware of their right of refusal and their rights to privacy and anonymity before and during any stage of the research. They were aware that the data they provided would be used for Birmingham City University research purposes. They were also provided with formal assurances over any concerns about the privacy of their identities and those of their organisations.

Maximum effort was made by to ensure that research inquiries via interviews, observations, and scenario planning sessions were conducted only in regard to the information that was being sourced. The research subjects were encouraged to give responses in a direct rather than an inferred manner, in order to minimize the possibility of data being interpreted inaccurately. Data collected from subject individuals and organizations were treated with confidentiality and were obtained and stored in secure and protected environments, such as password-activated computers, locked compartments, and private areas for interaction.

With respect to involvement in the operations of the research subjects' organisations (particularly during participant observation), care was taken to limit involvement so as not to influence the outcome of the operations. The researcher did not make independent contributions to meetings etc., and participation in activities was for the purpose of gaining first-hand understanding of the capacity development process, rather than affecting it. There was awareness of the risk that research subjects could expect the researcher to be of practical relevance to their operations, or to perform a favour for

them, before they would be willing to provide access to data. Section 13 of the BSA's Statement of Ethical Practice (BSA, 2004) acknowledges 'the difficulty of balancing potentially conflicting interests'. However, section 5 outlines that the freedom to research and study should be maintained, and section 14 mentions that research relationships should be characterized by integrity. Consequently, before the commencement of relationships with research subjects (particularly during participant observation), the relationship was clearly defined in a professional manner and put on record, the independence of the research was guaranteed, and the activities investigated were only those that are related to the research field of study.

3.5 DATA COLLECTION

This section discusses the data collection methods that were used to conduct the research. Figure 3.1 below illustrates how data was collected.

The section is divided into three parts, with 3.5.1, 3.5.2 and 3.5.3 looking at the methods of observation, interviews and scenario analysis respectively.

3.5.1 Participant observation:

In order to gain an understanding of how SMEs that provide sustainable energy services for buildings develop their capacity to perform as environmental businesses, it was necessary for to gain access to, and remain for a significant period of time in, an actual environment in which capacity development was being carried out. According to Babbie (2012), such 'field research' involves accessing a setting, establishing feelings of trust, and becoming involved in situations that would facilitate the divulgence of relevant information. Edmondson & McManus (2007) and Singleton et al. (1993) mention that this approach is widely recognised as one of the most common ways of conducting social research.

The Sustainable Housing Action Partnership (SHAP) was thus selected for study. SHAP (www.shap.uk.com) is an initiative made up of management-level representatives of 30 SME organizations from the construction, energy, and property sectors. These companies are involved in the procurement, supply, installation and or maintenance of sustainable energy products in buildings. SHAP also includes the contribution of big utility companies such as Eon. It has a formal goal of increasing the uptake of sustainable energy solutions in both new and existing buildings within the West Midlands in particular and the UK in general. At the time of conducting this research, SHAP was focused on developing supply chain, skills, and finance and other resources in preparation for the Green Deal programme, and on optimizing the economic, environmental and social returns from this activity. The Green Deal is a UK governmental policy aimed at encouraging the widespread implementation of a diverse range of sustainable energy products across the country, from insulation to window glazing to

low-energy lighting and heating systems to renewable energy technologies, and it went 'fully live' in January 2013 (Richards, 2013).

By virtue of its activities, the SHAP initiative represents a situation in which capacity is being developed for companies that provide sustainable energy services, and so it was considered suitable for the research. The SHAP programme was especially relevant in the sense that it provided an opportunity for various companies to be involved at once and for a collective perspective to be gained.

Access was granted by the organizers of the SHAP programme to its meetings, workshops and other sessions, and the participant-observation study began in February 2012 and concluded in July 2012. The sessions involved management-level staff from the different companies in the programme coming together to decide on the type and quantity of resources and skills needed to meet the market demand that was expected to be created by the Green Deal. The participants also planned how sustainable energy products would be sourced, distributed, and installed in buildings, and they worked on putting together a supply chain network for all the activities involved.

In order to record the interactions taking place among the SHAP participants as data, the participants were observed. The term 'observation' here is used in line with Langley's (1986) description of it as 'careful looking and listening in order to discover particular information about behaviour'. Warren and Karner (2005) and Adler and Adler (1987) write that when using the observation method, the researcher's role in the field often varies depending on the nature of what is being studied, and it ranges from being a complete observer to being a participant observer. Iacono et al. (2009) and Trochim (1999) state that complete or direct observation involves the researcher being unobtrusive and wholly detached, while participant observation requires the researcher to participate in a culture or procedure while at the same time recording what is being observed. A major risk associated with observation is that the researcher's role may change during the research, thus affecting the consistency of the data being obtained (Ahrens & Chapman, 2006).

In order to gain first-hand knowledge and experience about the capacity development process, it was necessary to not just watch, listen to, and record the interactions among the SHAP participants, but to also participate in the interactions. However, Cresswell (2012) reports that a researcher's participation in the activity being studied could influence the behaviour of the 'real' participants. Thus, in order to acquire reliable data, the researcher has to gain the confidence and trust of other research participants in order to minimise the risk of them altering their 'normal' behaviour, according to Snow & Thomas (2007) and Adler & Adler (1987). This in turn gives rise to the risk that the researcher could be required to perform 'favours' for all or part of the group (for instance, the researcher could be put under pressure to support a particular viewpoint), which could run contrary to good research practice (Yin, 2003). Yin (2003) further mentions that the participant role may require too much attention relative to the observation role, and that the researcher may thus not be able to commit enough time and effort towards

recording data or conducting deeper enquiry. Other authors such as Proverbs and Gameson (2008), Trochim (1999) and Iacono et al. (2009) raise concern over the time-consuming nature of observation in general, and the propensity for researcher bias in his/her perception of what is being observed.

The participant observation of the SHAP programme was conducted in such a manner as to minimise the limitations of the participant observation technique as identified from literature. To prevent the risk of generating inconsistent data, care was taken to maintain a constant participant-observation state throughout the period of study, without becoming completely detached (wholly observatory) or completely immersed (wholly participatory). To gain the confidence of the other research participants and ensure that the study would not alter their 'normal' behaviour, the intentions of the research were announced right at the beginning of the study. The researcher also drew upon his previous work background and his familiarity with the subject matter of the programme to form a working relationship with the other participants in order not to be regarded by them as an outside intrusion. To minimise the influence of the study on the SHAP activities, the researcher played only a minor participatory role. This excluded deciding how or what capacity development tasks should be performed. It also excluded taking up any lead responsibility or coming up with any creative input. Instead, it was limited to supporting individual participants in their assignments by following their instructions concerning what should be put down as the outcomes of the assignments.

With regard to recording as data what the SHAP participants, did, said and documented in respect to the development of capacity ahead of the Green Deal, a number of options were considered based on literature. Work done by Pope et al. (2006) and Mulhall (2003) identify the major possible choices of recording observation data as video cameras, audio recorders, and field notes or other written accounts. In order to ensure that the behaviour of the SHAP participants was not affected by his presence, an unobtrusive form of data recording was used. Participants indicated that they would be least comfortable with mechanical devices, and so field notes were kept instead. Emerson et al. (2011) refer to the field note as a transformation of observed interaction and the outputs learned from it into written communication. Authors such as Saldana (2009) and Yuan (2001) highlight its effectiveness at capturing a situation in its most realistic form, as it involves observing the situation as it occurs, taking account of actions, speech and text all at the same time, and thus generating more coordinated information. However, other authors such as Emerson et al. (2011) and Mulhall (2003) point out its drawbacks, mentioning that there is a wide variation in research opinion about how field notes should be written and structured, and that there is a risk of the researcher not making a distinction between what others said and did (i.e. the data) and his/her own thoughts and reactions.

The field notes were thus constructed in such a manner as to minimise its limitations while making use of its strengths. Care was taken to ensure that the field notes did not serve as a journal or diary. They did not include personal reflections and thoughts about what was being observed. They recorded only

the SHAP participants' actions, statements, plans and decisions in respect to how the capacity of their organisations should be developed for the procurement, distribution, installation and maintenance of sustainable energy products for buildings within the Green Deal programme. A total of 23 field notes were compiled (refer to Appendices, A1.1).

Participant observation was useful for studying the capacity development process required for the provision of sustainable energy products for buildings. It was also useful for gaining insight into how these products can be provided with minimum negative socio-environmental impacts. However, the outputs of the SHAP programme mainly took the form of recommendations rather than an actual expression of intent. Environmental business values were interpreted from the participants' response to the issue of impact minimisation, as will be demonstrated later in Chapter 5. Capacity development barriers were also identified.

3.5.2 Interviewing

Beyond observing the capacity development process, the research also looked into the effects that a company's implementation of environmental and social business practices could have on its business capacity. By way of achieving this, it was necessary to capture the in-depth perceptions of people who are responsible for applying these practices to the different components of capacity analysed from chapter 2 of this thesis –finance, supply chain and relationships, materials, equipment and infrastructure, labour, and knowledge. A study of literature (e.g. Kumar, 2005; Saunders et al., 2006; Bell, 1993) indicates that interviewing is the most common and versatile way of collecting primary data about people's experiences by which the interviewer can probe for responses and examine issues such as motives and feelings. Consequently, interviews – described by Holstein and Gubrium (2001) as conversations coordinated by someone (the interviewer) with the aim of obtaining information that is relevant to the research objectives – were used for this part of the research. Interviewing is not without its challenges, however, as a lot of responsibility is placed on the researcher to negotiate an effective relationship with the interviewee in order to yield valid and detailed data that is only minimally affected by human complexities (Haigh, 2008). There is also a risk of bias on the parts of both the interviewee and the interviewer, and of inaccuracies due to poor recollection (Yin, 2003).

Different interview types exist; according to Yin (2003), the most common categorisations are informal, structured and semi-structured interviews (Yin, 2003). In the informal or conversational interview, the researcher does not ask pre-set questions but rather generates questions spontaneously (Turner, 2010). While this has the advantage of flexibility, it creates the risk of inconsistency in the questioning process and raises the risk of researcher bias in the sense that questions could be generated on the spot to nudge the interviewee towards providing a 'desirable' response (Turner, 2010). Structured or standardised interviews require the interviewer to stick wholly to pre-set questions (Cresswell, 2012). While this aids consistency, it leaves limited room for gaining additional, unanticipated insight, and a rigid set of

questions may not be understood equally by all members of a diverse respondent group (Cresswell, 2012). Semi-structured interviews involve the use of pre-set but open-ended questions in order to allow for expansion on points raised by the respondents, and they also leave room for additional questions to be asked when necessary (Gall et al., 2003). Due to its relatively balanced approach, which provides more consistency than the informal interview but still allows a sufficient degree of freedom and adaptability in getting information from respondents (Haigh, 2008), the semi-structured interview format was selected for use in this research.

The interview respondents were staff from different SME companies that provide sustainable energy services for buildings. Management-level staff members were especially targeted in order to ensure that the respondents had expert perceptions of capacity development and its relationship with environmental and social responsibility. A profile of the interview respondents is provided in Table 3.1 below. The interviewees are not identified by name, but identity codes have been attached to them in the table. For the rest of this thesis, interviewees will be referred to by their identity codes.

Interviewee	**Title**	**Service offered by Company**
A1	Sustainable Technologies Manager	Supply of various renewable energy technologies
B1	Strategic Sales Director	Supply and installation of various renewable energy technologies
C1	Director	Installation and maintenance of solar PV
D1	Commercial and Customer Lead	Supply and installation of various renewable energy technologies and insulation products
E1	Managing Director	Installation and maintenance of solar PV and wind turbines
E2	Director	Installation and maintenance of solar PV and wind turbines
F1	Environmental Consultant	Supply and installation of various renewable energy technologies

G1	Director of Sustainable Development	Installation of renewable energy technologies and insulation products
H1	Sustainable Design Consultant	Sustainable building design
I1	Sustainability Director	Supply of various renewable energy technologies
I2	Business Development Manager	Supply of various renewable energy technologies
J1	New Business Director	Supply of insulation products
K1	Business Development Manager	Procurement of various renewable energy technologies
L1	Managing Director	Installation and maintenance of various renewable energy technologies
M1	Director	Installation and maintenance of solar PV
M2	Director	Installation and maintenance of solar PV
N1	Chief Executive Officer	Sustainable building design
O1	Manager	Procurement of different sustainable energy products
P1	Chief Executive Officer	Supply of various renewable energy technologies
Q1	Commercial Manager	Supply and installation of various renewable technologies and insulation products

Table 3.1: Profile of the Interview Respondents

The main focus of the interviews was on determining how company's environmental and social practices affect the different components of capacity in terms of the components' volume, type, and other factors considered significant by the interviewees. The interviews typically began with the

interviewees being asked to introduce themselves and their organisation, in order to confirm that their organisation provides sustainable energy services for buildings, and that the interviewee occupies a management role that makes him/her suitable to provide useful data. Interviewees were then asked about their companies' environmental and social practices and policies, in order to understand the degree of importance companies attach to socio-environmental responsibility. The interview respondents were asked about the advantages and disadvantages of environmental and social practices to the six capacity areas identified from literature. They were also allowed to talk about any other ways they felt the practices can affect their organisations.

In all, 20 interviews were conducted, at which point 'saturation' – new data fitting into categories already devised from old ones without introducing any new category (Charmaz, 2003) – was considered to have been achieved. The questions prepared for the interviews are shown in Table 3.2 below, although due to the semi-structured nature of the interviews they were not always asked verbatim and in the numerical order presented in the table.

	QUESTIONS	DESIRED INFORMATION
	Company background:	
1	What is your business all about?	The company's profile and the service it is offering. This is to confirm that the company is a provider of sustainable energy services.
	Socio-environmental practices and business capacity:	
2	Does your company have environmental and social policies?	The company's level of implementation of environmental and social responsibility.
3	What environmental practices do your company observe?	The company's environmental and social business practices.
4	What social practices do your company observe?	
5	How important are your company's environmental and social performances when compared to its economic performance?	The level of priority attached to environmental and social responsibility by the company.

6	How do your company's environmentally responsible practices impact on finance?	The ways in which the practices influence the volume of the company's capital base and expenditure.
7	How do your company's socially responsible practices impact on finance?	
8	How do your company's environmentally responsible practices impact on labour?	The ways in which the practices influence the criteria by which the organisation's staff are recruited, developed and motivated.
9	How do your company's socially responsible practices impact on labour?	
10	How do your company's environmentally responsible practices impact on its supply chain and other relationships?	The ways in which the practices influence the organisation's selection of, and cooperation with, its supply chain and other business partners and its expectations from them. Also, the ways in which the practices shape relationships with clients, customers, regulatory bodies and other wider stakeholders.
11	How do your company's socially responsible practices impact on its supply chain and other relationships?	
12	How do your company's environmentally responsible practices impact on its knowledge base?	The ways in which the practices influence the manner in which the company identifies and generates useful knowledge, applies and replicates it, and transfers and shares it internally and externally.
13	How do your company's socially responsible practices impact on its knowledge base?	
14	How do your company's environmentally responsible practices impact on equipment and infrastructure?	The ways in which the practices influence the type and quantity of tools, vehicles, work spaces and other physical facilities used by the organisation.
15	How do your company's socially responsible practices impact on equipment and infrastructure?	
16	How do your company's environmentally responsible practices impact on materials?	The ways in which the practices influence the company's selection of finished

17	How do your company's socially responsible practices impact on materials?	sustainable energy products and/or other materials needed for service delivery.
18	How else do your company's environmentally and socially responsible practices benefit it?	Additional effects of socio-environmental responsibility which are perceived by the interviewee to be positive.
19	How else do your company's environmentally and socially responsible practices have unfavourable effects on the company?	Additional effects of socio-environmental responsibility which are perceived by the interviewee to be negative.

Table 3.2: Interview questions

3.5.3 Scenario planning

As mentioned in 3.5.1, the outputs of the SHAP study took the form of recommendations made by the participants, which implies that while the participants have a perspective of what should be done, they may not necessarily go ahead and implement these actions within their respective organisations. Likewise, while the interviews provide information about the interviewees' experiences with implementing environmental and social business practices, in themselves they give only a limited indication of whether the experiences are just one-offs or a more complete representation of companies' regular operations. Thus, an additional stage of data collection and analysis was utilised in order to gain knowledge about the practical extent to which companies regularly operate as environmental businesses in different business conditions. Scenario planning exercises were conducted in this stage.

Ratcliffe (2008) and Islas et al. (2003) describe scenario planning as a way by which a study can be conducted into how managers and other decision-makers think through how they would make decisions in a dynamic, uncertain environment. A scenario is defined by Huss (1988) as a narrative description that defines in a probabilistic sense alternative sets of future conditions. Swart et al. (2004) points out that '*scenarios are neither predictions nor forecasts*', but simply reflect the uncertainty inherent in a given system and characterise the nature of human and environmental response under a likely set of future conditions. Scenario planning or scenario analysis is described as '*the process of understanding, analysing and describing system behaviour in terms of particular ways the system is expected to be used*' (Postma & Liebl, 2005), and '*the creation of alternative images of the future development of the external environment*' (Hsia et al., 1994). It is widely acknowledged in literature (e.g. Muskat et al., 2012; Alcamo, 2009; Jacobs & Statler, 2004) as a useful strategic planning tool for mitigating risk and uncertainty associated with problem solving and decision making. Fuller-Love et al. (2006) state that scenario planning does not aim to provide forecasts, but rather is intended to improve current decisions based on a better appreciation of a range of potential circumstances, and thus develop foresight across

many outcomes. Duinker and Greig (2007) partially agree with Fuller-Love et al. and Swart et al. by suggesting that forecasting is merely an element of scenario planning rather than being entirely synonymous with it.

Muskat et al (2012) and Bers et al. (1997) mention that while scenario planning was originally used for military purposes, over the second half of the 20th century it became a corporate strategic planning tool in a variety of other socio-economic sectors. Alcamo (2009) adds that since the early 1970s, scenario analysis has been applied to different scales of environmental problems – ranging from global sustainability to emissions, air quality and land use issues in specific districts or regions – and that it has the potential to '*be more comprehensive, flexible, and perhaps less expensive*' than other kinds of research fieldwork. Brauers and Weber (1988) further highlight the possible benefits of scenario planning by positing that alternative methods in the field of futures studies, such as Time-series Analysis, utilise the assumption that frameworks developed in the past are also applicable to the future. This assumption runs the risk of overlooking new opportunities and challenges facing an organisation and may not adequately exploit the qualitative knowledge of local decision-makers involved (Brauers & Weber, 1988). Walton (2008) alludes to the compatibility of the scenario planning method with the pragmatist research philosophy, since it can build on the constructivist-interpretive paradigm to '*emphasize decision-making utility as the outcome of inquiry*'.

As a result of its relative wide applicability, focus on decision making, consideration of multiple situations, and suitability for dealing with complexity, scenario planning was adopted for use in this research. The method is a management tool as well as a data collection tool, and so it has potential to not only provide data from companies, but also give something back to the participating companies as a business development device. However, it is not without its limitations, as it could perpetuate researcher bias and merely confirm preconceptions if not implemented properly (Ratcliffe, 2008). In addition, the absence of any actual consequences when making decisions during scenario planning means that participants could respond to scenarios in a different (e.g. riskier) manner than they would if faced with the same situation in real life (Lindgren & Bandhold, 2002). Strauss and Radnor (2004) write that operational managers and Research and Development personnel often see scenario planning as '*too soft*', and this results in poor participation, the generation of irrelevant data, and poor eventual acceptance of its outcomes. Chermack (2004) mentions that scenario projects fail because organisations do not have '*the mental model that allows them to comprehend uncertainty*' or a serious threat to their organization, or they are '*busy applying mental models to problems that they do not fit*'.

In order to manage the potential pitfalls of using the scenario planning method, care was taken to maintain an objective stance during the construction of the scenarios, its eventual simulation, and the analysis of the data obtained. The scenarios were developed and presented in such a manner as to elicit open responses rather than constrained ones. The respondents were not directly asked about the degree

to which they would implement environmental business values and practices in different scenarios, as this might have put them under pressure to provide 'tailor-made' responses. For instance, it is conceivable that companies that would not pay too much attention to environmental and social practices might feel compelled to state otherwise out of a need to 'save face' and appear corporately responsible. To avert this possibility, focus was not placed heavily on socio-environmental responsibility in the scenarios. Instead, the scenarios reflected different broad market situations from which a company's attention to environmental and social issues could nevertheless be inferred. Also, in mirroring market trends that companies have had experiences with or otherwise seriously take into account, rather than utilising abstract or fantastical situations, it was expected that companies would react to the trends as an actual possibility rather than as fiction or a game. The manner in which the scenarios were constructed for this research will now be explained further.

Ratcliffe (2008) presents a diagram of the scenario planning process and its possible techniques in Figure 3.2 below. In addition, work done by Liu et al. (2007), Fuller-Love et al. (2006), Zgurovskii & Pankratova (2003), and Millett (1992) indicate that most scenario planning exercises involve the same general steps. These are: the isolation of the key decision(s) to be made; the identification of 'driving forces' that would serve as building blocks for the scenarios; the recognition of the critical uncertainties; the construction of the scenarios; the analysis of the structures and systems that unfold as a result of the scenario stories; and the identification of key events or 'turning points' that influence the decision pathways within each scenario. In this research, scenario planning is intended to explore the interactions, factors and considerations within companies which influence the extent to which the companies apply environmental business values and practices during capacity development on a regular basis. The first stage of the primary research (i.e. the observation and interview data) was used to provide the 'driving forces' for the scenarios. These include environmental business values and the consequences of the application of socio-environmental responsibility to capacity.

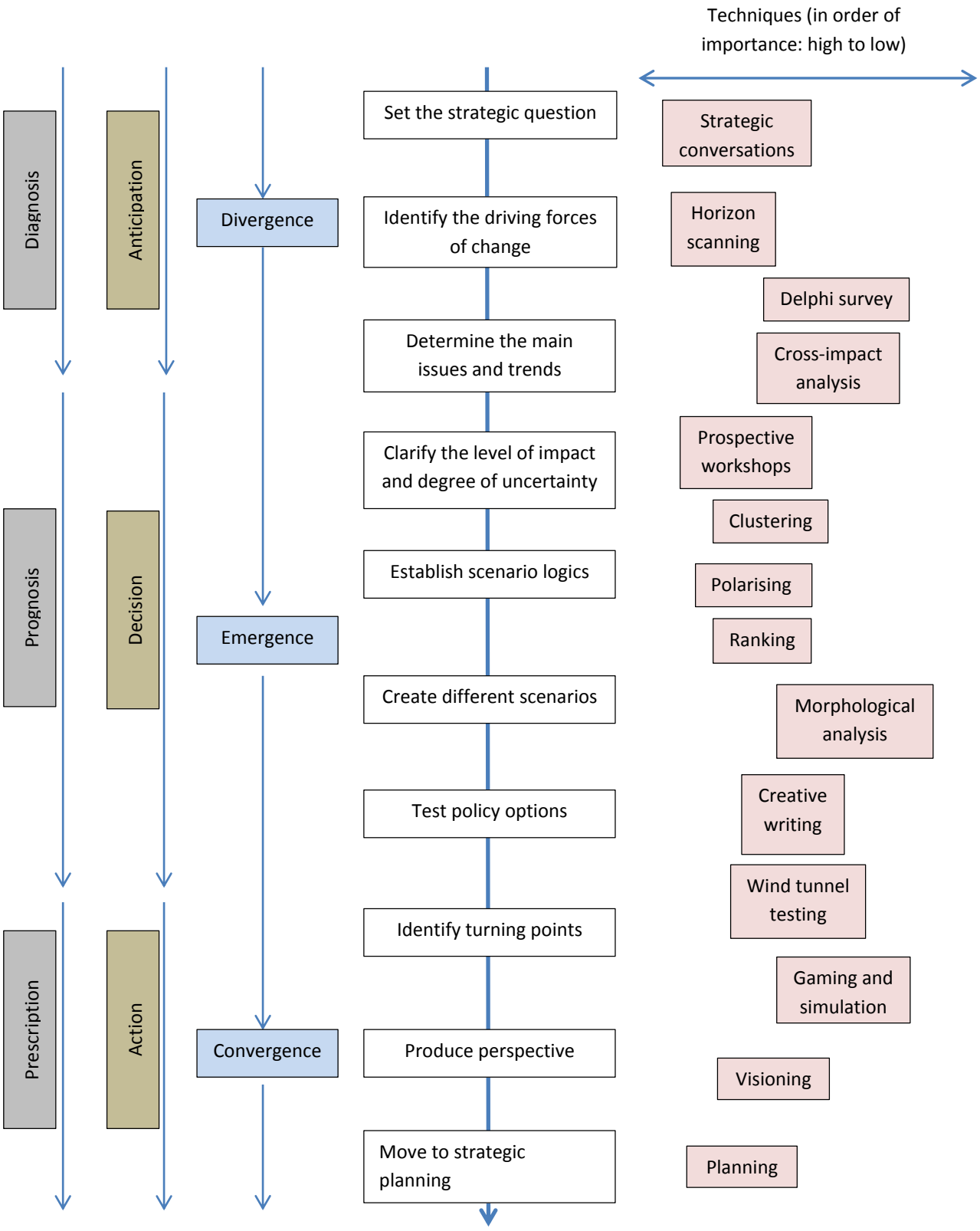


Figure 3.2: Ratcliffe's (2008) 'Prospective through Scenarios'. Strategic Conversations was Used as the Scenario Planning Technique in this Research

In order to include the element of uncertainty associated with capacity development, the scenarios consider a range of possible capacity development situations. Based on the review of literature

conducted in Chapter 2, the level of capacity a business organisation maintains is most closely linked to the volume of existing and expected customer demand for the organisation's goods and/or services. This capacity-demand relationship results in three main capacity development situations: capacity could lead demand, lag demand, or exist in approximate equilibrium with demand. Combining this information with the driving forces and uncertainties identified from the results of the first stage of the primary research, the scenarios were constructed to obtain information along the lines of Figure 3.3 below.

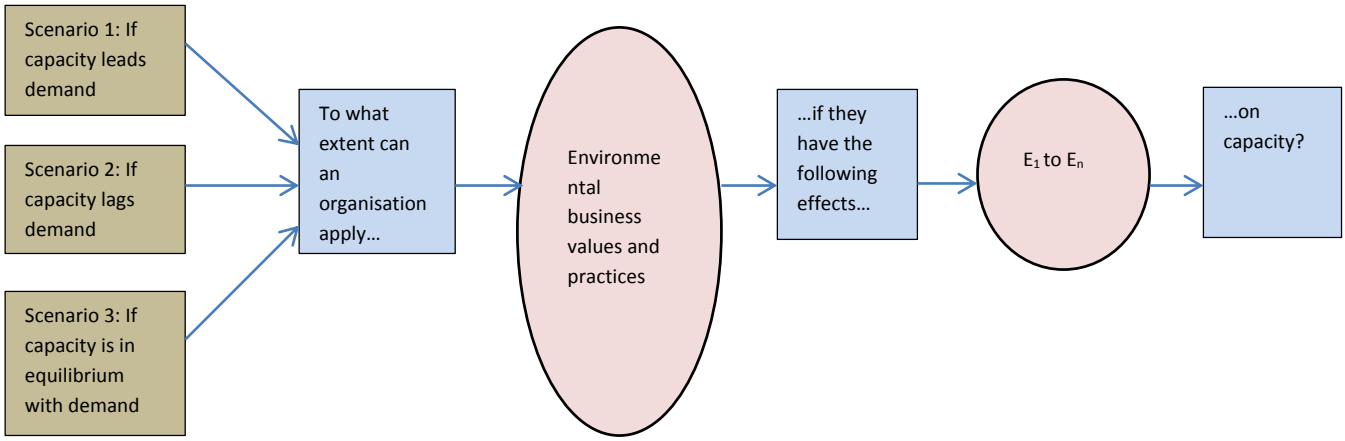


Figure 3.3: Construction of the Research Scenarios

E_1 to E_n denotes the possible effects of operating in a socio-environmentally conscious manner as determined from the first stage of primary data collection and analysis. The logic illustrated in Figure above resulted in the development of a set of three narratives, each narrative dealing with one scenario.

Kemp-Benedict (2004) mentions that ambiguous statements and goals are undesirable in a narrative. Van Notten et al. (2003) indicate the same in their work, 'An Updated Scenario Typology'. They also mention that an 'intuitive' and creative approach to storyline development is suitable for complex scenarios that are descriptive and based on qualitative knowledge. However, they also emphasise the importance of basing scenarios on requirements established earlier in the research from data collected. To this end, the scenario stories developed in this research relied on key information obtained during the first primary research stage. This ensured that the scenarios were sufficiently grounded in industry perceptions about capacity development challenges and opportunities and the implications of operating in an environmentally and socially effective way. To further enhance robustness, each narrative consists of a background context for the scenario being considered, an identification of the scenario that emerges from the background story, and the task facing decision makers within an organisation as a result. Care

was taken to develop the narratives in such a manner that it was flexible enough to be applied to different companies regardless of their specialisation. The narratives are presented in Table 3.3 a-c below.

Background:	*Company X's management team is expecting new economic opportunities for the company. Their expectations are based on the Green Deal and ECO programs and the £106 billion market for building energy-efficiency it is projected to deliver from 2013. The company's research also indicates that social attitudes towards environmental sustainability (and by extension, sustainable energy technologies, services, and products for the built environment) are becoming increasingly positive. However, there is no guarantee that these trends will actually translate to strong and consistent market demand for Company X's sustainable energy services. The company's research found that despite the apparent public support for sustainable energy products, they are viewed as just another building option and could be overlooked in favour of cheaper, less sustainable alternatives, especially since there have been cases of the products failing to achieve expected levels of energy-efficiency improvement in buildings. Likewise, the delivery mechanisms for the Green Deal and ECO programmes are not completely clear and there are some unanswered questions about the programmes' funding and government regulations.*
Specific situation:	*In the midst of this business situation that could go either way, Company X receives a sudden bulk order for its services. Since the market is inconsistent and unpredictable, Company X is unsure if it will get another order as big as this for the rest of the business year.*
Task:	*Company X's management team will have to decide on how they will organize their workforce, inventory, facilities, finance, processes, and supply chain and other relationships to meet the bulk order in a profitable way.*

Table 3.3a: Scenario 1, titled 'Certain Demand Now but Uncertain Demand in the Future'

Background:	*The transition from the government's current Carbon Emission Reduction Target (CERT) scheme to the Green Deal and ECO programmes is taking more time than expected. Consequently, the initial expectation that energy companies will provide £1.3 billion a year towards Green Deal/ECO does*

	not materialise as the programmes fail to pick up steam in time. Company X's research reveals that this situation is caused by inconsistent government policies and a complex stakeholder network and market structure. Due to the delay in the government-driven energy programmes, a shortfall in funding for energy-efficiency installations in public sector housing occurs.
Specific situation:	*Local Authority, Housing Association and other public housing orders for Company X's services, which constitute the bulk of Company X's orders, begin to be cancelled or put on hold. Company X's management doesn't expect the situation to get better any time soon.*
Task:	*Company X is faced with exploring ways by which the company's supply chain, processes, workforce, inventory, finance, and facilities could possibly be reorganised to reflect the economic downturn.*

Table 3.3b: Scenario 2, titled 'Availability of Capacity, Lack of Demand'

Background:	*Changes to government legislation have led to all people and organisations being compelled by law to minimise their buildings' carbon emissions. This development, coupled with already positive societal attitudes towards environmental sustainability, results in a strong and stable increase in public and private sector demand for sustainable energy goods and services. Confidence of investors and funding providers in the sustainable building industry increases.*
Specific situation:	*Due to the favourable business environment, Company X finds that orders for its services have increased, with a further steady growth in demand expected in the future. The company's capacity utilisation rate rises over 100%. The company comes under greater pressure to respond to customer orders on time while also focusing on product, service and process improvement.*

Task:	*Company X finds itself needing to make changes to its workforce, inventory, facilities, finance, processes, and supply chain and other relationships in order to expand its operations to meet increased demand.*

Table 3.3c: Scenario 3, titled 'More Demand than Capacity'

The set of scenarios were presented to management teams in five companies. In each case, team members jointly deliberated on the most suitable approach for dealing with the scenarios, thus simulating a multi-party decision making process. To avoid influencing the interactions that took place among the teams, the researcher did not participate in their discussions but only facilitated the sessions. Data was captured with the use of an audio recorder. A profile of the scenario planning management teams and their organisations is provided in Table 3.4 below. The members of the management teams are not identified by name, but identity codes have been attached to them in the table. For the rest of this thesis, the members will be referred to by their identity codes. Due to the high level of focus paid to capacity development at an organisational level during the scenario planning stage, consent was requested from the management teams to disclose the names of their respective organisations in this thesis. Consent was given by all the management teams, and the names of the companies are included in the table below.

Organisation	**Services offered**	**Management team members**	**Identity codes**
Inex Ltd	Installation of various renewable energy technologies	New Business Director Production Manager Projects Manager	IR1 IR2 IR3
Homeworks Intelligent Energy	Supply and installation of solar PV	Business Development Manager Finance Manager Operations Manager	HR1 HR2 HR3
Coen Building Solutions	Installation of insulation products; energy consultancy	Managing Director Commercial Manager Business Development Manager	CR1 CR2 CR3
Alsecco	Manufacture, supply and installation of	Business Development Manager	AR1

	insulation products; service training	Product Development Manager Finance Director	AR2 AR3
BNK	Installation of various renewable energy technologies; energy consultancy	Commercial Manager Operations Manager Business Development Manager	BR1 BR2 BR3

Table 3.4: Profile of Scenario Planning Management Teams and Their Organisations

3.6 DATA ANALYSIS: CODING

After data collection was completed, data analysis was conducted in order to yield research findings. The procedure most commonly identified from literature sources (e.g. Robson, 2011; King, 2004; Robson, 2002) as useful for the organisation and interpretation of qualitative data into relevant theoretical information is referred to as coding. According to Strauss and Corbin (1998), coding involves conceptualising data, elaborating it in terms of its different properties, and relating the concepts that emerge in order to build theory.

Coding involves a number of processes. The first step is referred to by Strauss and Corbin as *open* coding. This involves discovering concepts and their properties from data, and then categorising and subcategorising them (Neuman, 2005; Strauss & Corbin, 1998). This is followed by *axial* coding, which relates categories to their subcategories based on the identified properties of concepts (Strauss & Corbin, 1998). Hunter & Kelly (2008) and Coffey & Atkinson (1996) explains that this is in order to begin reassembling data fractured during open coding and to form more precise and complete explanations about phenomena. Strauss and Corbin (1998) mention that open and axial coding are both used to conduct a highly detailed, '*line-by-line*' examination of data (which Strauss and Corbin refer to as 'microanalysis') before proceeding with further analysis. Upon the conclusion of microanalysis, *selective* coding is then conducted by which the categories developed during microanalysis are integrated to take the form of theory, which is then refined (Silvester, 2004; Strauss & Corbin, 1998). Guetzkow (1950) mentions that the reliability of the coding process is dependent upon the 'ingenuity and insight' with which the researcher goes about selecting concepts and 'category-sets'.

The coding procedure is illustrated in Figure 3.4 below.

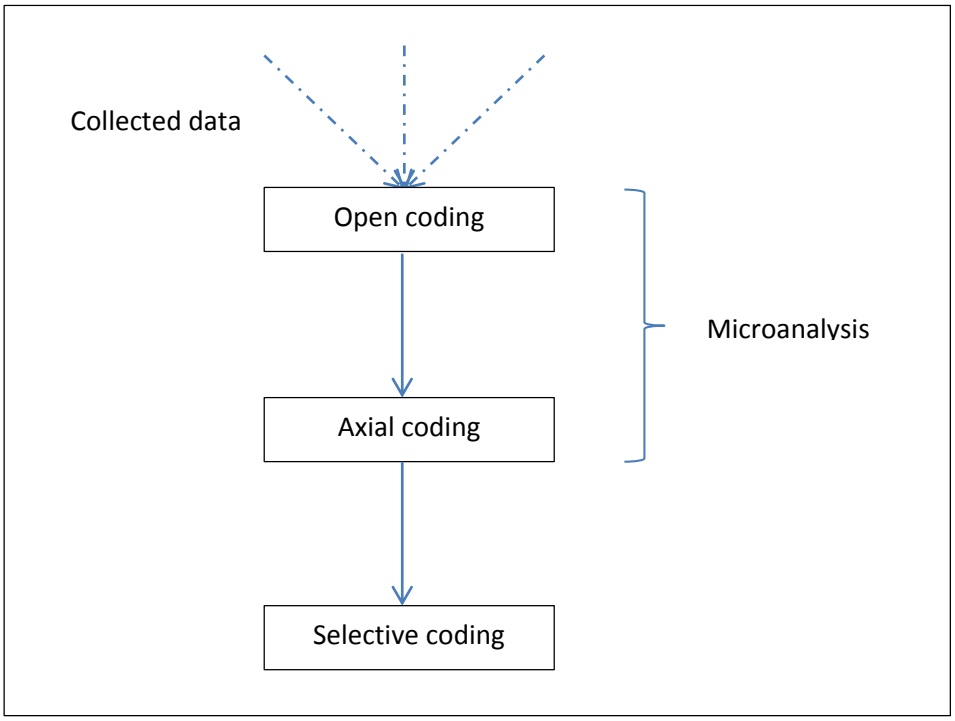


Figure 3.4: The Coding Process.

Data analysis within this research involved audio-recorded data (from the interviews and scenario planning sessions) being transcribed into text and, along with the observation data (which had always been maintained in text form), processed using NVivo 10, a qualitative data analysis software tool. The texts were read carefully to discover patterns that ran through them. Codes were created for the patterns, and all data from which a particular pattern was detected were grouped together under the code (or 'child node' in NVivo parlance) for that pattern. Next, related codes were grouped together under the same category (or 'parent node'). This concluded the microanalysis phase of coding.

Information from the parent nodes were inferred from the set of data coded under each node, and they were then pieced together in order to generate a statement of findings. The extraction of a theoretical proposition or other output from empirical data in this manner is commonly described as 'induction' by authors such as Alvesson & Skoldberg (2009), Flick (2009), Howitt & Cramer (2008), Fereday & Cochrane (2006), and Patton (2002).

Based on this approach, the observation, interview and scenario planning data were analysed as described in subsections 3.6.1 to 3.6.3 below.

3.6.1 Coding of participant observation data

The analysis of the participant observation data yielded information on capacity development activities and barriers, environmental and social problems associated with the provision of sustainable energy services for buildings, and environmental business values. This is explained below.

Since participant observation was conducted in order to investigate how companies develop capacity, the field notes recorded during the observation period concerned the activities that the research participants perceived to be crucial to the preparation of components of capacity for the UK's Green Deal program. During the open and axial coding stages, these activities were sorted into various categories depending on their purpose. The participants were also observed to pay significant attention towards identifying barriers to capacity development. Data patterns related to these barriers were thus coded on the basis that they constituted an important part of the participants' perceptions regarding the capacity development process. Based on the participants' views, the barriers were sorted into the following categories: regulatory, economic, stakeholder, technical, and behavioural. Regulatory barriers include the barriers perceived by the participants to be caused by industry regulation and legislation. The economic category is comprised of financial barriers. Stakeholder barriers include barriers caused by the supply chain structure and the wider stakeholder network. Technical barriers refer to the challenges that arise during process and product development within the companies. Behavioural barriers concern the barriers that are caused by the behaviour of the end-users of the companies' services, such as building occupants.

Apart from coding capacity development tasks and barriers, it was also necessary to code the responses of the participants towards the issue of minimising the environmental and social impacts of companies during their provision of services. This is because these responses are vital to the inference of environmental business values, as highlighted in subsection 4.2.1. The participants' views about existing energy-related problems in buildings were coded, as well as their views on new environmental and social issues that could arise as a result of addressing the existing problems. The perceptions of the research participants about how the potential new environmental and social problems could be avoided were then categorised as well.

Upon the conclusion of the open and axial stages of coding, selective coding was done in order to derive information from the various categories of data. The information obtained in this manner concern environmental business values and capacity development barriers, as highlighted in Table 3.4 below, which summarises the process of generating information from the categories and subcategories developed through open and axial coding.

Theme	**Microanalysis (open and axial coding)**		**Induction (during selective coding)**
	Category	**Sub-category**	
Existing problems associated with energy use and carbon emissions in buildings	Environmental problems	Individual environmental problems	Environmental business values
	Social problems	Individual social problems	
The capacity development process	Various activities related to capacity development		
New problems that could arise	Environmental problems	Individual environmental problems	
	Social problems	Individual social problems	
Response to new problems	Environmental response	Various responses of the participants to environmental problems	
	Social response	Various responses of the participants to social problems	

Capacity development barriers	Regulatory barriers	Individual regulatory barriers	The various barriers to capacity development.
	Economic barriers	Individual economic barriers	
	Stakeholder barriers	Individual stakeholder barriers	
	Technical barriers	Individual technical barriers	
	Behavioural barriers	Individual behavioural barriers	

Table 3.5: Coding of Participant-observation Data

3.6.2 Coding of interview data

The interviews were done in order to determine the effects of environmental and social business practices on companies' capacity. Thus, open coding mainly involved reading through the interview transcripts for patterns about environmentally and socially responsible business practices and their application to the different capacity components, as well as the effects of their application. Axial coding was useful for sorting data further by making a distinction between environmental and social practices, identifying their respective effects on an individual capacity component, and repeating these procedures for all the six components.

After the microanalysis of the interview data, the benefits of environmental and social practices were inferred, as well as the detriments. The coding process for the interview data is outlined in Table 3.5 below.

Theme	Microanalysis (open and axial coding)		Induction (during selective coding)
	Category	**Subcategory**	
Socio-environmental responsibility	Environmentally responsible practices	Various environmentally responsible practices	Benefits and detriments of environmental and social practices on the business capacity of companies
	Socially responsible practices	Various socially responsible practices	
Effects of environmentally and socially responsible practices on capacity areas	Effects on labour	Effects of environmentally responsible practices on labour	
		Effects of socially responsible practices on labour	
	Effects on finance	Effects of environmentally responsible practices on finance	
		Effects of socially responsible practices on finance	
	Effects on supply chain and relationships	Effects of environmentally responsible practices on supply chain and relationships	
		Effects of socially responsible practices on supply chain and relationships	

	Effects on materials	Effects of environmentally responsible practices on materials	
		Effects of socially responsible practices on materials	
	Effects on knowledge	Effects of environmentally responsible practices on knowledge	
		Effects of socially responsible practices on knowledge	
	Effects on equipment and infrastructure	Effects of environmentally responsible practices on equipment and infrastructure	
		Effects of socially responsible practices on equipment and infrastructure	

Table 3.6: Coding of Interview Data

3.6.3 Coding of scenario planning data

Open coding of the scenario planning data involved identifying the different ways in which the respondents went about developing capacity in the three scenarios. Axial coding was then used to extract from the open codes the respondents' references to the implementation and/or non-implementation of environmental business values and practices. In this manner, the open and axial stages of coding jointly provided an insight into the degree to which environmental protection and social responsibility feature in a company's capacity development efforts in different situations.

The induction done during selective coding generated a theoretical proposition concerning the extent to which companies apply environmental business values and practices during capacity development; the motives behind the application (or non-application); the circumstances that encourage application; and the circumstances that limit it. Table 3.5 below shows the coding process for the scenario planning data.

<table>
<tr><th rowspan="2">Theme</th><th colspan="2">Microanalysis (open and axial coding)</th><th rowspan="2">Induction (during selective coding)</th></tr>
<tr><th>Category</th><th>Subcategory</th></tr>
<tr><td rowspan="3">Companies' responses to different capacity development situations</td><td>Scenario 1</td><td rowspan="3">Various measures taken by companies in response to each scenario</td><td rowspan="6">The practical extent to which environmental business values and practices are implemented by companies during capacity development</td></tr>
<tr><td>Scenario 2</td></tr>
<tr><td>Scenario 3</td></tr>
<tr><td rowspan="3">Companies' consideration of environmental protection and social responsibility</td><td>Scenario 1</td><td rowspan="3">Various references to environmental business values and practices in each scenario</td></tr>
<tr><td>Scenario 2</td></tr>
<tr><td>Scenario 3</td></tr>
</table>

Table 3.7: Coding of Scenario Planning Data

3.7 SYSTEMS MODELLING OF THE TRANSITION FROM TRADITIONAL TO ENVIRONMENTAL BUSINESS CAPACITY DEVELOPMENT

Chapter 2 raised the question of what a company's transition from a traditional to an environmental business system involves. The analysis of the research data provides information on traditional capacity development and the challenges associated with it, as well as the requirements for and implications of a company's operation as an environmental business. Based on this information, it becomes possible for the research to propose how SMEs can transit from a traditional to an environmental business capacity development approach.

As part of the transition proposal, the research utilises systems modelling of the capacity development process to create a cognitive structure of how a SME can migrate from a conventional, economic-centred capacity development approach to an environmental business one. Systems models, and diagrams in general, provide a powerful means for communicating different understandings of the world and of the potential outcomes of actions taken (Ison, 2010). They are quicker than words in pointing out the multiple interactions among various entities within a system, and in making clear the key features of an interpretation of a given system (Morris, 2009).

Apart from systems models, other ways of representing the transition of a business process from an economic to an environmental business perspective include static sustainability models such as the Sustainability Venn Diagram, Concentric Circles, and Three Pillars of Sustainable Development. However, while these representations are useful in highlighting the relationships that exist among the economy, environment, and the society, they suffer from a number of limitations. Lozano (2008) mentions that they lack the ability to represent the process of change over time. They are also prone to over-compartmentalisation of the links between economic, environmental and social issues. For instance, the Sustainability Venn Diagram typically regards the overlapping area of all its three circles as the only indicator of 'full' sustainability, with the intersection between any two circles regarded as only 'partial' sustainability, and any element that falls within only one circle viewed as completely unrelated to sustainability (Dalal-Clayton & Bass, 2002). Dawe and Ryan (2003) argue that the Three Pillars Model portrays economy, society and the environment as parallel 'legs' of the sustainable development 'stool', when humanity can have neither an economy nor social well-being without the environment. According to Dawe and Ryan (2003), the environment is not simply one leg, but is the floor upon which the stool must stand; it is essentially the foundation from which the other two pillars proceed and should thus be considered at a more significant level than them. The Concentric Circles conforms to Dawe's and Ryan's view in the sense that it presents the economy as a sub-system of society, which is in turn nested within the environment. This gives an impression of an order of dependency which connects all three dimensions; the economy cannot exist but as an extension of wider society, which in turn requires a stable environment to occupy. However, such a representation falls prey to the assumption that there are sufficient resources with no external factors (e.g. climate disasters, or political and military conflicts) leading to reductions in the supply of these resources to society, and it also completely refutes the idea of balance among the three sustainability components (Lozano, 2008; Ehrenfeld, 2005; Mebratu, 1998). Crucially, none of these models adequately captures the company perspective of capacity development as determined from this research. Based on the research evidence as well as literature reviewed in Chapter 2, businesses traditionally exhibit a strong bias for the economic dimension and demonstrate only limited accountability for, and ownership of, society and the environment. Contrary to viewing the economy as a subset of the environment, commercial organisations appear to be more inclined towards viewing the economy as their world, and social and environmental matters as being subsets of that world.

In acknowledgment of this perception, the research seeks to utilise a systems model that recognises the significance of economic issues to SMEs whilst simultaneously highlighting the intersections between the economy, environment and society, thus making sure that wider social and environmental issues are not overlooked. The model will be constructed out of key research outputs concerning major issues and challenges associated with both traditional and environmental business capacity development, as well as factors that can mitigate the challenges and create transition pathways.

3.8 SUMMARY

Primary research was done to investigate the way in which SME companies that provide sustainable energy services for buildings develop their capacity to do so. As part of the primary research, participant observation of the Sustainable Housing Action Partnership (SHAP) Green Deal preparation programme was conducted in order to gain knowledge about the capacity development process for sustainable energy service companies. This provided knowledge about the values required for companies to avoid the creation of new environmental and social problems when developing capacity to address the issue of energy use within buildings. Through the use of interviews, knowledge was also gained about the implications (both positive and negative) to companies of applying environmentally and socially responsible practices. Scenario planning case studies were then used to evaluate the extent to which companies integrate these values and practices into their capacity development process in a range of practical situations. The next chapter focuses on the findings obtained from the primary research.

CHAPTER 4

OBSERVATION, INTERVIEW AND SCENARIO PLANNING FINDINGS

4.1 INTRODUCTION

This chapter looks at the findings obtained from the two stages of primary research. As has been explained in the previous chapter, the first stage of the research involved the conducting of a participant observation study and interviews. The participant observation findings provide data about the capacity development process, existing environmental and social problems associated with energy use in buildings, and potential new problems associated with companies' efforts to address existing ones. It also identifies companies' responses to these problems, and barriers to capacity development. The interview findings describe effects of socio-environmental responsibility on a company's capacity across the six areas of labour, finance, materials, knowledge, equipment and infrastructure, and supply chain and relationships. Overall, the first stage of the primary research yields data on capacity development activities and barriers, ways by which sustainable energy service companies can address existing socio-environmental problems without creating new ones, and the capacity implications of implementing environmental business practices.

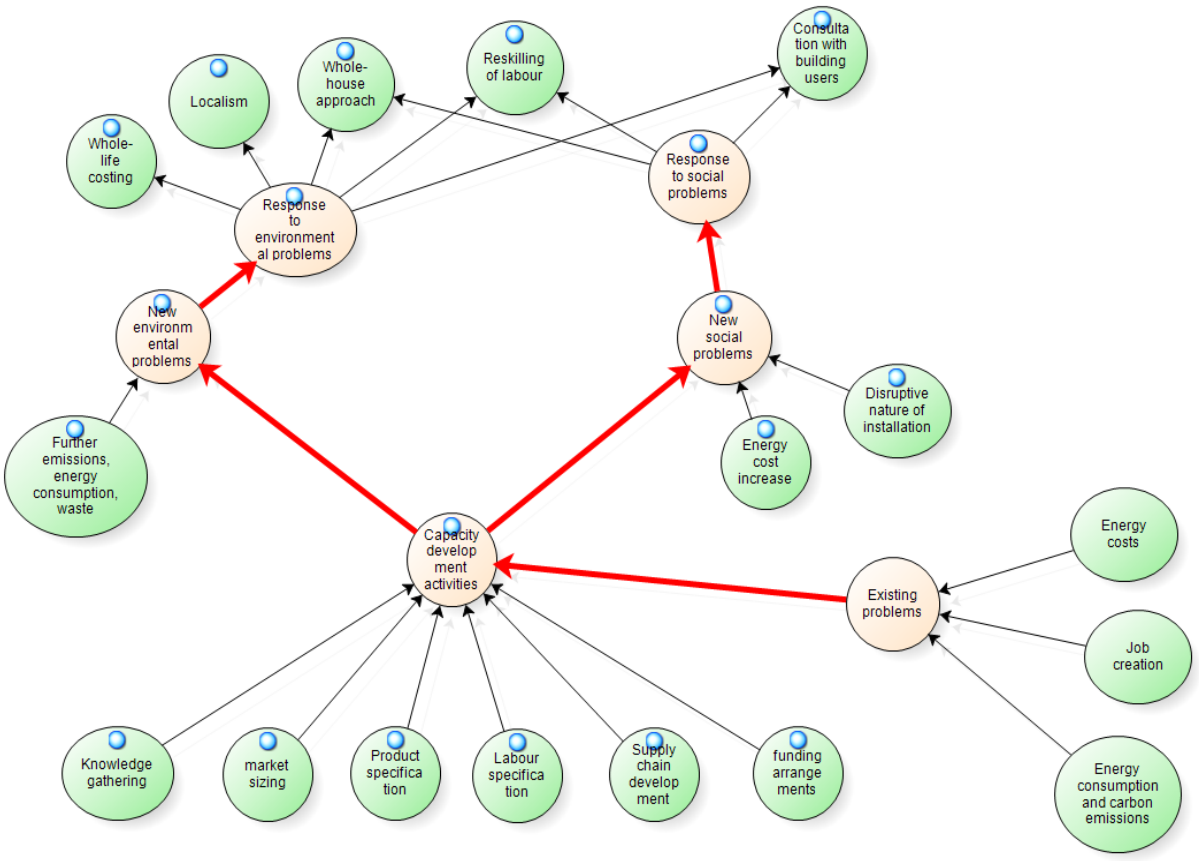
The second stage of the primary research consists of scenario planning cases. The findings from this stage show how SMEs develop capacity in three major situations, namely, capacity leading demand, capacity lagging demand, and capacity existing in equilibrium with demand. In this manner, a holistic picture of the companies' operations is generated. Data is provided on how companies respond to conventional economic concerns. At the same time, an insight is given into the degree of attention paid to the issues of environmental protection and social accountability by companies. Together, the first and second stages of the primary research generate data on what is required for a company to function as an environmental business, whilst also drawing attention to practical realities associated with business as a whole and with the addition of social and environmental responsibility.

This chapter features four sections apart from this opening segment. The first (section 4.2) reports on the participant observation findings, and the second (section 4.3) focuses on the interview results. The third section (4.4) looks at the scenario planning results and is broken down further to focus on each of the five companies that served as case studies. Each company's response to the scenarios is looked at one scenario after another. The final section of Chapter 5 (4.5) summarises the research findings.

4.2 PARTICIPANT OBSERVATION FINDINGS

A sample of the field notes recorded during the participant observation study, as well as supporting documentation from the SHAP Green Deal preparation programme, can be found in the Appendix. The data the field notes provide is described in the sub-sections below. 4.2.1 identifies the capacity development activities that were observed in the research. 4.2.2 talks about environmental and social

problems associated with the provision of sustainable energy services for buildings, and the responses of the research participants to these problems. 4.2.3 looks at capacity development barriers that were discovered in the research. Figure 4.1 below provides a structure of the findings for 4.2.1 and 4.2.2, while a similar figure is provided for 4.2.3 later on in this section.



4.1 Capacity Development Activities, Problems and Responses

4.2.1 Capacity Development Activities

Product Specification: As part of their capacity development efforts, the participants in the SHAP programme specified the products that would be most economically suitable for companies to invest in supplying and installing. The field note recorded on 2nd March 2012 mentions that participants focused on:

'*The specification of sustainable energy solutions that will be implemented, with respect to type, the required quantity, and the geographical areas in which they will be installed*'. Participants felt that '*the publication of a range of key products and standards would provide confidence in the market and encourage investment in local production*' (field note recorded on 12th April 2012).

In specifying sustainable energy products, participants focused on different components of a building and determined which product would be most suitable for individual building components. For instance, they specified external wall insulation and internal wall lining for a building's walls; double, triple and vacuum glazing for a building's windows; floor insulation and under-floor heating for a building's floors; draught proofing for doors; and loft insulation for lofts. A range of renewable technologies (e.g. solar photovoltaics and wind turbines), energy monitoring systems (e.g. light, temperature and humidity sensors and switches), and sustainable building design measures (e.g. daylighting) were also recommended by participants.

Market Sizing: Apart from product specification, the SHAP participants focused on projecting the value of the market that would arise out of the Green Deal scheme. Several field note excerpts allude to this, and some of these excerpts are given below:

'*SHAP Task-and-Finish Group 2 members identified the desired outcomes of their activities. These include: the calculation of the number of residential and commercial buildings to be retrofitted to any particular standard*' (28th February 2012)

'*Members identified the need to continue sizing the market opportunity for sustainable energy solutions in the West Midlands*' (5th March 2012)

'*Members agreed on new activities to be carried out by the group. The activities are: … the sizing and valuation of the potential market*' (7th March 2012)

'*SHAP Task-and-Finish Group 3 has prepared a first representation of the potential market size for the installation of insulation products, based on ECO Affordable Warmth activity*' (12th April 2012)

'*Of the total number of 5.8 million properties, over 1.6 million properties were projected to take up loft top-up insulation. Of this number, 210,299 will take up loft top-up insulation along with solid wall insulation, 628,987 will take up loft top-up insulation along with cavity wall insulation, and 797,344 will take up loft top-up insulation alone*' (26th June 2012)

'*There are an estimated over 3 million solid-walled properties in England with suspended timber floors which are suitable for insulation*' (28th June 2012)

The sizing of the market was conducted at national (UK), regional (England) and county (West Midlands) levels. The SHAP participants first evaluated current market values, and then they went on to assess the energy profile of the residential building stock in England and the West Midlands in particular. This was in order to gauge the potential of sustainable energy products and services for further market penetration. Participants relied on the assumption that a minimum average Energy Performance Certificate (EPC) rating of C is required for the UK housing stock in order for national

carbon targets such as the Climate Change Act 2008 and the Energy Efficiency Action Plan 2007 to be met. Just over 21% of residential buildings in England were found to be at C rating and above, while less than 30% already had 200mm or more of loft insulation, over 25% still required whole-house double glazing, and over about 30% of cavity-walled buildings were found to be uninsulated. The energy profile of the buildings thus signified to the SHAP participants a huge market potential for companies that provide sustainable energy goods and services.

'*159000 (0.7%) of the England housing stock have an A or a B energy efficiency rating. Almost 3.5 million (15.5%) have a C rating, about 9 million (40.4%) have a D rating, about 6.8 million (30.5%) have an E rating, about 2.1 million (9.6%) have a F rating, and 748000 (3.3%) have a G rating*' (22nd March 2012)

'*About 1.8 million (8.2%) of the England housing stock was found to have no double-glazing. Almost 1.2 million (5.2%) have double-glazing in less than half their windows, while almost 2.8 million (12.4%) have double-glazing in over half their windows*' (22nd March 2012)

'*About 19.7 million (87.8%) have lofts, of which almost 1.1 million (4.8%) do not have loft insulation. Of the remaining properties with lofts, 657000 (2.9%) have a loft insulation thickness of less than 50mm. Almost 6 million (26.7%) have a loft insulation thickness of 200mm or more, while about 11.9 million (53.3%) fall in between 50mm-200mm loft insulation thickness category*' (22nd March 2012)

'*Over 15.5 million have cavity walls (69.3%), of which about 7.2 million (32.2%) do not have cavity wall insulation*' (22nd March 2012)

However, SHAP participants only produced specific market value estimates for the installation of insulation and window glazing products. This is because they expected the installation of these products to account for most of the overall market value. The participants did not produce individual estimates for goods and services with lesser market potential, such as solar PV and other renewable energy technologies. The loft insulation, cavity wall insulation, and window glazing installation markets in England were estimated to have a combined value of over £14.5 billion, with the West Midlands county accounting for nearly £1.4 billion. The Green Deal market in the West Midlands for the development, procurement, sale and installation of all specified sustainable energy products was projected to be worth £3 billion. This did not include the provision of maintenance and monitoring services, which the participants identified as an area that is currently lacking in skills.

'*The members presented examples of this market opportunity within the West Midlands. These include a total market value of £3 billion, £194m worth of labour and materials for the installation of new boilers, and 2000 jobs per year for the installation of solid wall insulation over 10 years*' (24th May 2012)

Funding Arrangements: Another activity that SHAP participants carried out was the evaluation of the financial requirements for the adequate provision of sustainable energy services to meet projected demand.

'*SHAP Task-and-Finish Group 3 members agreed on the desired outcomes of its activities. The desired outcomes include: the identification of possible funding opportunities*' (7th March 2012)

'*Members recommended further activities for SHAP to carry out. These were: …the implementation of a manufacturing and business support strategy that addresses the high compliance and accreditation costs of entry into the market, and which includes mechanisms for dedicated finance …and inward investment and joint ventures*' (24th May 2012)

'*Members agreed to investigate available sources of funding for skills development from ERDF programmes*' (25th May 2012)

Labour specification: Participants also focused on labour and skills specification.

'*SHAP Task-and-Finish Group 1 members agreed to develop a road-map to the Green Deal. This includes the labour requirements for the provision of the Green Deal*' (2nd March 2012)

'*Members agreed on new activities to be carried out by the group. The activities are: …the estimation of the current labour pool; the estimation of the required labour pool for the Green Deal; the type of skills and training required*' (7th March 2012)

Participants drew up skill categories for the implementation of different sustainable energy measures in buildings. 3 skill levels were identified, with the first one targeting low-level skill sets, including people who are Not in Education, Employment or Training (NEET):

'*…local community members, hard-to-reach and long-term unemployed*' (field note recorded on 13th April 2012).

The products and services this skill level should focus on include:

'*…cavity wall insulation, double glazing, draught proofing, …low energy light bulbs, …customer care and technical knowledge assistance for these products and services*'(field note recorded on 13th April 2012).

Level 2 targets medium-level skill sets:

'*New employment, the re-skilling of the existing workforce, the reskilling of unemployed, and part-time opportunities*'(field note recorded on 13th April 2012).

The products and services recommended by SHAP participants for this skill category include:

'*…external wall insulation …central heating controls, surveying, all level 1 products and services, and customer care and technical knowledge assistance for level 1 and level 2 products and services*' (field note recorded on 13th April 2012).

Level 3 targets higher level skills such as:

'*…the existing workforce, new employment, college and university graduates, Small and Medium-scale Enterprises (SMEs), and the manufacturing sector*'(field note recorded on 13th April 2012).

Examples of the products and services Level 3 should focus on are:

'*…biomass boilers, …ground source heat pumps, …solar photovoltaic systems, …wind turbines, all level 1 and 2 products and services, energy certification, and customer care and technical knowledge assistance for level 1, level 2 and level 3 products and services*' (field note recorded on 13th April 2012).

Supply Chain Development: SHAP participants also paid attention to the development of an adequate supply chain for the provision of services around the products the participants specified.

'*SHAP Task-and-Finish Group 3 members discussed the supply chain and skills development paper previously developed by the group, and its adoption as a working document*' (13th April 2012)

'*They plan to conclude the development of a supply chain, ranging from manufacture to customer care, and identifying the 'local actions required', before the release of the SHAP Retrofit Summit interim report in September 2012*' (22nd May 2012)

'*MEBC* (Midlands Environmental Business Council, one of the SHAP organisations) *has carried out asset mapping of the local supply chain capacity in Lichfield. SHAP Task-and-Finish Group members reported that this exercise needs to be replicated across the West Midlands*' (24th May 2012)

Knowledge Gathering: In addition, participants focused on knowledge requirements for a successful preparation for the Green Deal. They drew upon case studies of energy-efficiency projects being carried out in other parts of the UK and abroad, in order to gain more understanding of how to implement the Green Deal preparation programme in the West Midlands.

'*Members agreed on new activities to be carried out by the group. The activities are: …an overview of relevant UK-based research activity in conjunction with the ESKTN* (Environmental Sustainability Knowledge Transfer Network) *and Building KTN* (Knowledge Transfer Network)*; and research findings of overseas experience*' (7th March 2012)

'*Members agreed that the sharing of training models across different industries may create more robust training models and sustainable employment for the manufacture and installation of sustainable energy products*' (13th April 2012)

'*SHAP members agreed that there exists an opportunity to maximise the value resource investments into the Green Deal preparation through joint commissioning of advice, the sharing of information obtained via single commissions…*' (24th May 2012)

Participants were observed to view the Green Deal programme as a commercial opportunity for:

'*the generation of intellectual property and knowledge assets …the development of new polymers and other materials for construction and energy management*' (field note recorded on 23rd April 2012).

Other technologies and systems that could utilise the Green Deal programme to penetrate the market were identified. These include carbon capture and storage, bioenergy, smart grids, new sustainable building and manufacturing design systems, and new instrumentation and battery technologies to support micro-renewable technologies.

4.2.2 Environmental and Social Issues and SHAP Participants' Responses

Existing Issues: With regard to social problems associated with the provision of sustainable energy services for buildings, SHAP participants regarded energy costs as a significant burden on building occupants. They identified fuel poverty reduction as a potential social benefit of Green Deal. This is due to the opportunity for building occupants to gain income from the sale of excess electricity – generated by renewable energy technologies installed in their homes – to the UK electricity grid. It is also due to a reduction in energy bills due to the increased energy conservation that would be brought about by products such as insulation. The following are some field note excerpts related to the issue of energy costs.

'*SHAP Task-and-Finish Group 2 members met to consider the critical role the electricity network/grid will play in enabling the West Midlands to take the lead in reducing fuel poverty for those most at risk*' (28th February 2012)

'*Members researched energy consumption savings that would be achieved by installations of cavity wall insulation, internal solid wall insulation, loft top-up insulation, and full double-glazing in outstanding West Midlands properties. The energy saving was found to be 11237 GWh/year*' (27th March 2012)

Apart from fuel poverty reduction, SHAP participants also identified employment generation as a potential social benefit of Green Deal, as the current labour capacity would need to be expanded to match the market demand that would be created by the programme. Specific job creation figures were generated for the products expected by SHAP participants to lead the market, namely insulation and window glazing. The following field note extracts provide instances. The average number of jobs per

annum drops when spread over a longer time period by SHAP participants, since most of the jobs are expected to be created earlier in the Green Deal programme rather than later.

'*Members noted the importance of good customer service and customer relations as a potential area for job growth in the delivery chain*' (12th April 2012)

'*Potential jobs per annum across the West Midlands region due to new installations of solid wall insulation are projected to be approximately 3800 per annum for the 10-year period starting from the commencement of the Green Deal. This figure drops to approximately 2500 per annum when considered over a 15-year period, and it is put at approximately 1900 per annum when considered over a 20-year period*' (20th April 2012)

'*Members eventually adopted the figure of 38000-60000 as the number of jobs that would be made available in 2015 as a result of The Green Deal policy, based on all the employment generation data researched by the group*' (28th June 2012)

'*Members presented figures concerning the potential jobs per annum that could be created across England through the installation of boilers, cavity wall insulation, loft insulation, and window glazing as Green Deal measures. 24842 jobs per annum were projected to be created across the 10-year period starting from the commencement of the Green Deal. The projection dropped to 16562 jobs per annum when it was considered over a 15-year period. The projection dropped to 12421 jobs per annum when it was considered over a 20-year period*' (2nd July 2012)

Energy loss and carbon emissions release were identified by participants as the major environmental problems associated with energy use in buildings. The field note recorded on 27th March 2012 indicate that one reason for participants' particular focus on residential buildings during the Green Deal preparation programme was that the residential building stock:

'*…had the highest energy impact on the environment compared to the commercial building stock*'.

<u>New Issues:</u> With regard to new environmental problems that could arise from the provision of goods and services to meet Green Deal demand, the participants acknowledged that additional emissions generation, energy consumption and waste generation could be caused by companies' activities. They expressed concern over:

'*…the creation of environmental harm in other parts of the supply chain other than the installers*' (23rd April 2012).

They also:

'*…identified the following as an area that required further information and work done in: whether there is an active framework to ensure that activities concerned with the Green Deal project, such as the transportation and manufacturing of retrofit materials, do not result in additional emissions, energy use and waste problems*' (27th June 2012).

Concerning potential new social problems, a major issue was the invasive nature of the installation of products and the inconvenience that this would pose to building occupants. The field note recorded on 27th June 2012 refers to the SHAP participants' view that:

'T*he more whole-house a solution is, the more difficult it becomes to achieve a zero-invasion situation where residents remain in their homes while the work is being carried out*'.

The installation process also looked set to disrupt existing housing structures and fittings. For instance, '*SHAP Task-and-Finish Group 3 members identified the disruption caused by floor insulation to most homes as a major barrier, as it involves the lifting of carpets and floorboards prior to insulation and the subsequent replacement of the floorboards*' (28th June 2012).

Another possible social problem was the prospect of an increase in energy costs for building occupants, due to the limited capacity of the electricity grid network to absorb the additional power that would be generated by renewable energy technologies (mainly solar PV) upon their installation in buildings. As is mentioned in the field note recorded on 3rd July 2012:

'*Participants noted that upgrades for micro-generation technologies are not funded by the government and therefore the costs are passed down to the customer. As a result, this is becoming increasingly expensive in urban areas and costlier to connect to the grid*'.

In responding to the identified environmental problems, SHAP participants were observed to adopt the view that even though the existing traditional building workforce could in principle install sustainable energy products in buildings, a reskilling process had to be introduced. This is in order for the workforce to not only install the products with a traditional building mind-set, but to also pay particular attention towards ensuring that the products fully realise their energy-saving potential upon installation.

'*Members mentioned the need for concentrating on the identification of new or upgraded skills needed for the installation of sustainable energy solutions in buildings*' (5th March 2012)

'*Members mentioned that current skill sets do not offer a flexible range of skills that can service and repair a range of products, and that there needs to be a provision to support multi-skilling in this area*' (13th April 2012)

'*Members identified 'moving away from traditional construction trades' as essential for the delivery of the Green Deal*' (25th April 2012)

The need for reskilling was further intensified by the SHAP participants' efforts to utilise the Green Deal preparation as a vehicle for enabling job creation and poverty reduction. The participants targeted the Not in Education, Employment or Training (NEET) section of the populace as a source of new members of a reskilled workforce for the Green Deal scheme. The NEET category's lack of work experience led to further importance being placed on the development of a skills program.

The SHAP participants favoured the adoption of a 'whole-house' approach for the design of work processes.

'*SHAP Task-and-Finish Group 1 members listed the information requirements necessary for the Green Deal preparation activities that they are going to conduct. The information included …the current potential for the implementation of area-based whole-house measures*' (2nd March 2012)

'*The members identified the achievement of area-wide, whole-house retrofit as a major issue for SHAP*' (24th May 2012)

Such a system would focus not on the efficiency of any single product in itself, but on the integration of different products within buildings. This is to ensure that individual buildings are customised with products that are the most suitable for them, and that different products complement each other upon their installation in buildings. A localism approach was also endorsed whereby companies would situate their activities as close as possible to the geographical areas in which their products would eventually be installed.

'*Participants at the session marked a few areas for consideration at the next meeting. The areas are: …and the engagement of local manufacturers to get them involved*' (12th April 2012)

'*Members identified the following as areas that required further information and work: … the ability and/or need for the UK to aspire towards a local manufacturing base and supply chain for sustainable building products; the way in which this local supply chain can be catalysed…*' (24th May 2012)

'*SHAP Task-and-Finish Group 3 members agreed that local manufacturing 'makes sense'. They also agreed to establish whether there is a local 'basic' product that is currently available for installation*' (4th July 2012)

Localism was found to be necessary for the minimisation of the energy, emissions and waste issues associated with procuring, transporting, storing and distributing the products and ancillary materials. It would also allow for a closer environmental monitoring of companies' activities. However, the setting up of local supply chain activities was found to require major financial investment. As a result, participants endorsed a 'whole-life costing' standard which particularly draws attention to the economic

benefits that might accrue to companies in the future to offset the initial investment costs. This is to encourage companies to take a longer-term view of the business rather than seek quick economic wins.

'*The group agreed on ways to overcome the market challenges. These include: a greater emphasis on whole-life costing rather than upfront costing*' (23rd April 2012)

'*Members recommended further activities for SHAP to carry out. These were: the encouragement of government to publish a long-term strategy similar to the German model, introduce whole-house policy and 'whole-life' costing standards…*' (24th May 2012)

In addressing the issue of the intrusive and disruptive nature of installation, participants identified consultation with building occupants and other building users as a way of arriving at a low-disruption approach. They also recommended the importance of spreading awareness among building occupants of the need for a more responsible energy lifestyle, such as by switching off lights when not in use, and by using energy-saving home appliances.

'*SHAP Task-and-Finish Group 1 members recommended further activities for SHAP to carry out. These were: …the development of customer engagement initiatives to reduce energy demand; the mapping of potential for change in energy end-users' consumption behaviour…*' (24th May 2012)

'*SHAP Task-and-Finish Group 2 reports that BIS funding needs to be put in upfront to facilitate engagement with homeowners*' (3rd July 2012)

The SHAP participants were not observed to come up with a response about how the risk of an increase in energy costs, due to insufficient capacity of the UK electricity grid to absorb surplus power generated by renewable energy generation technologies in buildings, can be addressed.

4.2.3 Capacity Development Barriers

The participants also identified barriers that companies would encounter in their preparation for Green Deal. These barriers are economic, regulatory, stakeholder-related, technical and behavioural in nature. Economic barriers include high volume of initial investment, and uncertainty over which Green Deal stakeholders are liable to cover financial losses in the event that companies' involvement in the Green Deal scheme fails to achieve profitable returns on investment. Despite the results of their market sizing activity, which point to an impending rise in demand, the participants also identified uncertain market demand as a barrier. Some field note extracts are presented below which highlight these issues.

'*The economic challenges include: high upfront investment costs, and insufficient security of demand*' (23rd April 2012)

'*Economic barriers identified were: insufficient security of demand, piecemeal activity, lack of investment finance, and limited market information and business support*' (25th April 2012)

'*At the end of the session, SHAP members concluded that the delivery mechanisms for Green Deal are still not clear and there are queries around financing*' (24th May 2012)

'*Based on the above Green Deal retrofit pilot projects, SHAP Task-and-Finish Group 3 members identified the following problem areas: …low uptake of/high dropout from the installation of sustainable energy solutions*' (27th June 2012)

As mentioned earlier in this section of the chapter, SHAP participants promoted whole-life costing standards as part of a means of encouraging companies to not become put off by high investment costs. SHAP participants were observed to make references to labour being an especially cost-intensive capacity component due to staff development and employee remuneration commitments attached to it. For instance, the field note recorded on 24th May 2012 captures participants' view that '*most of the Green Deal cost is in labour*'.

Regulatory barriers identified by SHAP participants include inconsistent and restrictive policies and uncertain scheduling of programs, as well as the challenge of integrating multiple programs.

'*A slow start is expected especially as Green Deal and the introduction of the domestic RHI* (Renewable Heat Incentive) *is also delayed*' (5th March 2012)

'*Regulatory challenges include: legislative issues such as planning policy restrictions on green energy installations*' (23rd April 2012)

'*Regulatory barriers identified were: unstable policy agenda, Electricity Market Regulation, planning policy, and building regulatory standards. FIT* (Feed-In Tariffs) *and the Introduction of RHI were mentioned as unstable policies*' (25th April 2012)

'*The members agreed that there are issues surrounding how CESP* (Community Energy Saving Programme)*, ECO and the Green Deal complement each other*' (26th April 2012)

'*SHAP Task-and-Finish Group 2 members reported that with the exception of BES* (Birmingham Energy Savers) *and work to be undertaken by the Black Country, legal and financial planning around the West Midlands is largely on hold until Green Deal details become clearer*' (24th May 2012)

'*Members identified the following problem areas: …long lead times involved in signing customers onto the Green Deal and getting planning permissions through; linking the Green Deal with other energy efficiency and housing projects may require more funding than is currently being allowed for…*' (27th June 2012)

Stakeholder barriers include the complexity of the stakeholder network due to the multiplicity of diverse interests and procedures involved. Other stakeholder barriers identified by SHAP participants include the instability of the supply chain for specified products and services, and the crowding out of smaller companies by bigger ones.

'*Stakeholder challenges include: Complex interaction between various internal and external stakeholders including regulators, planners, designers, installers, building owners*' (23rd April 2012)

'*Supply chain barriers identified were: market monopolies*' (25th April 2012)

'*Members identified the following problem areas: the constantly evolving supply chain*' (27th June 2012)

The technical barriers acknowledged by SHAP participants include the inadequate integration of modern sustainable energy products with older energy systems in existing buildings, and the limited availability of skills for the maintenance of products after they have been installed. Some supporting field note excerpts are given below.

'*Members mentioned that current skill sets do not offer a flexible range of skills that can service and repair a range of products*' (13th April 2012)

'*The technical challenges include: the incompatibility of new micro-renewable technologies with existing energy installations such as boilers, and insufficient skills development*' (23rd April 2012)

Participants identified insufficient public awareness about sustainable energy products and responsible energy behaviour as a major behavioural barrier. The field note recorded on 3rd July 2012 reports that SHAP participants took the view that a review of a change of behaviour is needed to see if '*changing our attitudes towards power can alter how we use it*', and that '*the attitude of the end-user*' of energy '*needs to be changed*'. Participants indicated that the limited familiarity of building users with sustainable energy products has a negative impact on market demand, as it means that building users would be less interested in acquiring the products for buildings. Participants were also observed to express concern about the motives of some companies entering the market. They were worried that '*the entry of companies with questionable motives such as an attraction to profit margins more than a long-term commitment to sustainability*' (23rd April 2012) could carry out work without regard for the long-term performance of products, which could result in poor product selection and operation. It was expected that whole-life costing could help dissuade companies from exhibiting such opportunistic behaviour. Figure illustrates the capacity development barriers.

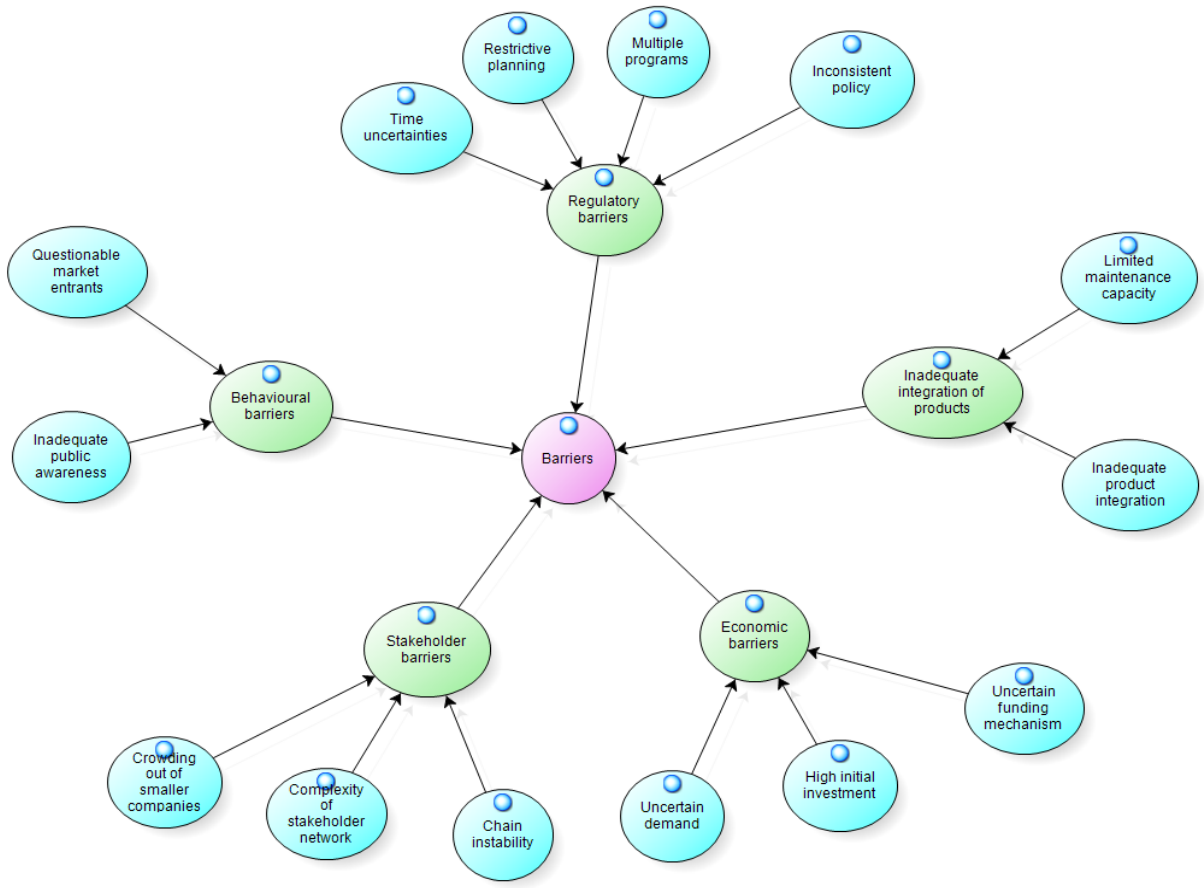


Figure 4.2: Capacity Development Barriers

A summary of the findings from the SHAP participant observation study is presented in Table 4.1 below.

Issue	**Details**
Capacity development activities	Market sizing, product specification, labour specification, supply chain development, funding arrangements, knowledge gathering
Existing social problems associated with energy use in buildings	Energy costs
Existing environmental problems associated with energy use in buildings	Energy consumption, carbon emissions

New social problems that could arise from companies' operations	Disruptive and invasive nature of installation, further increase in energy costs
New environmental problems that could arise from companies' operations	Additional energy consumption, emissions generation, and waste generation
Companies' responses to environmental and social problems	Reskilling of labour, a 'whole-house' approach to implementing sustainable energy measures in buildings, localism, a 'whole-life costing' attitude to business, consultation with building users
Capacity development barriers:	
Economic	Uncertain funding mechanism of the Green Deal scheme, insecurity of demand, high upfront investment costs.
Regulatory	Policy inconsistencies, time uncertainties.
Stakeholder	Complexity of stakeholder network, supply chain unreliability, crowding out of smaller companies.
Technical	Inadequate integration of modern products into existing buildings, limited skills for the maintenance of installed products.
Behavioural	Inadequate public awareness about sustainable energy products and responsible energy behaviour. Questionable market entrants

Table 4.1: Summary of Participant Observation Findings

4.3 INTERVIEW FINDINGS

As was mentioned in Chapter 3, part 3.5.2, interviews were conducted to determine the effects of environmental and social practices on 6 major capacity areas. Figure 4.1 below illustrates this.

This section is divided into 6 parts, 4.3.1 to 4.3.6, each part looking at each capacity area and the effects of environmental and social practices on it.

4.3.1 Finance

The interview data shows that the environmental practices of energy conservation and waste management reduce business costs for a company. To illustrate this, one interview respondent, A1, states:

'*If we can reduce the amount of energy that we consume then we can reduce the cost that we have … reducing waste reduces the amount of landfill tax that we pay …the amount of raw material we're buying in the first place*' (A1).

Q1 comments:

'*The larger the project, the more cost-effective it is to recycle your waste, because if you don't recycle your waste and you put it in a skip and it goes to general landfill, it costs three times the amount to do that should you recycle that and take it to landfill*' (Q1).

Other comments related to this issue include:

'*Waste management makes financial sense as well because waste is really expensive to dispose of, you know*' (O1)

'*So how does a business …use less energy, how does it use less resources, how does it use less transport miles, how does it keep its carbon footprint down? ... it wants to because it can see the business benefits of doing that, because if you use less energy you're probably saving costs, for example*' (P1)

'*Reusing of packaging, for example, it should vary, cost less because you're reusing packaging'* (E2).

Social responsibility was found to improve the organisation's prospects of winning public sector work.

'It helps our ability to win work because we work with public sector clients, they want us to use local labour' (A1).

With regard to sustainable energy service companies in particular, the potential of sustainable energy products to reduce fuel poverty has a positive impact on demand for these products and services. K1 states:

'*Energy prices are going up and up and up, so the business case* (for the company's services) *gets better'* (K1).

Similarly, other interviewees remark:

'*As energy prices continue to rise, more and more people want energy-efficient solutions for their existing buildings*' (B1)

'*Economics will drive it* (increased demand) *in the end because fuel prices are going up*' (I2)

'*I think on* (sic) *future developments it will be green because it'll all be driven by energy costs*' (Q1).

Despite these benefits, on the whole the application of environmentally and socially responsible practices appears to be cost-intensive. A1 states:

'*We appreciate there is a cost involved in it, an upfront cost*' (A1).

According to A1, one of the reasons why his organisation is having difficulty in becoming a '*zero-carbon business'* is because:

'W*e will become too expensive and too …we would become non-competitive. Our clients aren't going to pay us extra money because we are a zero-carbon business*' (A1).

A1 goes on:

'*At the end of the day it's about being a profitable business. And whilst we have all these values, there's no point in having them if we're not a profitable business*' (A1).

Q1 adds:

'*I would say for a business starting out… into sustainability, for a period of time it could increase their costs by anything, it could be twenty five per cent, until they've got to that point in time where they can operate it*' (Q1).

There was a prevalent view among the interviewees that companies that uphold a strong socio-environmental ethos are in a less competitive market position than the more mainstream companies. H1 mentions:

'*A company that doesn't think sustainably has higher profit margins than we do'* (H1).

A1 says*:*

'If we said, 'Ok, we're going to take on board that issue (high environmental and social performance) *as well as all the other issues', we would probably be the only organization that did it and we wouldn't win any work and we would no longer be a profitable business'* (A1).

Environmental business practices also limit the scope within which product and service quality can be lowered in favour of cheaper business costs. As E1 puts it:

'*If you buy just on price at the moment with these hundreds of manufacturers of PV, who knows what you'll get? And why would anybody buy something from an unknown installer when they really are expecting it to last at least twenty five years* (after installation in buildings)*?*' (E1).

In addition, the practices could exclude economic opportunities that are available in the mainstream building and construction sector. E1 narrates:

'*That's* (environmental and social practices are) *the problem …which has actually held us back compared to some competitor businesses, hasn't it? Because other businesses …maybe* (socio-environmental responsibility) *hasn't been a consideration* (for them), *so they've grown more quickly*' (E1).

E2 narrates that his company:

'…could have had the model of being the biggest nationwide installation company covering the whole country' (E2).

But it decided that:

'That wasn't the best model. The better model is for there to be an installation company in every town or village or wherever …it creates local employment' (E2).

4.3.2 Materials

Local sourcing and procurement was found to be a major way by which companies implement socio-environmental responsibility.

'We always try and specify: local to the site first, then UK, and then if we have to bring things in from abroad we don't want to bring them in from too far away' (H1).

The interviewees acknowledged the role of local sourcing and procurement in reducing the embodied energy of products (the energy consumed in the process of sourcing, producing and distributing them), carbon emissions, and negative social impacts. As D1 put it:

'*If you are sourcing locally, you've got a little bit of comfort that …the product itself is being manufactured in the right kinds of ways*' (D1).

Q1 questioned:

'*What's the carbon emissions to bring that piece of material from China? …That could be a substandard material and it's not got the lifespan that you think it's got and then you've got to dump it anyway*' (Q1).

Materials consumption is also reduced, due to environmental emphasis on waste minimisation.

'*Reducing waste reduces …the amount of raw material we're buying in the first place*' (A1).

However, environmental and social criteria were found to increase the intensiveness of materials specification and add to the overall complexity of the procurement process. According to A1:

'*We probably have more audit procedures because …we want to know where our products are coming from …there probably are more procedures than you'd have with a company that wasn't bothered*' (A1).

I2 states:

'*You can't chop and change things because everything's interrelated. But in traditional construction you chop and change things everyday. And that's probably the single biggest difference between the two markets*' (I2).

E2 remarks:

'*We spend a bit more time choosing products*' (E2).

The ethos of socio-environmental responsibility can also conflict with customer preferences. For instance, A1, whose company specialises in sustainable building materials states:

'*We did have an issue recently where a client …wanted a particular type of granite stone, and this granite stone …could only be bought from one source …and it was made in a place that, you know, we were nervous about or we were uncomfortable with, and that did present us with an issue because we didn't have a choice in that matter'* (A1).

Q1 narrates how his company lost out on a project because of its desire to implement waste reconversion:

'*We just bid a project that we haven't been successful on …We think we may …have disadvantaged ourselves because we've said, 'Well, we're not going to take that to general waste, we're going to sort that…' And the client …he went, 'That's fantastic. How're you going to do that? Where are going to do that, because there's no room on my site*' (Q1).

Q1 also states:

'*You do have projects where the client will specify a material that is not from a sustainable source. We will in those instances look to amend or change that product to a sustainable product. But there are instances when a client will say, 'No, that's the product that I want, and that's the product that I specify', so that's the product that is used*' (Q1).

4.3.3 Equipment and Infrastructure

Information obtained from interviewees about the effects of socio-environmental responsibility on a company's infrastructural capacity mostly had to do with a company's building and work facilities, transportation vehicles, and office equipment. Where companies apply energy conservation, carbon emissions reduction, and other environmental measures, these practices could restrict their infrastructure options. C1, E1, G1, I1, M1, M2 and N1 mentioned that while their organisations would like to expand and get new premises, they are constrained to buying or building rather than renting, as they would not be able to increase the energy efficiency of a leased building due to their limited rights over the building. E1 went on to add that this sort of situation *'has actually held us back'* compared to his company's competitors, because '*they've grown more quickly*' without such constraints. A1 uses the case of his company's vehicles to illustrate this point. He says:

'*If you want to drive a BMW, a Mercedes Benz or an Audi, in order to get those (reduced) emissions you are looking at cars that are thirty thousand pound plus …So you then have a dilemma that in that particular instance, you know, if you want to drive a big fancy car it's going to cost you a lot of money, or you settle for a smaller, more cost-efficient vehicle*' (A1).

4.3.4 Labour

Environmental and social practices appear to increase a company's administrative workload. According to A1:

'There probably are more procedures to go through, because we are accredited to certain standards, so there are certain procedures that we have to have. So yes, there is more work involved in it' (A1).

Insufficient public awareness about the proper operation of installed sustainable energy systems and technologies contributes to this situation, as it increases the amount of *'legwork'* (according to H1), and thus man-hours, that a company may have to put in to educate users on how to optimise the energy-saving potential of the products. Environmental business practices could also increase the level of training that a company would need to provide to staff. This was attributed to various reasons. F1 mentioned that the limited knowledge of traditional building personnel about sustainable energy products requires them to be retrained.

'*They know nothing about it, so we then have to teach them, and that is slowing things down dramatically*' (F1).

B1 suggested that a 'whole-house' approach, which was also recommended by participants in the SHAP participant observation study (as has been covered in section 4.2), requires staff to be provided with additional training. He mentions:

'*We're busy retraining our staff so they can carry out whole-house measures instead of just cavity or loft installation*' (B1).

Increase in training levels also occurs when companies implement the social practice of employing socially disadvantaged, long-term unemployed people – such as those in the Not in Education, Employment, or Training (NEET) category, which the SHAP participants paid attention to – rather than experienced professionals, as:

'*You're sort of getting them ready for work as well as doing the technical training*' (K1).

Another contributing factor is the need for companies to go beyond standard certification training in order to ensure that their employees are not just able to perform basic installation, but are also able to get products to achieve optimum technical performance. E1 states:

'*We do a lot of training of new installers …not the initial training for them to get their MCS* (Microgeneration Certification Scheme) *certification, but a lot of extra training on how to get the best out of solar systems*' (E1).

However, social responsibility by way of employee welfare protection was found to increase staff loyalty, and a company that pays attention to environmental and social issues attracts and targets employees who have a similar ethos. To illustrate this, H1 stated:

'*We've had a lot of CVs in from architects who really want to do green design …they've tried it with a few companies and …they think they can do better, do more. So they come to us to look for work because they can see our drive and what's behind where we're going*' (H1).

Other related quotes include:

'*People that come into the business, the values of the business are explained to them, and the expectations of what is there in the business is explained to them. If they come into the business during the trial period of settling into the business and they show that they've got no values, they won't be employed*' (Q1)

'*We come across as being a responsible business, and that raises the profile of the business and makes people want to work with us and also work for us*' (A1)

'*Your basic ethos is involved in all your steps. When you're recruiting, you look for certain aspects in each person*' (E2)

4.3.5 Supply Chain and Relationships

With regard to a company's supply chain and business relationships, companies that observe environmental and social business practices tend to form partnerships mainly with organisations that adhere to similar practices. This is evidenced by various quotes from interviewees:

'*We are careful not to align ourselves with companies that are on the wrong end of our* (socio-environmental) *scale*' (B1)

'*We want contractors, supply chain contractors and suppliers, to have the same ethos as ourselves in terms of what we're trying to achieve*' (J1)

'*I think the fact is that if you're a sustainable company and your core values are sustainable, then you'll use other sustainable companies'* (H1)

'*If you can't demonstrate that your process has got low energy, low resource, all the things we've talked about, you probably won't get into* (our) *supply chain*' (P1)

'*A lot of the trade contractors we use as well, part of their pre-qual.* (pre-qualifications) *to work for us, they've got to have sustainability sources, they've got to be green, they've got our ethics* (Q1)

'*There's a minimum level that people have to meet and we have various tiers in our supply chain, and tier one supply chain partners are the ones that are closest to us …To get to that tier one, they have to be a lot closer aligned to our values*' (A1)

'*We try with our logistics partners to choose companies that are aware of the consequences of what we do*' (E2).

A company's attention to socio-environmental responsibility has a positive impact on a company's reputation and could get other organisations interested in working with them. A1 remarked:

'*We come across as being a responsible business, and that raises the profile of the business and makes people want to work with us*' (A1)

H1 said:

'*We've also found that people who have those* (environmental and social) *values have an in-built integrity to do deliver what they say they're going to deliver*' (H1).

However, partners chosen based on socio-environmental criteria may not always offer the cheapest financial quotes, however, and this means that the company may have to forego cheaper partnership options, as A1 attested:

'If you're ruling certain people out they may be cheaper than others' (A1).

A1 adds:

'*As a business we wouldn't procure somebody just because they were cheaper than somebody else. We have to have certain standards and values*' (A1).

Apart from this, a conflict is set up between the socio-environmentally friendly principle of localism and the mainstream practice of globalisation. P1 mentions:

'*UK companies ought just not to be thinking about the market here, they ought to be thinking about the growing market* (sic) *there are* (abroad) *...but then of course we're back to what's localized, and so I think there's a little bit of a theoretical dilemma between the global market,* (and) *the localization*' (P1).

P1 continues: '*The thing I always struggle with …is thinking about the global economy, because it is a global economy now. So if we start doing all this stuff here* (the UK), *what does it mean for, you know, other parts of the world who may have previously been in that supply chain*?' (P1)

Another comment related to the localism-globalisation conflict is made by H1:

'*I don't think we're ever going to be buying everything from the UK. I don't think it's ever going to work like that, I don't know. You've also got to allow for free trade as well, haven't you, so, you know, you can't regulate against that*' (H1).

4.3.6 Knowledge

In terms of knowledge sharing, socio-environmental consciousness appears to make companies favour collaboration, as opposed to competition and *'blocking everyone out'*, as H1 put it. H1 also comments:

'*If you're truly trying to do it* (providing sustainable energy services) *for sustainable reasons …then you want the whole industry to progress with you*' (H1).

F1 states, '*We'll say to building products manufacturers, architects, cost consultants, engineers, main contractors, and the specialist sub-contractors, plasterers, electricians, plumbers, heating engineers, bricklayers, roofers…: 'We're doing this piece of work, which is about understanding what sustainable housing means …It will mean rethinking the bits we buy and the way we put them together. And we're buying the bits from you, and you're putting them together for us, so it means rethinking your business as well. Come talk to us*' (F1).

The variety of products and services required to jointly achieve higher energy performance in buildings further increases the importance of collaboration to sustainable energy service companies. An interview quote that affirms is made by K1:

'*They* (companies) *will be* (sic) *consortiums, because …there isn't anyone in the market that can do everything that is required*' (K1).

H1 goes:

'*They're getting more like that, as in, sort of more integrated their* (sic) *products. Might* (sic) *be more consortia-type companies kind of evolving*' (H1).

Environmental and social practices could also compel a company to forego the commercial exploitation of a product on the basis that its current energy conservation potential is underdeveloped. According to B1:

'*We want to keep things open so that when new technologies come on board, we're not restricted by what was going on two years ago*' (B1).

The effects of environmental and social practices on capacity areas are summarised in Figure 4.2 below.

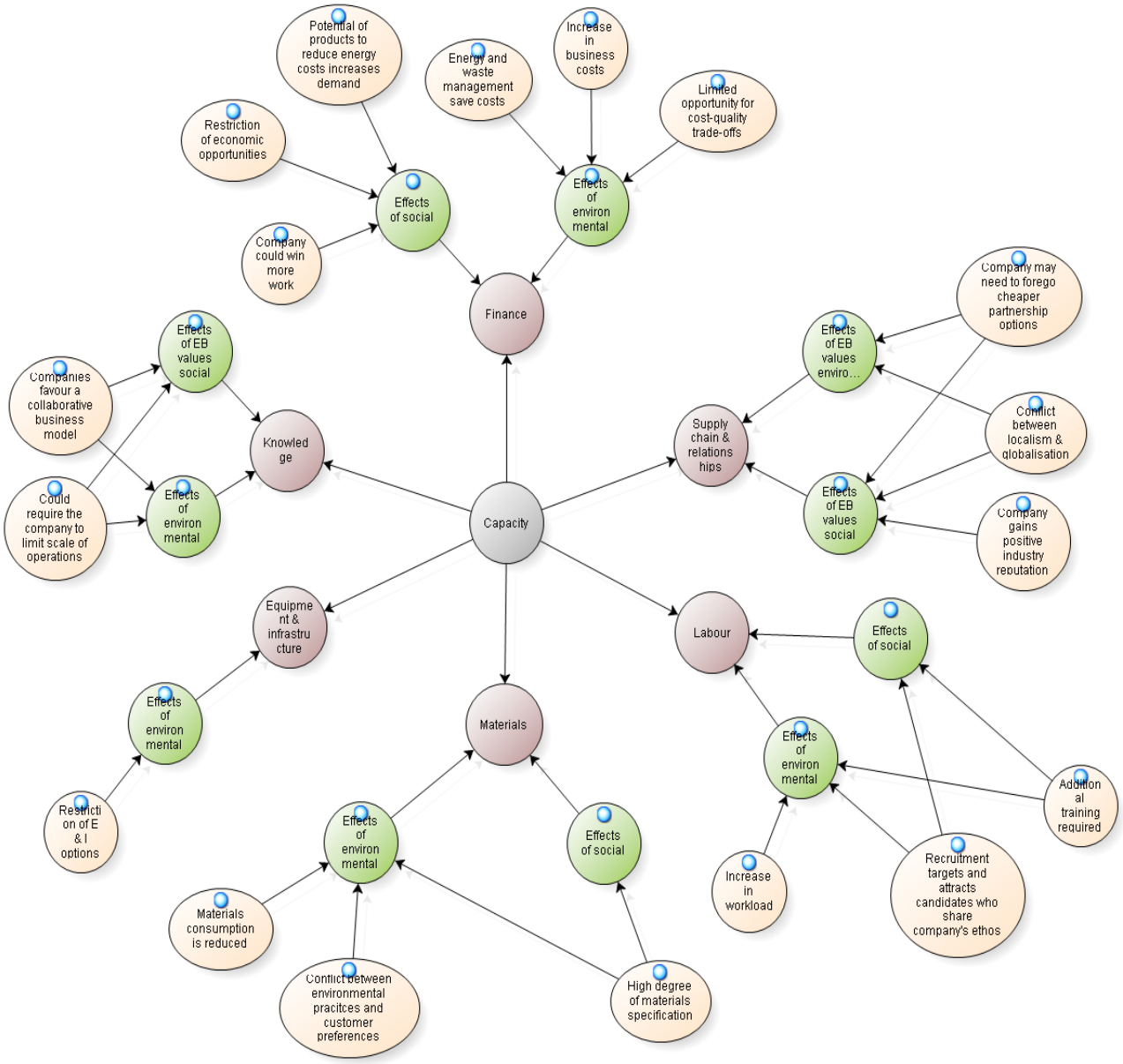


Figure 4.3: Effects of Social and Environmental Business Practices on Capacity Components

4.4 SCENARIO PLANNING FINDINGS

This section presents the results of the scenario planning cases. The responses given by the company management teams concerning their decisions on capacity development in the three scenarios are described. In order to establish the wider context within which each management team gave its response, the background of each company is outlined prior to the presentation of its management team's responses. The team's responses are then given scenario by scenario. This procedure is applied to all the companies one after the other. Permission was given by the management teams for the inclusion of the names of their organisations in this thesis. However, in the course of the scenario planning exercises,

the research participants also made references to other organisations. The identity of these organisations will be hidden since permission was not obtained from them.

Quotations made by members of the company management teams are written in italics. Non-italicised words are upon occasion included (in parenthesis) within the quotations in order to provide greater clarification of what was said. The description of a company as a Small and Medium-sized Enterprise (SME) is based upon the UK Department for Business Innovation and Skills' (BIS, 2010) description of a SME as any enterprise with less than 250 employees.

4.4.1 Company 1: Inex Ltd

Company background

Inex Ltd is a company that provides a variety of services within the property and construction sectors. According to the company's New Business Director, Inex implements sustainable projects, such as the installation of solar photovoltaic panels and ground source heat pumps, under the Green Deal program. However, the company also provides traditional building services such as bricklaying, scaffolding, plastering and roofing, as well as home improvement services such as carpentry, tiling, and kitchen and bathroom fittings, with most of their clientele lying within social housing. The management team members that were present for the scenario planning exercise were the New Business Director, who in his words searches for and wins *'new work for the company'* and develops business systems and procedures; the Production Manager, who is responsible for the company's work operations as well as environmental management and health and safety issues; and the Projects Manager, who directly oversees *'new-build and traditional-build projects'*.

Scenario 1: '*Certain demand now but uncertain demand in the future'*

The management team would first assess the contract arrangement in order to understand how flexible the contract is, as this would enable the team to then stretch the contract over *'a longer period'* (IR1). In delivering the work over an extended period, the team would consider how it would work with the company's supply chain to achieve this. Members of the supply chain with capabilities that are best suited to the requirements of the contract would be selected over other members. The quantity of buildings in which the work is to be carried out would, according to the Production Manager, be *'divided by the timescale'* (IR2) within which the work is to be completed, and this would enable the team to make decisions concerning how much of the supply chain it would get involved in the job.

The managers indicated that the company has a small team that is responsible for winning contracts for the company, and that after a contract has been won an internal communication process is set up through which the team explains the project terms to the management and staff. A project plan is then developed and parts of it allocated to different staff members to implement. The Projects Manager mentioned that

notable areas of concern during this stage include *'forming a team, looking at logistics'* (IR3), deciding on whether to *'setup smaller satellite offices to run from'* (IR3) or be based entirely on the site in which the project is to be carried out, and maintaining consultation with *'the client's representatives'* (IR3). Consequently, emphasis would not only be on internal communication but would also be on setting up *'an external stakeholder meeting regime'* (IR3). This external communication process would not only take client consultation into account but also *'the third-party people behind that, such as the planners, building control, perhaps, or any bodies like that'* (IR3). In addition, building residents and other building users would have to be persuaded that the work needs doing, and they would also be made aware of how the work is to be carried out. A backroom staff team would be created for this purpose, and training would be provided to this group *'so they know what they're talking about'* (IR1).

Cash flow was identified by the team as the area that presented the biggest barrier to the company's operations. With regard to the work order the company receives in this scenario, the bank would be asked to provide funding for the project. An explicit reason for this transfer of financial responsibility in order to manage the day-to-day financial impact of the project upon the company is contained within the following excerpt:

'At the end of the day we are a company that pay on 30 day payments so we have a very good relationship with our supply chain and suppliers. However, we have worked with organisations, like (identity of organisation hidden) *that could pay at 60 and 90 days. Well, you plug that into the plan and it's completely offset on every single corner* (sic). *So therefore, what we have to do is make sure that we've got the support from the bank to be able to do that to pick up the peaks and troughs during any 12 month period'* (IR2).

The team further stressed its focus on cash flow by mentioning that it is important for the company to build a partnership with its supply chain that would enable it to run up financial credit with its suppliers as the project progresses:

'Start off at five, probably ten (thousand pounds) *a week and then build it gradually up to 30 a week'* (IR3).

Even while being excited by the work order presented in scenario 1, the management team would remain realistic about how much capacity the company actually has to absorb the work, and it questioned whether a sufficient pool of skilled labour exists from within which the company could employ. Despite this position, later on the team members expressed confidence that when the capacity of the company's supply chain is included, they would not consider any contract as too big for the company, as it would be able to *'chop the work up'* (IR1) and allocate it to supply chain partners if its own capacity is fully utilised. The company conducts training for supply chain members working with it on a project. The

nature of this training depends on what project is being carried out. For example, if the project is concerned with the installation of a particular product, then product training would be provided as it:

'…is quicker than long-term skills training so that's an advantage …provided you've got the basic skills of individuals (sic)' (IR2).

However, such product training would not be provided directly by the company, but by the manufacturer of the product the company was installing:

'If they want us to use their product, they should provide the training to install that product' (IR3).

The Production Manager highlighted the need for a steady rather than abrupt growth approach for the company, stating that if the company started off doing lots of work without first being really good at it, and it did the work wrong, then it would end up being *'wrong in a lot of areas'* (IR2). On the other hand, if the company started off small and learnt from mistakes along the way, it would be able to gradually develop a good model for product and service delivery. In terms of – or indeed, despite – this gradual approach to growth, one of the processes that the company had been involved in within the 18 months prior to the scenario planning exercise was switching from being mainly a sub-contractor – *'80% of the business was with main contractors'* (IR1) – to being mainly a main contractor – '*we've reversed the ratios completely where* (sic) *we're doing 80% of our own work*' (IR1).

With respect to the company's work relationships, the team indicated a preference for utilising a personal style to develop strategic partnerships, as opposed to a more formal approach by which it would seek to *'nail people to documentation'* (IR2). The company has been able to arrive at a *'flexible arrangement'* (IR3) with its bank which has proved useful in enabling the bank to better *'understand how their products can dovetail into the business needs of what we want'* (IR3).

The company's approach to developing its own labour force within this scenario includes:

'…a certain amount of retraining for us, bringing new people on and bringing apprentices / young people through to learn the trade' (IR2).

With regard to training, the team provided another instance of diversifying its partners by stating that with respect to the training of temporary staff, it engages with more than one training provider. However, for a particular project, the training providers would be based within the geographical area in which the project would be undertaken. With regard to apprenticeships, the team mentioned that scenario 1 would only sustain short-term work experience opportunities which would end as soon as the work order the company received has been delivered. The recent economic recession has made it vital for the company to favour short-term work contracts for its staff in order for it to *'switch off the* (labour) *resource as quickly as possible'* (IR1) and avoid *'prolonged redundancy arrangements'* (IR1).

The team drew attention to *'all the accreditations that we've got in the business'* (IR2), citing this as evidence of the company's focus on achieving high service quality. The company uses green vehicles that are *'no more than 3 years old'* (IR3), and the team appeared to view the benefit of this, as well as the company's accreditations, from an economic perspective, stating that such measures lower the company's insurance premiums. Safety is another aspect of the company's operation that the team regards highly, not due to economic reasons, but because the company's work is often carried out around members of the public.

Scenario 2: *'Availability of capacity, lack of demand'*

The team began by comparing this scenario to the situation in the solar PV industry at the time of conducting this scenario planning exercise. It acknowledged that the scenario would have a significant impact on the company's cash flow in the sense that overheads would increase. As the workload drops off, staff and supply chain partners may become worried that they may not get paid for work already done, and this may impact negatively on loyalty towards the business.

'There will be a demand financially on the business quite quickly (sic) *for people to be paid; that loyalty towards the business will go quite quickly and they'll look at that work load dropping off, they'll see a risk within that. 'Will we get paid? When are we going to get paid?''* (IR1)

The team would respond to this scenario by first looking at the flexibility of the company's programme in order to ascertain if it could be *'delivered in a different way to suit not having to reduce the workforce'* (IR2). However, the company's staff would most likely be reduced eventually, and the management team would seek to mitigate this by prioritising the company's staff over its supply chain if it had to make cuts. The team would also try to move staff to '*other areas of the business*' (IR3) where they could be absorbed. The team's reluctance to let its staff go was due to the challenge of getting them back in the future (at current or lower wage rates) when a higher volume of labour capacity would be required once again.

Another way that the team would cope with scenario 2 is by the company working on a *'contract-to-contract'* (IR1) basis rather than operating as a continuous business. *'Just-In-Time'* (IR1) methods would be used to ensure that the company maintains minimal stock levels. In addition, the company has a:

'...diverse background of work load, so if one market drops off particularly (sic), *we have probably got two or three other markets that we can rely on'* (IR2).

The responsibility for funding staff and supply chain payments would be shared with the bank. As is the case in scenario 1, personal-style relationships between the company and its partners would be very

important, as it would better enable the company to reverse orders it had placed for materials before the workload started dropping.

The team mentioned that the company has an active apprenticeship program and suggested that besides the Corporate Social Responsibility (CSR) value provided by the programme, there is also economic value to the company as well, as apprentices are *'quite cost-effective'* (IR3) in the sense that they represent a source of labour at reduced cost than a fully qualified worker. Despite the unfavourable nature of scenario 2 to the business, the team expressed optimism that there would always be *'a small spike'* (IR1) in demand for the company's services during the spring and summer periods of the year, as *'people like to build things because the weather gets better'* (IR1). The seasonal nature of the market is further highlighted by the tendency of the company's social housing clients to put in orders for the company's services between January to March, after their budget reviews at the end of the previous year revealed areas in which their remaining budgets could be spent. As was the case in scenario 1, the team emphasized the importance of actual experience in enabling the company to adjust to market situations.

'So like anything else we've learned lessons …that's how you learn the business …So I think from that point of view we sleep a little bit better than we have perhaps done 12 months ago' (IR2).

As was also the case in scenario 1, the maintenance of a high level of product and service quality would be a high priority, with the negative situation presented in scenario 2 an inadequate reason for lowering quality standards.

'As far as quality goes, you've got no excuses nowadays for doing work lacking in quality' (IR3).

Scenario 3: *'More demand than capacity'*

The team members indicated that the company would increase its capacity to take on more work. However, the recent economic downturn within the construction and property industry appears to have led the team to adopt an instinctively cautious approach towards capacity expansion even in the situation of high demand presented in scenario 3.

'Actually, after what we've just come through …I would always work as if you're working on recession. I think that's the lesson for the future. If you want a business that's going to sustain itself, always believe that you're in some sort of recession and you need to be very careful about it …you could extend things out, but I'd rather keep it as a tight model …we all went along thinking the world would never end, and it did didn't it? Very, very quickly. I think you've got to have that in your mind' (IR2)

'I think most people have …had a bad experience, haven't they, and they want to do their best to stay out of that situation' (IR1)

Unlike larger organisations in which a significant proportion of their finance went into providing management-level staff with large allowances and *'a fancy car'* (IR3), which results in a *'big fat layer and you're not actually getting value'* (IR3), Inex's management team would not spend money in this manner but would rather allocate financial resources towards acquiring very good staff members – *'you get the best people'* (IR3).

Where the contract is bigger than the company can currently handle, the company would *'cut and carve that contract up and share that'* (IR1) with its supply chain partners under a Joint Venture (JV) agreement:

'What we do is …sit down and come up with a JV arrangement with other organisations of similar kilter to us and …take a small percentage of a finder's fee or whatever you want and we could then pass a section of that work to that particular supply chain member, knowing they've been vetted and their capability and capacity and offer them the opportunity to work with us/alongside us with their own arrangement, maybe with the client or with a model where the finance comes to us and back-to-back arrangement where it goes straight back to them so that there's not real constraint on payment. I think we could probably deliver 100% on something like that' (IR1).

In terms of the equality of the supply chain relationship, the company's supply chain partners would not be *'100% equal'* (IR2) with it, but would be:

'…just slightly below (the company) *so that we have the final say on the strategy and the ethos. We want the whole 100% completed in the Inex way'* (IR2).

As was the case in scenario 1, the team favoured diversifying its business partnerships rather than putting all its *'eggs in one basket'* (IR3). Again, as it did in the first two scenarios, the team indicated a preference for a personal style of conducting business relationships, as this enables the company to have *'honest conversations'* (IR1) with its clients and partners whenever it encounters difficulties in fulfilling work contracts. Apart from the supply chain, the team made reference to the company's relationship with *'the parties that are actually setting the strategy for how these projects are going to be delivered'* (IR1), stating that such stakeholder engagement is beneficial as it keeps the company abreast of market developments and *'what skills are required'* (IR1) to respond to them.

In terms of the company's own workforce, the team expressed its interest in creating longer-term training opportunities than are currently being provided to the company's apprentices in its training programme. While the team drew attention to the work experience and Corporate Social Responsibility benefits provided by the training programme, it also acknowledged (as it did in scenario 2) the economic value that the programme adds to the company, as the use of apprentices:

'...keeps the costs minimal and what we get then is the benefit of another pair of hands that can be productive on a construction site' (IR2).

As in the previous scenarios, the team emphasised its focus on effective quality management, and it indicated that it adheres to a high level of materials specification in terms of accreditation. It also indicated that clients should consider quality and localism as more important factors than product cost. The company's competitors that are coming in from other parts of Europe – because *'their own economy is absolutely on the floor'* (IR3) – offer cheaper prices – *'they're coming in at 30% less the rates'* (IR3) – but do not always have the *'competence or the warranties'* (IR3), and due to their itinerant nature they may not be available to provide maintenance support in the future when this is needed:

''Well where's Jim who was here last year that did this, because it's coming off now?' 'Well I don't know, he's gone, hasn't he?'' (IR3).

4.4.2 Company 2: Homeworks Intelligent Energy

Company background

Homeworks Intelligent Energy is a company that specialises in the supply and installation of solar photovoltaic panels. The company's management team that took part in the scenario planning session consists of the Business Development (responsible for developing business improvement processes), Finance, and Operations Managers.

Scenario 1: '*Certain demand now but uncertain demand in the future'*

The management team would be excited about the immediate opportunity in front of them, but it would also be interested in whether the project would actually benefit the overall financial performance of the business in the long run. This mix of excitement and cynicism – '*feast and famine days'* (HR3) – is based on the team's perception of the opportunity as short-term. The team members recalled that the UK government's Feed-In Tariff scheme for the Solar PV industry, which was introduced in 2010, presented a similar short-term opportunity which a lot of businesses rushed to take advantage of, only for '*over a hundred'* (HR1) of those businesses to go into administration after the government's efforts to reduce the tariff rates a year later. The renewable energy sector was described as being characterised by uncertainty:

'*Certainly, in the renewable energy sector, forecasting the week after next is difficult ...so to put a business case together for three years ...I'd love to be able to do that and put a very robust case together, but it's very difficult*' (HR2).

On the other hand, encouraged by real-life market events at the time of participating in this scenario planning exercise, the team believed that despite the uncertainty of demand in scenario 1 and in the

sustainable energy solutions industry as a whole, there exists '*an opportunity for many businesses in the green construction sector*' (HR3) in the future.

The team eventually indicated it would take up the work offer presented in scenario 1 even if the company does not have immediate funding to carry out the work. This decision was attributed to the company's SME status, which often necessitates the company to move quickly to get work even in the absence of sufficient financial capacity at the time of taking on the work:

'As a small company …you can't wait for grants to come in. You've got to do it (the work) and hope that the funding will arrive afterwards' (HR3).

This situation would apply to any other work offer the company receives and is exacerbated by the uncertainty prevalent in the scenario:

'*You tend to take on everything and anything virtually* (sic) *because you don't know what's around the corner*' (HR2).

The team would consider how the company's work would interact with that of other contract stakeholders – the Finance Manager cited *'specifiers* (sic), *manufacturers and the designers'* (HR2) as an example – and how the '*knowledge, experience and the skill sets*' (HR2) of all parties could be integrated effectively. The company would also engage with occupants of the buildings in which the work is to be carried out. The Operations Manager added more detail to this aspect by mentioning the need for the building occupants to be provided with *'homeowner training'* (HR3) that would enable them to:

'*…get the right benefits out of the products and the measures that are being installed on their properties*' (HR3).

The team indicated that the creation of new jobs and the maintenance of existing jobs are some of the company's corporate social goals. To this end, the team would focus on reskilling its existing employees to make sure that they would be able to fulfil the work order in scenario 1 properly. Such an investment in skills training for an employee would serve as an incentive to the company to '*keep that person on rather than letting them* (sic) *go in a down turn*' (HR3). However, the Operations Manager stated that the uncertainty prevalent in scenario 1 does not provide sufficient lead time for the company to schedule necessary training and accreditation of staff well ahead of major projects. He suggested that the main contractors which sub-contract work to smaller companies should take this situation into account when developing project plans for the delivery of the work.

The team was also worried about the risk of inflation. The Business Development Manager drew upon the company's experience with the Community Energy Saving Programme (CESP), a previous UK

energy-efficiency scheme, to note that if the uncertainty in scenario 1 eventually materialised into more work rather than less, this increased demand could put pressure on the existing labour capacity within the industry and result in an increase in labour costs. In the event that the uncertainty eventually materialises into more work, and also in order to fulfil the existing large work order, the team would diversify the company's supply chain structure by maintaining *'three lots of supply chain'* (HR2) which would overlap into each other. This arrangement would also ensure that the company would always have fall-back supply chain options.

Scenario 2: *'Availability of capacity, lack of demand'*

The team compared this scenario with the economic recession that was affecting the UK at the time this scenario planning exercise was conducted. SME companies were having to invest *'their reserves and savings'* (HR2), and it was '*becoming more risky to achieve growth*' (HR2). Consequently, the risk-to-reward ratio had become '*actually pretty imbalanced*' (HR2). The company itself had reduced its employees and contract staff by 60%, and the Finance Manager drew attention to the challenge of reengaging the released labour pool after the business situation improves.

In this scenario, the team would seek to take advantage of government funding; the Finance Manager specifically mentioned the Regional Growth Fund (RGF), describing this as a 60 million pound programme that '*is for existing businesses who wish to develop new markets and products, skills, wealth and capital investment*' (HR2), of which '*up to 35 per cent*' (HR2) is provided by the government in order to encourage the private sector to contribute the remainder. Between £20000 and £100000 is offered to individual companies as '*support for purchase of equipment*' (HR2), with up to 35% support for *'relocation and expansion into new premises'* (HR2), 50% support for *'new product development'* (HR2), 50% support for *'improvement in systems and processes'* (HR2), and 25%-60% for the '*development of management and staff capabilities*' (HR2). Job creation and preservation is part of the Key Performance Indicators (KPIs) for this programme, and one of the conditions of eligibility for funding is that every job within a company should exist for a minimum period of three years. The team complained about this requirement, with the Financial Manager commenting that it would be *'very onerous on us*' (HR2).

The team's preference for government funding as opposed to bank funding was based on the reasoning that the government has a responsibility to address the '*business confidence issue in the region*' (HR2), and that bank loans are '*not the right product at the time*' (HR2) as they carry interest. The team indicated that government funding would be vital not just for economic growth but also for *'sustainable growth*' (HR2) in the sense that the beneficiaries would include companies that operate in the green economy or are wishing to diversify into it.

The team would also seek to form consortia with companies that provide different types of energy conservation and carbon emissions reduction goods and services. This would facilitate the development of *'a whole-house solution'* (HR3) that would integrate different products effectively within buildings. However, there was also an economic motive to the formation of consortia; namely, it would increase the ability of the companies to compete against larger organisations.

The team indicated that despite the unfavourable business situation presented in scenario 2, market demand tended to increase during the summer since, for example, during this period '*all the colleges and universities want their jobs finishing* (they want their buildings constructed or refurbished)*'* (HR1). This seasonal increase in demand could provide a temporary respite:

'Resources can go in there on a short-term measure' (HR1).

The team stressed that *'energy-efficiency is a big thing for us'* (HR2) and drew attention to on-going practices within the industry which created negative environmental impacts. These include improper installation of energy conservation and carbon reduction products in buildings – '*I know …people who have had things done where it's actually made things worse*' (HR2) – and the release of *'a lot of carbon emissions*' (HR2) in the supply chain for the provision of these products. The team also complained about the difficulty of working in occupied properties and mentioned that in addition to this, building occupants often did not have a proper understanding of how to manage installed products in such a manner that would deliver energy efficiency. The Business Development Manager gave an example of such an occupant:

'*He hadn't got a clue what was going on … all the windows were open and … he'd forgotten certain things about the controls …We sort of showed him how to do that again so that he could close the windows and stop generating it* (energy) *so it goes out of the window*' (HR1)

The team emphasised the need for proper *'education'* (HR1) of building users in order to ensure that products deliver the intended conservation of energy as well as a reduction in energy bills.

Scenario 3: *'More demand than capacity'*

The team would favour increasing investment in equipment, expansion of premises, and labour. Rather than relying on a single partner for a particular work activity, the company would have multiple partnership options. The reason for this is to enable more businesses to benefit from the situation of high demand – *'You've got to spread that opportunity around, haven't you?'* (HR3) – and also to create competition among the partners, leading to them offering to carry out work at lower financial rates. The company's relationships with its clients and partners would be maintained in such a way as to accommodate shortcomings where these concern compliance with contract agreements – *'You've got*

to be understanding enough to say, 'Ok, you owe me one'' (HR1) – as this would foster '*the trust to work together as a team*' (HR1).

The team would be interested in forming consortia with other companies, as this could enable the company to transfer responsibility for capacity development to other parties involved. The Regional Growth Fund (RGF) was again brought up in this scenario and used as an example of how operating as part of a consortium would be beneficial to the company. Concerning the RGF eligibility requirement that the company would have to preserve its jobs for a minimum of 3 years, the responsibility for meeting this condition could be passed to another member of the consortium that '*has the capacity to employ people and give us the 3 year guarantee*' (HR2).

As it did in scenario 2, the team affirmed its commitment to sustainability even beyond the context of the building and energy sectors:

'*Sustainability is about much more than just buildings and energy. We're interested in the wider sustainability* (sic) *and the wider economic-environmental dimensions, so don't just think this is a talk around construction*' (HR2).

The team also raised up the issue of engaging with the community and building occupants, complaining about the complexity of formal engagement programs. The Operations Manager drew on the company's past work with a Council to highlight this.

'*With (*identity of organisation withheld*), there was always this 3-layer approach to the tenant representatives. You had different groups with different terms and conditions and in one area* (location), *so somehow it got quite complex sometimes who you were actually dealing with* (sic) *and you'd get told off by (*identity of organisation withheld*) for talking to the wrong group*' (HR3).

4.4.3 Company 3: Coen Building Solutions

Company background

Coen Building Solutions is a company that started off dealing with private clients but has now expanded to social housing as well. The company installs external wall insulation in already existing buildings – *'so it's retrofitting instead of new-build'* (CR1) – and also provides consultancy advice on cost-effective retrofitting solutions. However, Coen Building Solutions also offers traditional building services such as plastering, dry-lining, rain-screen cladding, and the construction of structural framing systems. At the time of conducting this scenario planning exercise, the Managing Director mentioned that the company was interested in diversifying further into the rail infrastructure industry. The air of transition within the company was further emphasised by the Business Development Manager's statement that Coen is currently involved in a two-year business improvement programme, with partnership support

from a university, which is aimed at optimising staff productivity, developing more *'sophisticated'* (CR3) work processes, and fostering more effective stakeholder engagement. The management team members that were present for the scenario planning exercise were the Managing Director; the Commercial Manager, whose responsibilities include the tendering of contract bids, pricing of materials and other resources, and project audit reviews; and the Business Development Manager.

Scenario 1: '*Certain demand now but uncertain demand in the future'*

The Managing Director drew comparisons between scenario 1 and the company's situation in mid-2012, narrating:

'We started to see some very large orders coming through and we didn't know whether there would be more coming through' (CR1).

In addition, the team was unsure if Coen had adequate capacity to fulfil the work orders that had come through. At the time, *'We had no experience of delivering anything like this'* (CR1). Nevertheless, the company went ahead to try and deliver the work orders. In the process, *'We doubled the size of the business …by taking on work we'd never done before'* (CR1). The Commercial Director attributed this success to the company's risk-taking ability, stating that Coen was '*probably not risk-averse enough*' (CR2), and that it had preferred to *'just do it* (the work) *and go'* (CR2).

Having had this experience, the team would bring the lessons it had learnt from it to bear on scenario 1. According to the Managing Director:

'*This year we're a little bit wiser and we did make some mistakes that we learned from and that's the point, that's why* (the Business Development Manager's) *on board now to build a few more robust processes*' (CR1).

Shedding more light on this statement, the Business Development Manager explained that the team had built stronger relationships with its materials manufacturers and now also had a better feel for labour and material costs, developing tenders for large work orders, and foreseeing problems that could occur at the work site. Consequently, regarding its tender for the work order in scenario 1, the team would be more aware of the need to quote prices for labour, materials and other resources at a fixed upper limit, and to leave the prices fixed for a given term – *'until a certain period that we're all happy with'* (CR3). This is in order to deal with the risk that labour costs could fluctuate upwards during the period in which the work is being carried out. The team would also *'stress to our clients…our payment terms'* (CR3); since Coen pays its labour on a '*fortnightly or weekly'* basis (CR3), it would seek to ensure that it is in turn paid by its clients at a similar frequency in order to maintain a balanced cash flow.

The team would also make efforts to ensure that Coen operates more sustainably. This intention appears to be based on economic motives; companies are becoming more aware that a significant volume of work exists in the *'Green Deal, ECO arena'* (CR1), and a sustainability mind-set would be useful for Coen to do its work properly and thus stay competitive within the market. The team members would have to '*sharpen our act up'* (CR1) to ensure that this competitiveness is not achieved at the expense of the company's ability to make a profit:

'The reason why we went into the sustainable environment was because we saw growth there' (CR1).

In the same vein, the gaining of vital environmental and quality accreditation would be economically useful in the sense that it would increase Coen's access to ECO work compared to competitors that have not achieved that level of accreditation.

Elaborating further on the team's intention to operate more sustainably, the Managing Director disclosed that the company was *'beginning to touch on CSR* (Corporate Social Responsibility) *a little bit, trying to engage with it'* (CR1), but that it was economically challenging to do this due to the unfavourable financial climate in which Coen is operating.

'*We're in a tough industry, we've had a lot of problems as an organisation over the last four, five years; there's been a lot of restructure required, so last year was the first (sic) we've made money for a long time*' (CR1)

The company practices CSR through running apprenticeships and educational placements, as well as through partnering with social enterprises to '*bring into work people that are less fortunate*' (CR1). An economic motive was detected behind these socially responsible measures through the Managing Director's statement that such measures are undertaken *'with a commercial bias'* (CR1), with the company regarding beneficiaries of its social programmes as a relatively low-cost way to *'add value to us'* (CR1) in terms of labour. The team reiterated that its overall interest in the market is because of its economic growth potential – *'as blunt as it is, our main focus is about financial security'* (CR1) – and the opportunity that it presents to Coen to *'make a niche as opposed to being a traditional construction business'* (CR1).

Scenario 2: *'Availability of capacity, lack of demand'*

The team indicated that scenario 2 would result in an increase in overhead costs for Coen, and that the unfavourable situation in this scenario is further worsened by the significant extent to which the company's work is affected by wet and cold times of the year. However, based on market developments at the time of conducting this scenario planning exercise, the team did not expect the events in scenario 2 to persist for a very long stretch of time at once:

'*We do see the sustainable work, the solid wall insulation, coming back relatively soon*'(CR1).

Thus, despite the overhead, the only component of the company's existing capacity that would be reduced is labour. It would be *'relatively simple to scale back'* (CR1) the company's labour force by downsizing its own *'direct labour*' (CR1) and utilising contract staff on temporary work arrangements:

'W*e engage with subcontractors*, (and then) *we release those guys, we don't give them any more orders*' (CR1).

However, the sacking of the company's direct employees poses a problem in terms of trying to reengage experienced staff once demand picks up in the future. The team would also diversify its operations by taking on new work outside the sustainable energy solutions market. According to the Commercial Manager:

'*We're not just all about Green Deal and ECO and external wall insulation*' (CR2).

This strategy of diversifying the business beyond insulation would provide a '*consistent flow of funding so we don't have the ups and downs*' (CR2). The new product the company would deal with would not have to be a physical one like insulation, but could be a '*non-commodity type*' (CR2) as well (asset management was specifically cited). The company could even diversify beyond the built environment altogether, and in this regard the Commercial Manager drew attention to Coen's real-life efforts (at the time of conducting this scenario planning exercise) to branch out into the rail industry.

Scenario 3: *'More demand than capacity'*

As was the case in scenario 1, past experience appeared to partially shape the response of the management team. The company's previous handling of large work orders in 2012 presented it with a situation then in which *'we were close to our critical capacity'* (CR1), and the team used this as a reference when deciding on what it would do in scenario 3:

'*The learning curve that we've been through should hopefully ensure that …we do make a profit and it improves on where we were last year*'(CR3).

The team would increase its labour capacity by recruiting and training new staff. With regard to this, the Managing Director expressed concern that if scenario 3 manifests in the UK building industry, there may not be enough skilled workers available for recruitment within the country, which meant that Coen would have to try '*to find ways that* (sic) *the scarce resource really would prefer to work for us*'(CR1). Labour would also have to be sourced from other European countries.

The team would take advantage of the less competitive nature of scenario 3 (compared to the first two scenarios) and adopt a steady rather than rushed approach to company growth:

'We're not in it for growth's sake; it's very good to grow but on the right terms' (CR1).

It would do this by being very selective when taking on and retaining clients. Clients would be selected based on how they had worked with Coen in the past, with *'disorganised*' (CR1) clients dropped since they do not '*help our profitability when we get onsite'*(CR1). When asked to elaborate on the kind of client they would prefer, the team members indicated that such a client would be prepared to engage with them within a collaborative rather than a '*master and servant*' (CR1) relationship, and would '*talk to you about what you need and what they need and putting (sic) them together*' (CR1). The Commercial Manager mentioned that the construction industry as a whole is characterised by 'master and servant' behaviour and that this is further reflected in the tendency of companies to want to have control in their relationships with their sub-contractors:

'*That's indicative of the construction world, you know; they beat us with a big stick when it suits them …we need to engage with companies who* (sic) *value us as much as we value them*' (CR2).

The team stressed the importance of developing close work relationships that would enable clients to be more accommodating of unexpected setbacks in the progress of work.

Just like in scenario 1, the team would negotiate payment terms with its suppliers which would ensure that Coen would not pay its suppliers quicker than it pays its labour. Alongside this, it would also negotiate with its customers for them to pay for its services within a shorter period. The company's outward payments would then be matched by its inward ones, thus creating, according to the Managing Director, a *'working capital-neutral*' (CR1) situation.

The team emphasized the importance of ensuring that the company's work processes are designed to good quality and that this quality is ultimately reflected in how the work is carried out onsite. The focus on quality appeared to be mainly due to the team's desire for Coen to maintain a good reputation within the industry. According to the Commercial Manager:

'*We don't want to be perceived as a contractor that'll throw a load of men on site, and the bodies are there but the end product is next to useless. We want to make sure that we do provide the right amount and level of service, but also to produce the right quality that is synonymous with Coen'* (CR2).

4.4.4 Company 4: Alsecco

Company background

Alsecco is a company that manufactures, supplies and maintains phenolic, expanded polystyrene, and mineral wool external wall insulation, as well as internal wall insulation. In addition, the company runs an academy that offers training on the installation of its products. The company's management team

during the scenario planning session consisted of the Business Development and Product Development Managers as well as the Finance Director.

Scenario 1: '*Certain demand now but uncertain demand in the future'*

Upon receiving the work order, the team would consider the company's existing capacity. Where this is inadequate, the team would agree to do only a part of the work.

'So we'd have to look at that, break it down and say ok there's 200 houses here we can do 150 and we'd offer them that sum and say 'I'm sorry, but the other 50 would over stretch us'. We've got to be realistic about it' (AR2).

The company's materials would not all be sourced from one supplier; rather, different components would come from different suppliers. The Product Development Manager stated that this is less costly and that it would not affect the performance of the finished product.

Economic growth would be the '*top focus for the mass delivery*' (AR3) of products to meet the large work order. Environmental performance appeared to be considered only as a form-filling exercise, as this excerpt suggests:

'*There are no real environmental metrics in there for us, other than there is a little note on the paper work. There's a box there that says (sic), 'Does this have a positive impact on carbon reduction?' So we will tick that box if it does*' (AR1).

The team indicated that the company clients do not usually oblige it to achieve specific environmental targets:

'*We're contractually not asked to quantify it* (environmental impact) *so it's about* (sic) *we have to measure* (economic) *growth. So the metric* (of business success) *would be financial. I would say, 'What's our staffing costs last year, what's our profit, what's our depreciation?*'' (AR1).

The team stressed that '*we love supporting environmental projects*'(AR1), but that despite the potential of such projects '*in terms of saving the planet*' (AR1), if they '*didn't produce any commercial downstream advantage, it wouldn't be very good for us. So that's the cold hard truth*'(AR1).

The team would try to reduce future uncertainty by evaluating '*the market need*' (AR2); '*the attractiveness of the product*'(AR2); the reasons why people would want to have it installed in their properties; the price they would be willing to pay for it; and the size of the market, as well as whether it is '*a growing market or a diminishing market*' (AR2), '*a global market*' (AR2) or '*a local market*' (AR2). According to the Product Development Manager:

'*You've got to get a handle on the numbers, because if you can't get a handle on the numbers, the numbers affect how you design it* (the product) *and how you manufacture it and how you tool it up to make those volumes. So you have to be thinking about that very early*' (AR2).

In addition, the team would attach less priority to doing work that it would have to finance itself, and more towards doing work that is grant-funded. This could mean rejecting the former and holding out until the latter becomes available:

'*We'll sit on the fence and wait until it's almost free and then we'll hopefully jump in and go and do as much as we can*' (AR2).

The team would favour lean methods by which the work process would be *'slicker, faster'* (AR2), and devoid of activities that do not add economic value. This is in order to raise the company's competitiveness in an uncertain market. The team would like its financial performance '*to be within, plus or minus, 15 per cent*' (AR2) of its forecast. A deficit above this range would be problematic as the company would not have enough funds to fulfil work orders; the team would have to let some staff go, with the remaining staff having to work overtime. As a result, service quality might suffer, as well as the staff's *'work-life balance'* (AR2).

The team would be interested in developing the '*community engagement*' (AR3) skills of its workforce in order to build customer trust. The team regarded community engagement as a *'softer skill'* (AR3) compared to the technical skills required to supply and maintain products, but acknowledged that '*it's a very important skill*' (AR3) as it often came up in discussions in industry workshops that members of the team attended. Effective supervisory and management skills, as well as product quality, were other areas that the team identified as very important in order to reduce the risk of low performance of insulation products in buildings. The team indicated an interest in collaborating with other organisations that could improve the company's work processes, make its equipment work more efficiently, and improve the energy conservation potential of insulation systems.

Scenario 2: *'Availability of capacity, lack of demand'*

The team indicated that this scenario occurs when companies do not evaluate the market properly:

'What's the root cause of that? Well, you haven't done your market research properly' (AR1).

If the company felt that there would be high demand for its products simply '*because it was a good idea*' (AR1), and it geared up its supply chain to produce based on this reasoning, then it would collapse. Inadequate public awareness about sustainable energy products, as well as damp problems that arise if insulation is not done properly, further serve as obstacles towards achieving a high level of demand – '*What's the incentive over here to get the private householder to do stuff?*' (AR1).

As was the case in scenario 1, economic performance would be the main priority. Besides, the company's operations already have an inherent environmental advantage due to the energy-saving function of insulation products. While the environmental dimension to the company's operations '*gives us quite a nice feeling that we're doing something to save the planet*' (AR2), the absence of a commercial benefit to the company would lead the team to explore other products outside the sustainable energy sector. The primary emphasis was on building a '*bigger, better, stronger, more profitable*' (AR3) business, and if the company just so happens to be involved with sustainable energy products, then '*great, even better*' (AR3).

The team would rely on *'word of mouth*' (AR1) to raise interest in its business. Existing customers would be encouraged to inform other people of the usefulness of the company's products:

'*You get a couple of people on the street who have had it done, and if it's done well then hopefully that will pave the way*' (AR1).

The team would also draw the attention of the public to the economic value that its products would yield to customers in terms of reducing energy bills, increasing the value of their property - '*What you're getting is, your property is going up by three, four, five thousand pounds'* (AR3) – and improving their respiratory health by increasing the amount of heat available within the building to keep it dry and prevent mould growth.

As it did in scenario 1, the team emphasised the need for product quality to be frequently monitored and for the client to acknowledge this and allow for this in the budget. The team also stressed that it would be useful to build a *'personal dynamic*' (AR3) into the company's relationships with clients and business partners.

Scenario 3: *'More demand than capacity'*

Just like in scenario 2, the team attributed this scenario to inaccurate forecasting and market evaluation, with the Finance Director stating that proper market evaluation is one of the major contributors to the success of larger organisations such as '*the Apples or the Toyotas or the Procter and Gambles*' (AR3), which '*do a huge amount of work upfront. They don't get it cataclysmically wrong like SMEs might*' (AR3). The team acknowledged that this scenario could be detrimental to the company and its supply chain partners in the sense that demand could outweigh their infrastructure to manage work activities, warrant products and service them after installation, and conduct sales processing. *'Quality, cost and delivery'* (AR1) would be affected because work processes may become rushed, staff would have to put in extra work shifts, staff training may not be done properly during the time available, and equipment would experience wear and tear at an increased rate. The tendency of some customers to default on

payment would further worsen the situation; the cash flow of the company would be affected as '*we still need to honour our payment terms to our labour force*' (AR2).

The team would rely on a supply chain that was '*on parity*' (AR2) with it in terms of '*quality and procedures*' (AR2) as well as '*accreditation*' (AR2). The team also pointed out the need for the company to engage with community groups and community leaders – '*You need the village and parish councillors*' (AR3) – in this scenario, as this would ensure that the situation of high demand is maintained; the community groups and leaders would persuade the rest of the community to take up energy-efficiency measures in their homes and commercial buildings:

'*There's some very good and influential religious groups in the Birmingham area, and that's worth looking into because they'll introduce all the commercial buildings into that as well*' (AR1).

On a similar note, the company would rely on independent workers, '*the white van men who are out there doing odd jobs*' (AR1), to promote energy conservation and carbon reduction products.

4.4.5 Company 5: BNK

Company background

BNK is a company that installs renewable energy technologies such as ground source heat pumps and wind turbines, and it offers consultancy support on effective energy solutions for buildings as well as on how to reduce building energy costs. However, the company is also a general building contractor. The company's management team that was present for the scenario planning session consisted of the Commercial, Operations and Business Development Managers.

Scenario 1: '*Certain demand now but uncertain demand in the future'*

The management team acknowledged the significant degree of uncertainty that characterises the industry – *'We could never see past maybe 3 months' worth of work; if you could see beyond that you'd done really, really well'* (BR1) – but indicated that experience eventually adjusts one to it:

'Years ago I'd lose sleep if I couldn't see, I'd be really worried, and then you grow accustomed to that being just the way the market is' (BR1).

More specifically, the team drew a parallel between scenario 1 and the uncertainty in the industry at the time this scenario planning exercise was conducted. The team members had expected the market to be driven by the Green Deal programme, but they had not anticipated the level of control and influence that the big energy companies would seek to exert within the programme. The big companies are obligated to provide funding for Green Deal under an associated programme, the Energy Company Obligation (ECO), but according to the Commercial Manager, the companies are directing this funding

towards *'trying to gobble up as much supply chain as they can'* (BR1). Consequently, the team would prefer forming a consortium with other companies and operating Joint Venture arrangements in order to increase its own capacity. The dependency of the work upon dry and warm weather conditions was also brought into attention as a factor that further heightens the level of uncertainty within scenario 1; with the weather getting *'a bit volatile'* (BR3) from *'September, October'* (BR3) up to February or March *'if it's anything like this year'* (BR3), there is a risk of the company not fulfilling confirmed work orders before deadlines.

The Commercial Manager appeared to pay attention towards developing labour skills in particular, as opposed to other areas such as *'how to get the market going and … generating how the finance works'* (BR1). He felt that skills development needs to be conducted independent of, but in coordination with, these other *'larger mechanisms'* (BR1), as there is a danger that if it was conducted as a part of the them it could become *'vacuumed up into one of those super groups if you like'* (BR1). The team expressed interest in developing a process map of the installation and maintenance activities involved in the Green Deal and identifying *'what the skillsets are at different points'* (BR1) and the appropriate types of training that would be relevant for acquiring these skills. Managerial-level skills in particular were identified as an area in which *'we've got resources being made redundant all over the place by main contractors'* (BR2); managers of past construction projects are *'sitting at home at the moment …waiting for somebody to say, 'We've won a hospital job or a railway station somewhere' … what they don't realise is that there is an opportunity within this market'* (BR2) which their current level of technical expertise coupled with reskilling would make them suitable for.

The team displayed an awareness of the need to engage with building occupants and other users, and it also acknowledged that there was a high degree of customisation in eco-refurbishment, since each building has its own specific energy-efficiency needs. The team indicated that these considerations play a part in the recruitment process within the company, as prospective workers should at least have a basic ability to engage with customers and adapt to diverse building situations before they can be employed and given further training:

'If you're going to upskill (sic) somebody, you've got to make sure you've got the basic fibre right' (BR3).

Such customer engagement responsibilities of the company's workers include *'customer confidence-building …and managing them through the process'* (BR1), while with regard to the different energy-efficiency needs of individual properties, the workers have *'got to know all the products and they've got to …have enough technical expertise of those products to determine the whole system'* (BR1). However, the team noted that such a whole-house approach *'probably isn't affordable'* (BR1) for the company.

Since the onus is often on installers of energy conservation and carbon reduction products to provide warranties for their installations, the team would pay attention to *'quality checking'* (BR1) and product specification in order to ensure that the company does its work properly. However, the Business Development Manager complained that manufacturers which are *'in bed with the utility companies who* (sic) *are funding most of this work'* (BR3) try to unduly influence the choice of products put into buildings by smaller installer companies, and that consequently:

'We're been driven by manufacturers and funders as opposed to what's actually right for the houses, the property, the tenant' (BR3).

The Commercial Manager also complained about the lengthy process involved in training workers to become suitably qualified to carry out eco-refurbishment work.

Scenario 2: *'Availability of capacity, lack of demand'*

In the absence of adequate demand, the team would have no choice but to adopt a position of *'sitting on the fence'* (BR1), waiting until the situation improves. Also, in this limited market the team's preferred work would be in properties that are relatively easy to treat:

'What I'm concerned not to do is give away the low hanging fruit' (BR2).

Additionally, the team would look for demand outside the Green Deal programme. However, it acknowledged that in looking outside government schemes to create a market, a *'credibility gap'* (BR3) would need to be negotiated by the company when seeking to assure people that *'this is a really good thing to do and here are some really good examples'* (BR3).

The team would try to make its services more attractive to the public by promoting sustainable energy solutions as a means of increasing the economic value of a property. Economic gains would come about via improved fuel efficiency, an increased energy performance rating, and lifestyle and health benefits, as indicated in this excerpt for instance:

'*We did a property about 3 years ago. We did a ground source heat pump for a family of ten; two adults, eight children …by the time we'd finished, they'd got as much heating as they wanted, their energy bills were significantly reduced. It was about 30% of what it was before … but the big thing that everybody had missed as well was the benefit of that healthier living, and the guy* (referring to the father) *…said 'The one thing we don't have to do now is during the winter is* (sic) *keep taking the kids down the doctors* (sic) *for the colds and the chest infections'. And there's a value to that*' (BR1).

The team suggested that a significant contributing factor to scenario 2 is the public's lack of understanding about the Green Deal coupled with its inherent mistrust of major energy companies:

'Everybody hates Eon and British Gas' (BR3).

Just as it did in scenario 1, the team indicated that the big energy companies that are responsible for financing ECO are also seeking to gain control over the supply chain:

'(Identity of organisation hidden)*, for example …tried to buy* (identity of organisation hidden) *…they're trying to buy, procure, all the suppliers'* (BR2).

The team also revealed that the big utility companies are asking smaller companies to give them greater access to client data and are also seeking to control how eco-refurbishment work is being carried out and priced by the smaller companies.

The team acknowledged the need for knowing how different products interact with each other in buildings. However, it drew comparisons between scenario 2 and the construction industry at the time of conducting this scenario exercise, expressing concern that many companies would not seek to implement such a whole-house approach – *'They're not looking at a whole-building specification'* (BR2) – but instead:

'…are champing at the bit to try and get going and …they just want to get this stuff on the wall and get paid' (BR3).

Similarly, there is a risk that sustainability would not be an actual concern to companies, but instead would be something that *'is there as a little add-on …and you've only got to be aware of it'* (BR1).

Just like it did in scenario 1, the team affirmed the need for effective engagement with building users in order to improve the public's understanding about energy conservation and carbon emissions reduction products. However, the facilitation of such engagement comes at an economic cost to the company, and this would need to be included as part of the installation price. Similarly, there is a cost attached to doing a technical survey on a property in order to determine the energy-efficiency needs of that particular property. This means that if after the survey has been conducted the customer declines the installation, the company would have to bear the survey costs, unless a prior arrangement exists by which customers would be charged for the survey, regardless of whether or not they would go on to allow the installation to be done on their property. The team mentioned that in addition to achieving energy-efficiency, ventilation and damp issues also constitute a challenge in carrying out eco-refurbishment work.

'*I have got property* (sic) *that … got damp because no one looked at the ventilation problem and now we're going to have to spend loads of money to really unpack loads of insulation that we put in …so the whole thing is wrong, and that's causing lack of credibility but also property damage and cost*' (BR2).

Scenario 3: *'More demand than capacity'*

The team would be selective in taking on work and would go for locations that were willing to fund themselves (in contrast to locations that are completely reliant on funding by grant schemes). Since wealthier locations would be more willing to self-fund than lower-income areas, eco-refurbishment work could end up not benefitting those who are suffering from fuel poverty. The team admitted that such a situation was an inevitable consequence of operating as a business, and that the company would have to protect its economic interests by choosing clients who could provide ready payment:

'If we're being really crude about it, it's a market and you go for that (affluent) *area'* (BR3).

The existence of a high volume of work would be beneficial to the company in the sense that it would be able to procure materials at a discount, since it would be buying them in bulk. If the work was concentrated in a single geographical area – the team cited *'a whole street'* (BR3) and *'1970s-type properties where there's a lot of them on a little estate'* (BR1) as examples – the company would also be able to lower the cost of setting up and dismantling its equipment and infrastructure within that area. For instance, it would be able to set up *'one long scaffolding instead of individual ones'* (BR3). By extension, the company would be able to pass some of its financial savings onto its customers in the form of reduced service costs.

'*If there were several* (work orders) *and you could see the continuity of work, you could offer a percentage* (reduction in service costs) *because you could still claim discount* (sic)*'* (BR2).

As in scenarios 1 and 2, the team would pay attention to customer engagement. It would focus on training staff to liaise with building occupants and community groups in order to make them aware of what the eco-refurbishment work would involve and to gain feedback from them. Community leaders would be targeted in particular as they are in a position to influence other members of the community and persuade them to install sustainable energy solutions in their homes.

'*At (religious) services, when they're talking to their communities, they say it's ok for this to happen, then the doors fly open. You've got it from the highest people you can in the community'* (BR3).

The team would also conduct supply chain training in order to ensure that the high volume of work that would be done in this scenario would be performed properly. However, the Operations Manager expressed concern about the lengthy time that this training might require, commenting that by the time the training is completed *'we could be well into this market'* (BR2). In addition, the specification of products that would be installed in buildings may not fully take damp issues into account, like in scenario 2, and this could end up having a negative impact on the company's reputation in the future:

'It …is just going to come back and haunt us in ten or fifteen years' time' (BR1).

The team also complained about dishonest practices by building occupants whereby after the company has finished carrying out installation work above the ceiling of an apartment, the occupant would sabotage it – '*he'd go in one evening and pull his ceiling down'* (BR2) – and blame the company in order to gain monetary compensation.

As was also indicated in scenario 1, the longer the company experiences this scenario, the better it adapts to it. The Operations Manager mentioned that until the company has actually gone through the process of surveying properties in order to determine and customise their individual energy-efficiency needs, estimating the cost of working on a property after the customisation survey, mobilising finance to carry out the work, and then going on to complete the work, '*can you then sit back and assess how can* (sic) *I make the whole process easier'* (BR2).

4.5 SUMMARY

Based on the SHAP study, capacity development involves specification of products that are economically viable for companies, sizing of the market, making funding arrangements, and the development of knowledge, labour skills, and the supply chain. The West Midlands market for the provision of sustainable energy services around the specified products was estimated by participants in the SHAP programme to be worth around £3 billion, excluding maintenance and monitoring services.

Energy loss, carbon emissions, and fuel poverty were identified by SHAP participants as current environmental and social problems associated with energy use in buildings. While job creation and fuel poverty reduction were identified as potential beneficial impacts of the installation of sustainable energy products in buildings, participants also identified new environmental and social problems that could arise from companies' operations. These include new emissions discharge, waste generation, and energy consumption by companies, as well as the invasive and disruptive nature of installation. An inadvertent increase in energy costs was also identified as a possible new problem. Participants went on to determine the barriers to capacity development, and these were found to include various economic, regulatory, stakeholder, technical, and behavioural issues.

The interview results show that the application of environmental and social business practices to companies' capacity comes with both positive and unfavourable consequences. While some practices such as energy conservation and waste management generate cost savings, overall the practices are cost-intensive. Examples of other effects include conflict between socio-environmental responsibility and customer preferences; a high degree of materials specification; a preference for collaboration rather than competition; and conflict between localism and globalisation.

The scenario planning cases provide information on how SME companies develop their capacity in situations when capacity leads demand, lags demand, and exists in approximate equilibrium with demand. The findings from the primary research data are analysed in the next chapter.

CHAPTER 5

DISCUSSION

5.1 INTRODUCTION

As has been described in the previous chapter, the primary research provides data on capacity development, and how sustainable energy service companies can respond to the risk of new environmental and social problems arising from Green Deal activities. Capacity development barriers have been identified, as have the effects of socio-environmental responsibility on key capacity areas. The responses of SME management teams to the three main capacity development situations (capacity leading, lagging, and existing in equilibrium with demand) were also obtained.

This chapter analyses the findings obtained from the two stages of primary research. It builds a picture of what capacity development traditionally entails, and it discusses the values associated with a company operating as an environmental business, and the challenges that companies could encounter in trying to become one. The challenges are based on traditional business problems as well as problems specific to the focus on environmental protection and social accountability, and so a broad picture of the consequences attached to a company's operation as an environmental business is obtained. The chapter also evaluates the extent to which SMEs are willing and able to function as environmental businesses during capacity development. Table 5.1 below displays the outputs of the data analysis. It shows the sections of this chapter in which the various outputs can be found, and it also identifies the dataset from which each output was obtained.

OUTPUT	DATA FROM WHICH IT WAS OBTAINED	SECTION
Capacity development activities	Participant observation	5.2
Capacity development themes	Scenario planning	5.2
Environmental business values	Participant observation	5.3
Challenges	Interviews, participant observation	5.4
Feasibility of an environmental business	Scenario planning	5.5

Table 5.1: Data Analysis Outputs

Overall, the chapter is useful for identifying the ideals an environmental business should aspire to, as well as the degree to which the ideals are practically viable for SMEs. Based on this understanding, this research can then proceed to propose measures by which SMEs can overcome obstacles on the road to adopting the environmental business philosophy.

5.2 A REVISIT OF CAPACITY DEVELOPMENT

The literature looked at in Chapter 2 provides information on what capacity development means, as well as the major areas in which companies seek to develop capacity. This section describes how the primary research complements the information obtained from literature?

The SHAP study provides detail on the activities surrounding the development of capacity in the six areas identified through the literature review (labour, finance, supply chain and relationships, equipment and infrastructure, knowledge, and materials). The key capacity development activities include labour specification (the identification of skills requirements for companies' personnel) and funding arrangements (the evaluation and fulfilment of the financial requirements for the adequate provision of services to meet market demand). They also include market sizing (the evaluation of the volume of market demand that services would need to be provided for) and supply chain development (the identification and strengthening of existing supply chain capacity). Knowledge gathering (the expansion of companies' absorptive capacity) and product specification (the identification of the types of products and other materials that a company should utilise for the provision of services) are the other main capacity development activities identified from the research data.

The capacity development activities mentioned above could be readily inferred from the SHAP data. On the other hand, capacity development information contained within the scenario planning results was less obvious. However, it was noted that in all three capacity-demand situations that were considered in the scenario planning cases, the company management teams emphasised the need to relay decisions and plans effectively to both staff and external business stakeholders. They also paid attention to collaboration with supply chain partners, clients, policy makers, building occupants, and other stakeholders. Despite their interest in collaboration, however, the management teams made various references to their ambitions – and the ambitions of other industry stakeholders – to control and influence market events. They exhibited a high level of consideration of external market conditions, as evidenced by the several crucial references they made regarding the market (as distinct from their companies' internal activities). Economic issues, in terms of the availability of finance and the prospect of business growth, appear to have influenced the teams' decisions to a significant extent. A high level of risk consciousness was displayed by the teams on multiple occasions, and they were also noted to frequently make reference to the operational problems they encounter both within and outside their companies, and how these problems influence capacity development. The teams also identified diverse tactical measures they would take in order to respond to the three main capacity development scenarios.

Due to the level of importance that the management teams attached to the issues outlined in the paragraph above, these issues have been developed into themes that are crucial to decision making concerning capacity development. The capacity development themes developed from the scenario planning sessions, coupled with the activities discovered from the SHAP study, together provide a broad

picture of capacity development beyond that contained within literature. A closer examination of the themes reveals the priorities and conflicts that arise during the capacity development process for the companies that were researched. These are looked at in sub-sections 5.2.1 to 5.2.7 below.

5.2.1 Communication

The companies appeared to focus on communication within both an internal and external context. Internally, the company's management focuses on effectively relaying the company's operational plans to staff and making sure that staff members are aware of their individual roles in the plan. The excerpt below illustrates this:

'I think the first thing that we'd probably do in order to spread that communication normally …open up to the rest of the business …to actually talk about the project and give everybody the opportunity, so the key members that will deliver the project – the hands-on people – will then be engaged, go through the tender process, go through the clients, contract relations, that sort of thing and we develop a plan then of everybody going away with actions to actually develop and produce their part of the plan' (IR1).

Externally, the companies favour a personal style of interacting with clients and supply chain partners. This is for the purpose of achieving flexible payment arrangements that would be beneficial to the companies; reversing orders for materials at short notice when demand begins to drop; increasing clients' tolerance when the companies run into problems in completing work; and creating a more even relationship with clients rather than a formal one in which the client dominates.

'*We don't sit down and nail people to documentation and say this is how you'll perform …it's people working with people, and what we've been able to negotiate are some really good payment terms, especially with the suppliers and extended arrangements where we need them, purely on a basis that we've been honest and open and said, 'We're looking to expand the business in this way, we're expecting something like this type of project to come through, how will you support us?' …by doing that and testing the supply chain in a different way, what we've got back is added value to the business in respect of 'Yes we can accommodate that, we can extend your payment terms and we can accommodate holding the materials, etc., etc.,' and …they come to the table and offer us some great opportunities really*' (IR2).

'*So there's a personal dynamic in the projects that you do because you do get involved very closely with clients and their products*' (AR3)

'*You're always going to get problems, not just from contracts but your client is going to provide you with problems, and …you've got to be understanding enough to say, 'Ok, you owe me one' …Forming the relationships, having the trust to work together as a team, that's the way*' (HR1)

'*But in the first case you've got to have a relationship with the client to be able to say, 'I've got some bad news*' (CR2)

Though business relationships are established between organizations, they are actually managed by individuals, and interpersonal relationships are a vital part of the relational exchange (Weitz & Bradford, 1999). Within their business network, companies are continually challenged to move into a main partner position and to defend this top spot against competitors, or else face becoming a backup partner and gaining only a small share of business within the network (Ulaga & Eggert, 2006). As price increasingly becomes a less important market differentiator, the improvement of interactions with partners, clients and other stakeholders has steadily become a means by which organisations seek to gain differentiation and secure business relationships (Ulaga, 2003). Ulaga (2003) mentions that external communication is enhanced by strong interpersonal ties among firms, as this make problems more readily addressable, and each partner's objectives in the relationship more understandable, which provide both parties with an opportunity to expand the relationship.

Although the scenario planning company management teams did not make reference to any negative issue associated with communication, this does not mean that communication is without its complications. Peterson and Rajan (1994) state that if the information communicated by a company within a business network is private to one partner and not transferable by the firm to others (e.g. if information about a firm's ability to fulfil contractual agreements cannot be verified by other partners), the one partner acquires an 'informational monopoly' over the firm. In the case of a SME firm and its creditor, for instance, this means that if the cost of providing capital to the SME is relatively low due to the SME being less risky than average, the creditor could seek to exploit its informational monopoly by reducing the interest rate by less than the true decline in cost (Peterson & Rajan, 1994). Ulaga (2003) adds that there is a risk that knowledge transfer within a company can slow down if a company communicates more with one of its essential suppliers than another or if communication between the company and its partners is otherwise uneven. This has negative implications for a company's absorptive capacity.

5.2.2 Collaboration

The companies appeared to favour a collaborative approach by which they would liaise with businesses with different specialisations, in order to build a picture of how their work can be coordinated alongside the other companies' when working together on a project. They would also liaise with clients and customers in order to understand how these parties want work done, and with policy makers in order to contribute towards shaping industry regulations. Collaboration was found to often take the form of Joint Ventures, consortia, sub-contracting to supply chain partners, and community engagement programs.

'*Collaboration would be a way to make this process work better for us. It might be that somebody in your supply chain has the capacity …and because they are your supplier you're working very closely with them and it might help you to help yourself*' (HR2)

'*We're involved with the parties that are actually setting the strategy for how these projects are going to be delivered. I think that helps us a little bit*' (IR1)

'*There's some very good and influential religious groups in the Birmingham area and that's worth looking into because they'll introduce all the commercial buildings into that as well*' (AR1)

'*We've come together as a consortium to try and think, 'Can we go and do ECO as a joint venture more effectively, because we've got greater numbers of stock?*' (BR2)

Few SMEs are self-sufficient in technical expertise, management structures, and support mechanisms (Kua & Lee, 2002). Due to the growing recognition of the strategic importance of close relationships, companies are moving away from an adversarial style and towards a logic of building long-term partnerships (Ulaga & Eggert, 2006). Earlier research by Peterson and Rajan (1994) into the benefits of a collaborative approach suggests that close ties between SMEs and their creditors (including banks, non-bank financial institutions, and other sources which provide direct finance, and suppliers which postpone collecting payment for their deliveries) increase the availability of financing, although it has a lesser effect on the price of credit. Collaboration provides a collective learning space in which knowledge is shared and developed, as well as a means by which individual SMEs can address the problems related to their size and improve their competitive position (Ceglie & Dini, 1999). According to Ceglie and Dini (1999), collaboration can take place 'vertically', by which SMEs cooperate with other SMEs as well as large companies across the entire value chain; this enables enterprises to specialise on their core competencies and gives way to an external division of labour. Collaboration can also take place horizontally, by which SMEs collaborate with other SMEs that occupy the same position in the value chain, enabling companies to pool together their capacities to satisfy large-scale orders, and creating economies of scale effects which would otherwise have been beyond the reach of individual small firms (Ceglie & Dini, 1999).

Peterson and Rajan (1994) suggest that a collaborative relationship between a small business and its partner is dependent on the amount of information that the partner possesses about the business' ability to keep to contractual agreements. Such information should be durable and not easily transferable to or observable by outside parties, and information production should be subject to economies of scale, in order for the partner to not be influenced by issues such as the age of the firm when evaluating the relationship (Peterson & Rajan, 1994). Other factors that contribute favourably to the maintenance of close ties include the extent to which a firm provides a partner with a voice in its affairs (Hennig-Thurau et al., 2002). The length of time in which a firm has previously honoured agreements with partners also

plays an important role. For instance, the longer a company has serviced its loans, the lesser the level of risk that the lender attaches to the loans, which in turn reduces the cost of lending and increases the willingness of the lender to provide funds (Peterson & Rajan, 1994). A company's assessment of the benefits and sacrifices associated with a relationship would not be restricted to a single-episode level, but would utilise a longer-term approach that requires looking beyond the transaction at hand to its implications for the development of personal relationships (Davies et al., 1995).

The scenario planning companies also showed a preference for having exhibited a preference for multiple partnership options, rather than single partnerships, in their implementation of collaboration. This is due to their desire to have sufficient supply chain capacity to draw upon in the event that a large work order is received; share the responsibility for capacity development with other parties; keep business costs competitive; and have contingency business arrangements in place in order to avoid over-dependence on an individual supplier. The quotes below illustrate this:

'*I think you've got to spread that opportunity around haven't you. A lot of people in the past have sort of put all their eggs in one basket …what you need to do is have 2 or 3 so they're not getting all the business and they compete against each other*' (HR3)

'*I think going back to a model that we've just put in place now is to create again from strategic partnering approach, is to engage with local training providers, not just one …but spread it out*' (IR1)

There are arguments for and against this in literature. Chopra and Sodhi (2004), for instance, lend support to the multiple partnership system, stating that it enables a firm to respond better to setbacks and risks that occur in its supply chain due to accidents and natural disasters, labour disputes, supplier bankruptcy, social unrest (e.g. due to wars and terrorism), system breakdown, inter-firm conflict (e.g. due to intellectual property breaches by one or more parties), and other causes. By switching to another existing partner, a company avoids disruptions in the flow of materials, finance and knowledge, and the damage to sales and/or increase to business costs that the disruptions bring (Chopra & Sodhi, 2004). On the other hand, Ulaga and Eggert (2006) report that single sourcing or multiple single sourcing is becoming 'the norm rather than the exception'. In a similar vein, DiMaggio (2001) asserts that a key feature of modern business is the shift from multiple competitive sourcing to 'long-term, sole-source relational contracts'. The scenario planning cases deviate significantly from DiMaggio's view, however, and in this regard they suggest that an organisation's emphasis on collaboration is independent of whether a company utilises single or multiple partnerships in its operations.

5.2.3 Market

The need for proper market evaluation and forecasting was stated by the scenario planning participants. One of their quotes is stated below:

'*So what is the market need? What's the attractiveness of the product? Why would people buy it? How much would they pay for the product? How big is the market? Is it a growing market or a diminishing market? Is it a global market or is it a local market? You've got to get a handle on the numbers, because if you can't get a handle on the numbers, the numbers affect how you design it and how you manufacture it and how you tool it up to make those volumes. So you have to be thinking about that very early in the project*' (AR2)

Based on the perceptions of the participants, the market in which their companies operate is uncertain and fluctuates across all three scenarios that were considered, as the following excerpts illustrate.

'*Certainly in the renewable energy sector, forecasting the week after next is difficult*' (HR2)

'*The way the market has been over the last 18 months it's been a bit of a chameleon really, things have changed because the way the market has dropped out. I think we were all expecting it to do one thing and it's probably slightly changed*' (BR1)

This uncertainty is partially mitigated by the seasonal nature of the market. For instance, it is likelier that on the whole demand will arise during the warmer periods of the year, and that social housing clients might put in work orders in the first quarter of a new year after their annual budget reviews at the end of the previous one (Chapter 4, Sub-section 4.4.1). Other quotes that allude to the market's seasonal nature are given below:

'*Everybody is also forgetting the weather impact of EWI as well, you know you're going to get to September, October and then it's going to get a bit volatile about what the weather is going to do. That could, if it's anything like this year it could last up to February / March time and then really you've got one summer left before the deadline of March 2015 to really hit it*' (BR3)

'*Then you've got the summer with all the colleges and universities want their jobs finishing, there might be opportunities where resources can go in there on a short term measure*' (HR1)

'*April was particularly bad because of the weather and the knock on effects of the weather and so on*' (CR1)

A capacity development strategy that can provide a firm with the ability to respond to a wide variety of demand situations would be beneficial for SMEs operating in such an uncertain market (Fine and Freund, 1990). However, there is a risk that such a flexible strategy could come at the expense of the increased cost of capacity acquisition when compared to a more dedicated approach, based on work done by Chopra & Sodhi (2004) and He and Pindyck (1992). In order to mitigate this risk, various authors (e.g. Ashayeri & Selen, 2005; Chopra & Sodhi, 2004; Netessine et al., 2002; Fine & Freund, 1990) propose that a firm invest in capacity before actual demand is known, and then, when demand is

realised, utilise the same capacity for a variety of different services and tasks, depending on the pressures attached to a specific service/task at a particular point in time. Netessine et al. (2002) provides an example of this approach, namely, an airline's use of business-class seats to satisfy unexpectedly high demand for economy-class ones. However, this proposal could give rise to new problems associated with the timing of the capacity investment. Ideally, capacity should be installed at the point in time from which customers begin to request supply, as earlier or later installation could result in overstocking, or failure to fulfil work orders on time (which could lead to a loss of customers), respectively (Ashayeri & Selen, 2005). It could also be argued that the proposal is geared more towards dealing with the possibility of excess demand than it is towards addressing the risk of demand shortage. SMEs would need to modify this approach so that its benefits increase the more uncertain a market gets.

5.2.4 Economic

The companies looked to transfer responsibility for finance outwards by taking advantage of loans and grant schemes.

'*So the whole market at the moment is just driven from free money …yes we'd like to do 6000 homes for free, you know, and we'll sit on the fence and wait until it's almost free and then we'll hopefully jump in and go and do as much as we can*' (AR2)

'*The central government basically announced this* [unclear] *which is called the Regional Growth Fund round 3 and we took advantage of that, we absolutely did because we felt that there was a business confidence issue in the region and* they (the government) *needed to do something and loans were not the right product at the time as they carried interest*' (HR2)

The matching of times of outward payment (to staff and suppliers) to those of inward payment (from clients) was noted to be a means of maintaining a balanced flow of finance, while the operation of the companies on a contract-to-contract basis, rather than as a continuous business, serves as a means of preventing the risk of capacity under-utilisation.

'*If we're set up as a business working contract to contract then the effect is not going to be as great as if we're running ahead with it going on*' (IR1)

'*Payment terms to our labour are much quicker than the payment terms we get from our customer, so we have to offset that with materials where we can and we've …also worked very hard with our customers to bring in the payment terms. So if we can almost match the labour to the customer's payment terms that's almost working capital neutral and if we can push the materials out it becomes working capital favourable. If we can achieve that we can grow and it doesn't become an issue*' (CR1)

The management teams generally appeared to perceive their companies' economic situation as being characterised by uncertainty during the period in which the scenario planning exercises were conducted (early-to-mid-2013). However, just as was the case in the SHAP programme, they also displayed a significant degree of optimism about future economic prospects, suggesting that future capacity expansion rather than reduction is likely. As CR3 put it, '*There are positive signs out there*'.

The Energy Company Obligation (ECO) provision under the Green Deal is intended to help alleviate companies' concern over economic issues, particularly companies that specialise in cavity wall insulation, solid wall insulation, and district heating systems. Significant knowledge about ECO was gained through the participant observation study of the SHAP programme. Under the ECO arrangement, project financing is undertaken by the big six UK energy suppliers, which will provide finance either from their own funds or by borrowing from a third party such as a bank. The finance goes towards funding Green Deal customers to take up loans with which they can have sustainable energy products installed in their homes. The loans would then be repaid from the savings in energy bills which the products are expected to deliver. The big six energy suppliers would bear the risk of Green Deal customers defaulting on loans repayment, and they would also bear the project performance risk by guaranteeing that installed products will deliver savings in energy bills. The ECO arrangement is comparable to the Energy Service Companies (ESCOs) financing mechanism and other energy-efficiency funding programs which have recorded varying degrees of success over the years in different countries. Painuly et al. (2003) describe this type of financing model as a 'shared savings contract', as opposed to a 'guaranteed savings contract', in which the big energy supplier only plays the role of a middleman, arranging for a loan contract between the bank and building occupants or other customers. The bank, not the energy supplier, would bear the risk of the customer defaulting on the loan repayment, and the energy supplier would only bear the project performance risk by guaranteeing that installed products will deliver the expected savings in energy bills, from which the loan will then be repaid (Painuly et al., 2003). While ECO is useful for encouraging the public to take up sustainable energy measures, and while it may be more effective at increasing the investor confidence of banks than a guaranteed savings contract, it bases financial returns on future savings which sustainable energy products are predicted to generate on energy costs. It is likely that financial institutions may view this as too speculative and become uneasy about lending money to the big six UK energy suppliers to fund the programme. The early phase of the Green Deal indicates that the UK government is trying to instil a greater degree of assurance by not only acting as a policy maker, but by also acting as a customer and information provider. Local authority, housing association and other public housing bodies constitute the bulk of the client base for companies that provide sustainable energy products and services.

5.2.5 Problems and Risk

Based on the scenario planning results, the uncertainty prevalent in the market translates into a significant level of risk for companies operating within it. In a situation of low market demand, the loyalty of staff and supply chain partners to the company is adversely affected, as they would tend to seek faster payment times due to their concerns that the company's finances will diminish over time as a result of the low volume of work coming in.

'*There will be a demand financially on the business quite quickly for people to be paid, that loyalty towards the business will go quite quickly and they'll look at that work load dropping off, they'll see a risk within that. 'Will we get paid? When are we going to get paid?''* (IR1)

Industry regulations were found to be problematic in two ways. Firstly, the Green Deal requirement for installers to source all the components of a product from a single manufacturer was unfavourable in the sense that procuring components from different manufacturers to assemble a product presents a cheaper option for installers without lowering product quality. As AR2 indicates:

'*You can literally say ok, 'We'll have that component from that manufacturer, we'll use that component from that manufacturer'. It's just more economical to do so. But under the Green Deal you have to have a complete system and you pay through the nose for it. It's not necessarily any better than the systems we were using previously that have been tried and tested*' (AR2)

Secondly, the requirement by the Department for Business, Innovation and Skills (BIS) that companies should demonstrate sustainability by creating long-term jobs in order to access major grant schemes is tasking to a SME company that prefers to use short-term labour. HR1 comments:

'*One of the conditions that BIS has put forward is that job creation must be sustainable for a minimum period of 3 years and that's been very onerous on us. We've been negotiating and unfortunately they are still holding us to that*' (HR1)

There is currently insufficient understanding of building occupants and other building users about how to manage and operate installed products in such a way that they deliver optimum socio-environmental benefits.

'*This guy, when we went to visit him …he hadn't got a clue what was going on …and we said, 'You know, let's just show you one more time how the controls work' …We sort of showed him how to do that again …So it could be negative if that education is not right*' (HR1)

The involvement of big energy companies in Green Deal and ECO further complicates this situation, as there appears to be a significant level of suspicion and mistrust directed at these companies by

building occupants, thus increasing their reluctance to have energy conservation and carbon reduction products installed in their buildings.

'*Everybody hates Eon and British Gas and what have you so they're not going to do it, so there's a disconnect*' (BR3)

The scenario planning results also indicate that there is a risk that products could be installed incorrectly in buildings.

'*There's a risk that this product, especially when we're talking about EWI and IWI* (external and internal wall insulation), *that it could be installed incorrectly*' (AR3)

This was attributed to the challenge of companies carrying out installation work in occupied buildings. While the SHAP study shows that the installation of products in used buildings poses a disruptive and invasive problem to building users, the scenario planning exercises suggest that the process is inconvenient to the installation companies as well, as it is more difficult to do the work in a used building than in a vacant one. This increased difficulty appears to lower the companies' ability to identify faults in the installation work.

'*When we used to do more refurbs (refurbishments) for HAs (Housing Authortities), certainly the larger refurbs, gut outs with the insulated external walls, it was easy to pick up the faults. If you're dealing with an occupied property it's going to be hellish*' (HR2)

The risk of improper installation is also reflected in the management teams' concern that the current volume of suitably skilled labour within the industry (at managerial and non-managerial levels) is insufficient to cope with an increase in demand, and that this unavailability of proficient labour could negatively affect the quality of work done if demand begins to increase.

'*Are there going to be enough people out there trained up to do the job in the first place?*' (IR1)

'*You're not going to have all the companies that can actually, you know, maintain the jobs over that period of time, so we'll have to over perform on jobs*' (HR2)

'*We've got resources being made redundant all over the place by main contractors, so some of their good site managers, some of their good contracts managers …Now if we could get the skills right for them and they could see, they're sitting at home at the moment looking for their next project and with their knowledge they're waiting for a construction project to start somewhere. They're waiting for somebody to say, 'We've won a hospital job or a railway station somewhere', and they'll apply …what they don't realise is that there is an opportunity within this market to do some of the roles that we're talking about, cause* (sic) *they've got that technical knowledge*' (BR2)

'*There's a scarce commodity in what we would imagine will happen later this year in that there are not enough skilled tradesmen to do the activities required*' (CR1)

'*The whole supply chain is now going to be stretched and that poses problem, that will affect quality, cost and delivery. If you're panicking, you're struggling, you're putting extra shifts on, you're not training the people properly, the tools are wearing, you're rushing, you know, all that will have an adverse effect on that*' (AR1)

5.2.6 Tactics

The companies were found to generally prefer a cautious style of capacity development even in a situation of high market demand. The company management teams favoured keeping the companies lean and focused on activities that add economic value. A flexible approach was noted whereby the companies maintain minimum capacity and increase it only upon receipt of a work order, rather than maintaining higher levels of capacity in anticipation of future work. The management teams preferred employing staff on short-term contracts, either by engaging sub-contractors for a fixed term or by recruiting direct labour on a temporary basis. The tactic of stretching work over as long a period as possible was also mentioned.

'*Now what we've learned is that we operate just in time so if suddenly that got switched off that unit would become empty but we wouldn't be left with any stock really*' (IR1)

'*The traditional way with us when we started was all about …operational improvement, make it leaner, slicker, faster, remove all the non-value added activity*' (AR2)

'*We engage with subcontractors* (and then) *we release those guys, we don't give them any more orders*' (CR1)

'*Can we look at the programme and deliver it over a longer period which will help us in terms of resource, the financial impact, cash flow and how we're going to manage the finance to deliver it?*' (IR1)

Responses given by the management teams during the scenario planning sessions were often based on the companies' current and previous market experiences, underscoring their reliance on lessons learnt from experience to improve their future performance.

'*So like anything else we've learned lessons …So I think from that point of view we sleep a little bit better than we have perhaps done 12 months ago*' (IR2)

'*Because of the experience that we've gained over the last sort of 8, 9 ,10 months, we have got a much better feel for what our costs are as far as labour and materials. The learning curve that we went*

through obviously exposed where we'd either missed things out on tenders or we hadn't allowed for this or there's problems out on site that we can now allow for or that we can foresee' (CR3)

'*Years ago I'd lose sleep if I couldn't see, I'd be really worried, and then you grow accustomed to that being just the way the market is*' (BR1)

Companies' adoption of a cautious approach to capacity development has to do mainly with the lingering trauma of their experiences during the 2008 economic recession, which crippled business activities in the UK and other parts of the globe. As IR2 states:

'*Actually, after what we've just come through …I would always work as if you're working on recession. I think that's the lesson for the future. If you want a business that's going to sustain itself, always believe that you're in some sort of recession and you need to be very careful about it …you could extend things out, but I'd rather keep it as a tight model*' (IR2)

Despite the companies' apparent inclination towards maintaining a minimum level of capacity, they showed a reluctance to release their existing staff, supply chain, and equipment and infrastructure, even in the scenario of low market demand. These two positions, caution and reluctance to downsize, initially appear to conflict each other. However, the reluctance is attributable to economic concerns in the sense that the termination of employee and supply chain contracts during a situation of low market demand creates the inconvenience of sourcing for quality labour again when demand rises to exceed capacity in the future. The management teams exhibited this reluctance when they felt that the situation of insufficient demand would not last long and would be replaced by an improved demand situation in which their companies' capacity would cease to be idle. Some quotes related to this are given below:

'*You would be able to look after your best resources so that when it* (the market) *does pick up you can bring them back out and reutilise those skills*' (IR2)

'*We have some vehicles that we could have sold that we use for that specific type of work, but we've kept hold of them thinking that it's* (the work's) *going to come back*' (CR1)

The companies displayed a tendency to diversify their operations beyond the sustainable energy sector. In this regard they showed a marked lack of interest in associating themselves solely with energy conservation and carbon reduction products, and are willing to be involved in the provision of less sustainable goods and services both within and outside the building industry.

'*If one market drops off particularly we have probably got two or three other markets that we can rely on*' (IR2)

'*In the mean time we've picked up round screen cladding, just a few jobs keeping us ticking along, it's not where we want to be but we still have aspirations to increase our turn over by 30% this year*' (CR1)

'*If we had only been in solid wall insulation today we would have been doing next to nothing so far this year and I imagine that is the situation for some of our competitors*' (AR1)

This suggests that despite the socio-environmental relevance of their activities, the companies do not perceive themselves as being strictly an environmental business. Rather, they view their operations mainly from a commercial angle and have limited reservations about being involved in any other business that offers economic growth.

At the same time, they expressed a readiness to set limits to the maximum level of capacity maintained, and the maximum volume of work accepted, by the company. This appears to be based on their acknowledgment of the company's limited capabilities due to their SME status. It can also be attributed to their reluctance to commit a lot of resources to a still evolving and uncertain market.

'*We would set a threshold of what our capabilities are …we know what our ability and our capability is*' (IR1)

'*I think what happened with solar PV and the way lots of businesses set up to deal with that …there were something like over a hundred of those organisations that have gone into administration …so there's a lesson in there about setting your stall out too big really*' (HR1)

'*We don't want to be committing ourselves to something that we can't fulfil. So we'd have to look at that, break it down and say ok there's 200 houses here we can do 150 and we'd offer them that sum and say I'm sorry but the other 50 would over stretch us. We've got to be realistic about it*' (AR2)

5.2.7 Control and Influence

The company management teams often expressed an interest in controlling the flow of work that they were involved in with other parties. The way by which they went about achieving this in the scenarios is by operating as a main contractor rather than a sub-contractor and thus being in a position to receive a large work order, undertake the volume of that work that their capacity can cope with, divide the rest of the work among their partners, and have the final word on how their partners go about completing this. For instance, IR1 mentions:

'*One of the main strategic features of the business over the last 18 months has been to swap over from working for main contractors. 80% of the business was with main contractors …Now we've turned that round …we've reversed the ratios completely where we're doing 80% of our own work …That's had a big impact and that's opened our view of the business going forward and what we are capable of delivering*' (IR1)

IR2 adds:

'*I'd like them* (other companies) *to be partners but not 100% equal, just slightly below so that we the final say on the strategy*'

While the above tactics are useful to a company's efforts to increase its level of control and influence over other organisations within its partnership network, Isaksson et al. (2010) point out that the wider the network, the less defined overall ownership could become.

The desire to be the dominant party within a work contract appears to be exhibited by both small and large firms. The scenario planning teams mentioned that utility companies and other bigger organisations involved in the Green Deal programme display a tendency for control by trying to buy up the supply chain. These larger organisations also seek to direct and influence the Green Deal work design and costing processes. As BR1 puts it: '*The* (six major) *energy companies have sort of nudged in and they're using their ECO funding and …they're trying to gobble up as much supply chain as they can …they've absorbed a lot of that supply chain*' (BR1). BR2 adds: '*All the* (big) *utilities are saying is you give us all of your data and we'll tell you how and when you can have it and how we'll deliver it and how we'll do it …well no we're not prepared to do that*' (BR2).

5.3 THE VALUES THAT ENVIRONMENTAL BUSINESSES SHOULD DEMONSTRATE

As discussed in Chapter 3, Section 3.2, the research seeks to infer 'environmental business values' from the actions and behaviours exhibited within and amongst companies in response to environmental and social problems that are likely to arise as a result of companies' activities. Using the Green Deal as a reference point, these problems include the disruptive and invasive nature of installation, the risk of an increase in energy costs, and an increase in energy consumption and waste and emissions generation on the part of companies. The risk of an increase in energy costs was attributed to the inability of the current electricity grid network to absorb the additional power from solar PV and other micro-generation technologies. This presents a significant case of sustainable energy products creating a social effect opposite to that which was intended (i.e. a reduction in fuel poverty). Literature provides further evidence of this risk; Menz (2005), for instance, alludes to the burden that the connection of small-scale renewable energy systems poses to the utility grid. SHAP participants were not observed to come up with a response to the unfavourable prospect of higher energy costs. This could be because the expansion of grid capacity presents a solution to this problem, but grid capacity expansion falls outside the remit of companies and into that of the government. The risk was brought up in only one SHAP session, which could also imply that the participants consider the likelihood and impact of its occurrence to be marginal. The research could not conclusively establish this possibility.

For all the other problems identified, SHAP participants were able to propose responses for the alleviation of the problems. The following values can be inferred based on the participants' responses to environmental and social problems:

5.3.1 A Reorientation and Diversification of Skills Away from More Traditional Approaches in the Building Sector:

SHAP participants were of the view that a reskilling of the existing traditional building workforce is necessary in order to get the workforce to pay particular attention towards ensuring that sustainable energy systems and technologies fully realise their technical potential upon installation (Chapter 4, Sub-section 4.2.2). The fulfilment of technical potential results in environmental and social benefits for buildings and their users (energy efficiency, carbon emissions reduction, and energy cost reduction) and so in this manner reskilling makes current work skills better able to address environmental and social issues.

Various literature sources similarly propose the reskilling and multiskilling of traditional tradesmen in order to ensure optimum performance of sustainable energy products in buildings, and SHAP is not alone in pursuing the issue of reskilling the building workforce. Fitzgerald et al. (2013) make reference to the relative newness of sustainable energy service jobs such as energy auditors; insulation and weatherisation technicians; Heating, Ventilation and Air Conditioning (HVAC) technicians and installers; wind energy technicians; solar PV installers; product distributors and salespeople; and research and development staff. In order for the existing workforce within the building industry to be capable of performing these jobs, traditional traineeships and apprenticeships may have to be customised (Rafferty & Yu, 2010). Menz (2005) warns that a shortage of installation and energy assessment skills can result in a loss of consumer confidence in green electricity products. Clarke et al. (2008) indicate that an up-skilling of industry workforce is a necessary task for the improvement of the environmental quality of buildings and the correct installation of sustainable energy products. Sinclair (2012) states that the 're-skilling, cross-skilling and up-skilling' of new work practices and workers creates a window of socio-economic opportunity for disadvantaged groups, such as the NEET sector targeted by SHAP participants. According to Naumann (2012) and Sanghi & Sharma (2012), green job creation is expected to increase over the years due to a growing focus on the production of environmental goods and services as well as the 'greening' of traditional industries, and such an event has implications for skills development policies and requires an available workforce with skills that help in the maintenance of a sustainable ecosystem.

An insight into how reskilling can take into consideration environmental and social issues can be obtained from various case studies. In Portugal for instance, the INOV-Energi@ programme incorporates green skills concerns with the task of raising youth employability in green sectors and activities (Naumann, 2012). Continentally, the European Build Up Skills initiative (November 2011-May 2012) concentrated on setting up a qualification platform and training roadmap to improve the green skills of building craftsmen and installers (Naumann, 2012). Measures proposed during the initiative include that unemployed building workers should be retrained as a priority, and that energy-

efficiency skills should be a cross-cutting content in all building sector qualifications (Naumann, 2012). In other parts of the world beyond Europe, Singapore's Building and Construction Authority (BCA) is addressing skills development at the managerial level, conducting courses such as the BCA-HFT Stuttgart Executive Development Programme on Innovations in Sustainable Design & Technology (Prakash & Chan, 2012). In Australia, the Council of Australian Governments (COAG) published a Green Skills Agreement (GSA) in 2010 which aims to embed skills for sustainability practice and teaching in Australia's vocational education and training system (Brown & Cartledge, 2011).

Previous studies by Naumann (2012) and Sinclair (2012) provide information about possible constraints to skills reskilling. These include limited quality and availability of trainers, and a lack of conviction about sustainability on the part of company managers. Sanghi and Sharma (2012) identify the mobilisation of adequate financial investment and stakeholder participation as another problem, along with the task of creating effective convergence between skills development initiatives conducted separately by academic institutions, government, and private sector. According to Rafferty & Yu (2010) and Omer (2008), even when skills reorientation and diversification is achieved, opportunities for workers to demonstrate their reformed skills may only be created when there is public demand for the skills and sufficient public knowledge about how to harness the benefits of sustainable energy products.

Within this research, SHAP participants were found to support Naumann's view that more green jobs are expected to be created in the future and existing work skills thus need to be reoriented (Chapter 4, Sub-section 4.2.2). Participants also support Sanghi and Sharma in that they identified training costs as a major constraint for the reorientation and diversification of skills. Reskilling formed a significant part of SHAP participants' efforts to utilise the Green Deal preparations as a mechanism for increasing employment generation and poverty reduction. The participants targeted the Not in Education, Employment or Training (NEET) category of the public as a viable labour pool from which new members of a reskilled workforce can be sourced. This raised the training requirements for Green Deal preparations, as the NEET category lacks relevant work experience and so requires basic as well as specialised training. Consequently, in this case the reorientation and diversification of skills achieves an added social objective of providing a disadvantaged section of the public with skills and work experience.

Reskilling would also be instrumental for addressing the social problem of the invasive and disruptive nature of the installation of sustainable energy products in buildings. As the field note recorded on 13th April 2012 states: '*The skill levels* (that were agreed upon by SHAP participants) *are intended to produce naturally multi-skilled people that can deliver a service with minimal impact on tenant and home owners*'. While the problem of disruption and invasiveness appears to be of a temporary nature and may not be relevant beyond the installation period, it could serve as a disincentive for building occupants to view sustainable energy products and services favourably. An unfavourable perception of

sustainable energy products and services could in turn have a negative impact on market demand for them, and so skills reorientation and diversification indirectly helps to protect demand.

5.3.2 Product Integration:

The SHAP programme endorsed the utilisation of a 'whole-house' approach by which a company would not view the product it was supplying, installing or maintaining in isolation (Chapter 4, Sub-section 4.2.2). Rather, it would regard the product as part of a wider solution that includes other energy conservation and carbon reduction products, with the energy performance of a building not reliant on the effectiveness of any single product in itself, but on the integration of different products with each other. Interview respondents similarly emphasised the importance of product integration when discussing the effects of socio-environmental responsibility on capacity. For instance, N1 mentioned that retrofitting existing buildings with sustainable energy products did not simply involve '*just putting PV on*', but also '*making sure we've sealed it* (the building) *properly*' and also paying attention to '*various components* (of a building) *that make it energy-efficient. That's a whole gambit of things, isn't it? You know, it's windows, it's doors, it's insulation, it's roof tiles*' (N1).

Previous research supports this position and provides complementary information. Jakob (2006) calls for a shift from 'an isolated consideration' of individual energy measures to 'a consideration of the building as a whole'. Wang et al. (2009) advises that in order to improve both cost-effectiveness and integration among different sustainable energy products, an analysis of local climate data should first be conducted in order to take maximum advantage of local climate conditions for achieving energy conservation. In addition, the relevance of passive sustainable energy measures (such as daylighting and the orientation of solar PV panels towards the South without shading by nearby trees or buildings) to the minimisation of heating and cooling requirements of buildings should be acknowledged (Wang et al., 2009). The behaviour of building occupants and other building users should also be taken into account (Peuportier, 2001). Computer modelling of the energy performance of buildings can be used to match products to particular building types and contexts, and to assess, for instance, how much roof insulation is required in a house that also utilises solar PV, so that the consumption of too little or too much insulation materials is avoided (McElroy et al., 2001). An integrated approach stands to benefit sustainable energy companies economically, as it makes it easier for the industry to collectively reduce demand uncertainty for individual products and services, although the substantial degree of customisation that comes with such a system can increase the cost of product and service development, based on research done by Clarke et al. (2008) and Omer (2008).

The SHAP participants' endorsement of product integration was aimed wholly at enabling optimum energy performance of buildings. However, the participants were not observed to make reference to other functional issues in buildings - such as ventilation, air quality, space provision, illumination, comfort, noise level, building integrity, and occupant habits – and how these can be considered

alongside energy concerns. This could result in sustainable energy measures being implemented at the expense of a building's other functional requirements. Previous research advises against this situation. Authors such as Omer (2008) and Kua and Lee (2002) indicate that thinking through energy performance requirements in isolation to other building functions can lead to conflicting strategies, which can ultimately have a detrimental impact upon energy performance, and that energy-efficiency in buildings can be optimally achieved only if the interrelationship of different functional issues is appreciated. Unlike the participant observation study findings, the interview results did provide insight into the attention paid by building practitioners to other functional issues when trying to improve the energy performance of buildings. For instance, I2 states: '*It's trying to balance the energy demand of air tightness, the human demand for good air quality through ventilation, and the building's demand for trying not to trap moisture in the building …One of my fears is, as we start doing lots of retrofit they won't all be taken into consideration …and in ten years' time we'll have increased asthma, we'll have buildings with rot, mould, damp, mingy, all caused by people with the best intentions trying to reduce the energy*' (I2). Such a coordinated approach would ensure that the goal of improved energy performance is achieved alongside adequate building comfort and the maintenance of good health of building users.

5.3.3 The Localisation of the Supply Chain:

SHAP participants recommended the localisation of the supply chain for the provision of sustainable energy services. By this participants meant that companies should situate their activities close to the geographical areas in which the companies provide services (Chapter 4, Sub-section 4.2.2). Alaane and Saari (2006) provide an additional view on what localisation entails. They refer to localisation as the improved utilisation of local resources in energy systems, and it could take the form of local fuel harvesting and storage, the promotion of local business opportunities, and the development of goods and services based on local raw materials and labour. Other authors (such as Hamilton & Summy, 2011; Rio and Burguillo; 2009; and Ristola & Mirata, 2007) mention that the localisation of renewable energy production activities is beneficial to employment creation, social cohesion, education, population distribution, and income distribution. Porter and Kramer (2011) point out that in addition to reducing the energy and emissions associated with procuring materials over long distances, supply chain localisation benefits companies economically in the sense that it can achieve greater logistical efficiency, ease of collaboration, and reductions in time, complexity, and management and energy costs. However, in literature there are also reservations about the practice of localisation. For instance, Lam et al. (2010) suggest that the relatively low energy output produced per unit volume of various renewable energy sources ultimately increases the complexity (along with the cost and emissions) of supply chains and affects the feasibility of their localisation. Richard (2010) indicates that independent local suppliers may only be adequate for small-scale energy generation activity; a more practical alternative to regional or global market arrangements is the operation of single companies on large

contiguous land areas in order to achieve a less fragmented but distributed approach. However, this system comes with problems associated with land access and appropriation and the risk of an inadequate volume of local suppliers (Richard, 2010). If global energy consumption remains unchanged and traditional fuels and technologies are still used, the volume of emissions reduced by localised renewable power generation would remain constant rather than rise (Alaane & Saari, 2006). In other words, the localisation of energy generation may redistribute global emissions but not reduce it. By implication, the intensification of local manufacturing and service activities within the UK could cause a setback to the country's achievement of its energy and carbon emissions reduction targets.

In this research, supply chain localisation was found to perform multiple functions. SHAP participants shared the view that the adoption of supply chain localism for the implementation of the Green Deal has the potential to minimise the energy, emissions and waste issues associated with developing, procuring, transporting, installing and maintaining both production materials and finished products (Chapter 4, Sub-section 4.2.2). The participants were of the view that the localism approach would allow for a closer monitoring of the production and delivery of goods and services to guarantee that only minimal or zero harmful environmental impacts are yielded. It also serves to reduce the distance across which products can be distributed, thus reducing the release of carbon emissions in the case of fossil fuel-based transportation. Beyond the environmental rationale behind SHAP participants' support for localisation, there are also socio-economic reasons as well. The creation of new businesses and employment and poverty reduction opportunities in Local Authority Areas throughout the United Kingdom was identified as a major potential benefit of supply chain localisation.

The research findings about the benefits of supply chain localisation correspond with some literature sources identified earlier in this section of the thesis. Unlike Porter and Kramer (2011), however, the research did not detect any financial advantage that localisation presents to companies. With all the benefits attached to it, supply chain localisation appears on the surface to be worth considering as a possible route for the industry to minimise negative environmental and social impacts whilst expanding economically. However, while the SHAP programme identified the potentials of supply chain localisation, it was less definite about the feasibility and possible adverse consequences of such a move. Participants also noted that the setting up of a local supply chain involves a high level of initial investment (Chapter 4, Sub-section 4.2.2). They did not establish a quantitative definition of localisation in terms of distance or other geographical terms. For example, it is not clear how far away from its eventual point of use a renewable energy technology can be manufactured before its production can no longer be described as 'localised'.

In view of the possible benefits and detriments of supply chain localisation, it is important for localisation to be handled in such a manner that supply disruption and its attendant economic repercussions would be avoided. Furthermore, while localisation represents a sustainable business

option in principle, it requires an atmosphere of low domestic costs of business in order for companies to be persuaded to adopt it.

5.3.4 A Longer-term View of Business Success:

As was reported in Chapter 4, Section 4.2.2, SHAP participants endorsed the use of a 'whole-life' approach to business as a means of encouraging companies to take a longer-term view of their operations and to eschew a focus on quick financial gains. Participants also projected that regulatory intervention via government-led energy-efficiency programs in the building sector will result in a future increase in market demand for sustainable energy goods and services, providing a further incentive for a long-term business view. For instance, SHAP members reported that '*while signing up to the Green Deal is currently voluntary, it is likely that in the future people might be compelled by law to reduce their carbon emissions rather than being left to volunteer to do so. This could positively contribute towards market demand* (30th April 2012).

Authors such as Bartlett & Howard (2000) support SHAP participants' recommendation of a long-term approach to costing within the building sector. They write that construction professionals need to be more informed about costing tools that enable value judgements to be made based on joint environmental and economic considerations, rather than on 'over-simplified budget estimates' that exaggerate the cost of implementing sustainable energy measures in buildings. However, the adoption of a long-term outlook faces significant challenges within neoclassical business and financial models. This is because these models often interpret future events as costs, with a clear bias for current benefits, and it is also difficult to translate cultural value objectives (such as high environmental and social performance) and ecological metrics to a system of market prices (Roper & Beard, 2006). SHAP participants chose to interpret future events as holding a lot of economic potential for companies, based on the market sizing and evaluation activities that the participants performed. In other words, the adoption of a longer-term view of success is predicated on the expectation of a significant future economic payoff, without which the strategy becomes difficult to justify. Where there is insufficient assurance that market demand will at least match existing capacity in the future, SMEs might feel compelled to seek out immediate economic opportunities and rely less on long-term planning that takes account of environmental and social issues.

5.3.5 Effective Inclusion of Building Users in the Capacity Development Process:

SHAP participants recommended the involvement of would-be beneficiaries of sustainable energy services in the Green Deal preparation process. This is for the purpose of gaining feedback about how to alleviate the invasive and disruptive nature of the installation of sustainable energy products in buildings (Chapter 4, Sub-section 4.2.2). It would also serve as an opportunity to create awareness about

the need for building users to adopt responsible energy behaviours and use the products in the right way.

There is support for this proposal in literature. Omer (2008) mentions that the conditions necessary for renewable energy technologies to yield the benefit of being environmentally benign include the involvement of local communities in the technologies' development, and the encouragement and enablement of active and informed individual and corporate consumers. Similarly, Rohracher (2001) mentions the improvement of company-user relationships, and the integration of consumers into the development of goods and services, as vital for achieving greater sustainability in the building stock. Kua and Lee (2002) write that the public should not be treated as passive consumers, but as an integral part of the 'production-utilization system that, in turn, needs their active contribution and participation to maintain it', and that companies should provide the public with an interaction channel with which its interests, queries and experiences can be communicated. DiMaggio (2001) identifies client participation in product design as a trend that is replacing firms' tendency to create products first and then market them. The involvement of potential customers of sustainable energy services in the capacity development process could also have the effect of increasing customer demand. By giving members of the public a sense of control and leadership and emphasizing the effectiveness of individual action in protecting the environment, companies may increase the public's non-economic motivation to purchase environmental goods and services (e.g. Boonekamp, 2006; Wiser, 1998). Wiser (1998) also advises that programs aimed at getting people to contribute towards the development of green goods and services should be coordinated by locally sited enterprises rather than large national or global corporations, which are often seen as having little interest in the community. Similarly, Thollander et al. (2007) and Breukers and Wolsink (2007) recommend the institutionalisation of local participation in the planning of sustainable energy projects, as local participation initiatives achieve higher levels of success in increasing society's interest in the projects than wider information campaigns. However, Henryson et al. (2000) caution against undue optimism about the effectiveness of customer inclusion in influencing the public's energy behaviour. They mention that it is difficult to establish beforehand how much energy savings an information campaign would yield, and that while building users could become encouraged to adopt more responsible habits, knock-on effects could also be created which could reverse initial gains. For instance, a drop in energy expenses due to the installation of products in buildings could merely encourage consumers to buy more electrical appliances as a reaction to the money saved, and to further increase their energy consumption.

The research data indicates that the involvement of building users in capacity development efforts can be beneficial to sustainable energy service companies by way of improving their service delivery and effectiveness. SHAP's intention to use the involvement of building users in Green Deal preparations as an opportunity to educate them on sustainable energy products and responsible energy behaviour also provides a clear environmental benefit. The research data did not produce definite information about

how the inclusion of building users in the Green Deal preparation process could be achieved. However, it can be argued that since noise and visual impacts of installation activities can affect not only occupants of a single building but the entire neighbourhood in which the building is located, community-wide engagement programs are a viable option. Hence, companies should take advantage of community and social dynamics when seeking to engage with the public, as is suggested in literature in the previous paragraph. The research findings also suggest, just as Wiser does in the paragraph above, that people have an unfavourable opinion of engagement programs organised by big companies. SHAP participants noted that '*householder engagement needs to come from a trusted source rather than big companies like Eon or Tesco, which are often held in suspicion by members of the public*' (27th June 2012). SMEs, being smaller than large corporations, could be viewed with less cynicism by the public, and the practice of supply chain localisation, which has been discussed in 5.3.3, could gain them further acceptance at the community level.

The participant observation data did not contain any information about possible downsides or contradictions associated with the involvement of building users in the capacity development process. However, unlike Boonekamp (2006) two paragraphs above, the first stage research findings do not suggest that customer inclusion has a positive effect on demand. In addition, due to resource constraints, it is possible that SMEs may not be able to administer a sustained or repeated campaign, which in turn gives rise to the possibility of people eventually forgetting information over time, or losing enthusiasm for behaviour change.

5.4 CHALLENGES EN ROUTE THE TRANSITION FROM A TRADITIONAL TO AN ENVIRONMENTAL BUSINESS APPROACH TO CAPACITY DEVELOPMENT

As was pointed out in Chapter 3, Section 3.3, a company's operation as an environmental business comes with consequences for its business capacity. The research data was useful for gaining information about these consequences, which were identified in Chapter 4 (Section 4.3). Regarding a company's labour capacity in particular, companies that demonstrate socio-environmental responsibility were found to target and attract people with strong environmental and social ethics. When this is combined with other information about the required characteristics of an environmental business – such as localisation and skills reorientation and diversification – an idea of the ideal recruitment criteria for an environmental business is formed. The labour capacity, both permanent and contingent, for an environmental business should consist of skilled people who have a personal commitment to sustainability and are local to the area in which the company operates. The company should also target having employees who would otherwise have been socially disadvantaged. There are constraints to the feasibility of this employment strategy, however. SMEs with limited resources may not always be able to recruit people other than those who already possess sufficient skills and experience, as the companies could be seeking to minimise staff training and development costs. Consequently, SMEs may be

reluctant to hire people on the sole basis that they are socially and economically vulnerable. They may also have few reservations about recruiting highly skilled, affordable personnel who do not reside locally and/or who are apathetic to sustainability.

The research data also produced information about the criteria that environmental businesses need to use to select products and other materials for the provision of a service. Materials specified need to be sourced from sustainable and local companies (Chapter 4, Section 4.3.2). However, both the SHAP participants and the interview respondents acknowledged that the environmental business value of supply chain localisation is cost-intensive and requires a high level of upfront investment. One interviewee, O1, mentioned that *'There's a lot of investment required for new manufacturing facilities'* (O1), while H1 states that *'We need to be manufacturing it here, but yeah, that's quite a lot to set up … it's more expensive to produce here'* (H1). Likewise, SHAP participants identified a high level of initial investment as an economic barrier (Chapter 4; Sub-section 4.2.3). It is reasonable that the existence of an effective capital funding programme run by either the government or the private sector could encourage companies to implement supply chain localisation. Since the availability of these funding programmes can be affected by the wider economic climate within the country (for instance, in times of recession such funding streams could become narrower), it follows that the extent to which companies implement localisation, and other cost-intensive but socio-environmentally beneficial measures, is as much a reflection of external political and economic factors as it is of companies' internal resolve.

The costs that environmental protection and social accountability add to a company's operations are of particular significance in the light of SME's limited financial capacity. It could mean that even in the event of a SME's willingness to function as an environmental business, they would be restricted by financial constraints, especially in a situation of low market demand, or where industry regulations and customer preferences are not conducive to a company's implementation of socio-environmental responsibility. Finance is not the only area in which the consequences of acting as an environmental business are felt by companies. The differences between environmental business and mainstream practices could mean that a company that has been operating in a mainstream manner would have to make changes to its processes in order to perform as an environmental business. This could come with attendant issues of inconvenience and the challenge of overcoming internal resistance to change.

In addition to internal challenges associated with functioning as an environmental business, the motives of other companies operating in the sustainable energy services industry were also a source of suspicion to research respondents. The SHAP participants were observed to express concern that some companies were more interested in making quick economic gains than in a longer-term commitment to good socio-environmental performance of sustainable energy products (Chapter 4, Sub-section 4.2.3). Likewise during the interviews, E2 expressed displeasure at the inclusion of a Chinese company with

questionable values in the Birmingham Energy Savers scheme, which is a local eco-refurbishment initiative linked to the national Green Deal scheme. He complains: *'When Jinko were* (sic) *chosen for this tender, we felt that …the values of the tender has* (sic) *been cheated, because at the same time were being taken to court in China for their pollution of the local river and the riots that it caused'* (E2). Another interviewee, P1, states: *'What we found from the work we did for Birmingham is that …an awful lot of small companies have set themselves up to do stuff around solar PV particularly …and obviously they don't have the experience and all they're wanting really is to do an installation and go away'* (P1). In this manner, research respondents drew attention to the need for environmental businesses to form business partnerships with organisations that share similar values with them, not just any organisation. However, this approach could in turn further increase SMEs' financial commitments, as they may have to sacrifice cheaper partnership options on the basis that the companies that would be involved with them in these partnerships are not environmental businesses (Chapter 4, Sub-section 4.3.5).

The challenges posed by the environmental business approach are compounded by those traditionally associated with capacity development. The findings of the research concerning traditional capacity development barriers are consistent with literature evidence surrounding the topic. For example, while this research groups barriers into economic, regulatory, stakeholder, technical and behavioural, (Chapter 4, Sub-section 4.2.3), Tonn and Peretz (2007) identify four general barrier types: awareness (limited knowledge of society about products); cost; capabilities (households and firms may not have the technical capabilities to take advantage of energy savings opportunities); and transaction issues (e.g. organisational efficiencies and lack of public trust). In his work titled 'Energy, Environment and Sustainable Development', Omer (2008) identifies initial high development costs, and poor institutional arrangements which favour energy consumption rather than conservation, as barriers to the contribution of renewable energy to the environment. Likewise, Kua and Lee (2002) mention the following as barriers: lack of financial resources; limited professional capacity to incorporate and manage energy conservation and carbon reduction products in buildings; insufficient knowledge of building owners, developers and occupants about the negative environmental impacts of energy-inefficient buildings; inadequate information about the economic and socio-environmental benefits of energy conservation and carbon reduction products to building users; and inadequate institutional structures to support and encourage uptake of the products.

The research's identification of insecure demand as an economic barrier (Chapter 4, Sub-section 4.2.3) seems at odds with its projection of increased future demand for sustainable energy goods and services (Chapter 4, Sub-section 4.2.1). However, this paradox appears to be widely characteristic of the sustainable energy sector both within and outside the building industry, based on previous research. For instance, using The Netherlands as a case study, Verbung & Geels (2007) find that within the sustainable energy sector 'signs of hope' coexist with 'moderate pessimism'. As mentioned in 5.2.4,

the Energy Company Obligation (ECO) provision under the Green Deal is intended to deal with economic barriers for some sustainable energy service companies.

In view of the challenges looked at in this section of Chapter 5, the next section looks at the degree to which SMEs are able to prioritise environmental and social issues as much as economic ones.

5.5 THE FEASIBILITY OF THE ENVIRONMENTAL BUSINESS PHILOSOPHY

As mentioned in chapter 3, Sub-section 3.5.3, the outputs of the SHAP study took the form of recommendations made by participants. In itself, this does not imply that the companies involved in the study would actually go on to implement the recommendations. Likewise, while the interviews provide information on the effects of environmental and social practices on companies' capacity, they give insight into discrete experiences rather than the continuous process of capacity development. The scenario planning cases are thus particularly relevant in terms of indicating the frequency and depth of companies' application of the environmental business concept on a continuous basis in different capacity development situations.

The companies that participated in the scenario planning sessions were found to practise Corporate Social Responsibility (CSR) in the form of job creation and the provision of apprenticeships and work experience opportunities. Some relevant excerpts are given below:

'*I'd suggest that we look quite carefully at apprenticeships so that we can bring in long term training opportunities*' (IR1)

'*We've now got 9 apprentices, one placement person, we're dealing with a couple of social enterprises to look at how we can perhaps bring into work people that are less fortunate*' (CR1)

'*It might be an idea to set up a separate side of the business looking after that sort of area of training, providing training programmes for people*' (IR3)

Companies are conscious of the need to reduce carbon emissions in their supply chains. They also displayed concern for ensuring that the goods and services they deal in fully deliver their energy conservation potential upon installation in buildings. This is reflected in the companies' emphasis on high product and service quality as well as environmental accreditation by relevant bodies.

'*You're committed to quality at the outset*' (IR1)

'*We found a lot of carbon emissions going on in, not the large companies but in their supply chain. So we thought that targeting the SME supply chain would be a good intervention*' (HR2)

'*I think if you look at all the accreditations that we've got in the business, without putting them up just as badges, I think all those have a part to play in what we're talking about in terms of the quality aspects*' (IR2)

'*So, it could get in a mess quite quickly if we miss the fundamental point of monitoring on site and getting the quality right and having the guys understanding …what needs to be done in terms of specification*' (BR1)

With regard to the environmental business values identified in Section 5.3, the companies were found to favour engagement with building users in their capacity development decisions, as well as local business partnerships. They also favoured product integration and the reskilling of staff so that they supply, install and maintain sustainable energy products in such a way that the energy-saving benefits of the products are realised and the social problem of inconvenience to building occupants is minimised. The company management teams did not make any explicit reference to the fifth value, the adoption of a longer-term view of business success, but they were noted to prefer steady rather than abrupt or rapid capacity expansion. They also set limits beyond which capacity would not be further increased, and they displayed reluctance to let labour and supply chain partners go even in a situation of insufficient market demand.

'*We'll also talk to some of the community groups just to see what their take is on what we're saying*' (BR3)

'*Then there's that really technical bit which is about really knowing the property …cause* (sic) *every property will be different and they've got to know all the products and they've got to know enough, have enough technical expertise of those products to determine the whole system*' (BR1)

'*You need a surveyor or someone, almost like a clerk of works that can literally, who knows all the green deal measures and how they interact*' (BR2)

'*Quite rightly start off small, learn all your little mistakes, iron all of those creases out and then as you grow, you're growing a really good model for delivery then*' (IR2)

However, while the companies did exhibit a desire to be sustainable, green businesses that provide jobs and work experience opportunities and improve the welfare of its customers through the services they provide, the motives behind these practices are in themselves not always socio-environmental. Economic growth and benefit appeared to be a predominant driver in two ways. Firstly, the companies appear to perceive some socio-environmental measures as useful for delivering some form of gain that could be quantified in financial terms. A specific instance of this can be found in Inex's use of their possession of green vehicles and environmental accreditation to lower its insurance premiums:

'*What we've tried to do is bring in those people, like the insurers, did you know that we've got green vehicles, did you know that they're no more than 3 years old. It has an effect on your premium, it has an effect'* (IR3)

Another instance can be found in Coen's perception of apprentices and socially-disadvantaged work experience placement persons as a cost-effective source of labour compared to its regular staff, as well as in its management team's acknowledgment of environmental accreditation as a means of improving the company's chances of winning public sector work (Chapter 4, Sub-section 4.4.3). The relevance of socio-environmental responsibility as a means of securing public sector work contracts was also recognised by interview respondents during the first stage of the primary research (Chapter 4, Sub-section 4.3.1). The high emphasis placed on quality by the scenario planning teams appears to be driven mainly by the need to enhance market competitiveness and reputation as well as meeting clients' expectations concerning quality assurance guarantees. As IR1 states: '*Every client now will say have you got quality assurance guarantees. You've got to issue them*'

Engagement with building users and the wider community is done for the purpose of increasing the number of potential customers, and products are advertised to the public not simply as a means of protecting the environment and improving social well-being, but also as a way of improving the financial value of the buildings in which they are installed. As BR2 observes: '*There's a huge commercial unseen value to this, health benefits, fuel poverty, a reduction in voids and people leaving, reducing rent arrears which is going to be a huge problem*'. The BNK scenario planning data in particular reveals that the cost of raising public awareness about the benefits of sustainable energy products is included by the company in the final price of its services, with BR1 stating: '*It would have to come as part of the installation cost*'. The case study companies were found to have few reservations about diversifying into other businesses that do not deal with environmental goods and services (5.2.6).

Secondly, the companies view the green building and construction sector as a business area that has high economic growth potential, which appears to be the reason why they got involved in providing sustainable energy services. As CR1 points out, '*People are picking up to the fact that there is a lot of work in the EWI* (external wall insulation), *Green Deal, ECO arena so we need to make a more sustainable business*' (CR1). AR2 states, '*I think if there is an environmental project, we're all responsible people and that gives us quite a nice feeling that we're doing something to save the planet …providing we can see that there is a commercial benefit of doing it, you know we're not there for supporting charities*' (AR2)

As has been mentioned in 5.2.6, companies' reluctance to release staff and supply chain partners even in a low market demand situation appears to be in contrast to their readiness to achieve economic growth, and seems more in line with concern over employee welfare. However, it should be noted that the termination of employee and supply chain contracts during a situation of low market demand creates

the inconvenience of sourcing high-quality labour all over again if demand rises to exceed capacity in the future. This translates to an economic concern rather than a social one. Similarly, companies' preference for steady rather than abrupt growth, and their apparent disinclination towards abrupt expansion, can be linked to economic motives. A gradual approach to capacity expansion could give a company time to learn from its experiences and position itself to be a bigger competitor in the future.

On the whole, the research findings suggest that environmental and social performance in itself is not strongly used as an indicator of business success by the companies. Rather, environmental and social business measures are often validated by the economic benefits they yield, rather than in their own right. Environmental business values and practices appear more likely to be implemented if there is security of demand and the cost of implementation is perceived as not high. Recognition of this company perspective is a crucial first step towards designing a strategy for the transition of SMEs from a traditional to an environmental business approach to capacity development.

5.6 SUMMARY

In this chapter, the values of an environmental business were determined from the responses of research participants to environmental and social problems associated with the provision of sustainable energy services. The values are skills reorientation and diversification, product integration, supply chain localisation, the adoption of a longer-term view of business success, and the inclusion of building users in the capacity development process. Based on the results of the research, companies are aware of and adhere to environmental business values and practices to a significant extent during capacity development. However, the motives behind this behaviour are largely economic rather than based on concern for the environment and society.

The information gained on the capacity development process and its challenges, environmental business values and practices, and the extent to which SMEs can implement the environmental business philosophy during capacity development, are useful for the next chapter. This is because they enable this research to propose the readjustment of capacity development from an economic context to an environmental business one.

CHAPTER 6

THE TRANSITION OF CAPACITY DEVELOPMENT FROM AN ECONOMIC-LED PROCESS TO AN ENVIRONMENTAL BUSINESS

6.1 INTRODUCTION

Having established the activities, themes and barriers surrounding capacity development, the implications of environmental business values and practices for capacity, and the extent to which SMEs are willing and able to function as an environmental business, it is possible to present how the transition from a traditional to an environmental business form of capacity development can take place. This can be achieved through systems modelling which illustrates the complexity of issues and the interactions that occur among various factors during change.

As discussed in Chapter 5, the companies that participated in this research demonstrated awareness of the need to operate as an environmental business. However, the companies are not always able to transform this awareness into actual implementation, due to operational barriers and economic realities that they encounter. Consequently, they adhere mainly to the traditional, economic-led perspective of business success discussed in Chapter 2. At the same time, as the literature review conducted in Chapter 2, Section 2.2 indicates, some degree of deviation from traditional business practices is required if companies are to avoid worsening the socio-environmental impacts of their operations.

A pragmatic approach to operating as an environmental business is thus vital. In the scenario planning case studies, the company management teams perceived capacity development to be mainly an economic-led process, but capacity development activities also yielded significant but understated socio-environmental benefits. In this way the findings indicate that a transition from a traditional system of capacity development does not necessarily require the invention of completely new processes. Rather, it can be achieved through a shift in how existing capacity development activities are conventionally perceived. By adjusting existing, traditionally economic activities to focus more on the latent social and environmental functions contained within them, more emphasis can be placed on the role that these activities have to play in minimising the negative environmental and social impacts of companies. This could then encourage companies to view capacity development less as a wholly economic process and more as a sustainability-related one, and to view socio-environmental responsibility not as an extra burden that falls outside their core operations, but rather as an inherent part of them. The focus on redefining existing capacity development activities (as opposed to designing new ones) has the added advantage of lowering companies' resistance to change, as the activities involved include ones that they already utilise. This view is supported in literature; for instance, Hilary (2004) identifies resistance to change as a significant barrier to companies adopting environmental management systems. In a similar vein, Nidumolu et al. (2009) state that company executives treat environmental protection and social responsibility as divorced from business objectives due to concerns that a more sustainable approach may require new processes and facilities.

This chapter looks at how the economic view of capacity development can be expanded to accommodate environmental and social dimensions. In order to do so, it relies on a systems model that takes into account the high priority attached to economic considerations by SME businesses, but also carries the principles of environmental protection and social responsibility alongside the need to achieve economic success. The representation of the capacity development process in this manner is crucial on two fronts. Firstly, it emphasizes the role that traditional, economic-led capacity development activities can play in reducing negative social and environmental impacts. In this way, more attention could be drawn to the socio-environmental potential contained within capacity development, which as mentioned before, was found to be understated within companies' views of the capacity development process in the scenario planning case studies. Secondly, the model illustrates how environmental and social practices can be of economic benefit to SME companies, thus providing an incentive for companies to implement these practices. Hart and Milstein (2003) state that just as business is often viewed from a one-dimensional, economic angle, sustainable development is often framed by business managers as a 'one-dimensional nuisance' that is rigidly connected to regulations, added cost, and liability, and this view leaves businesses ill-equipped to deal with the issue in a strategic manner. Since many SMEs remain unconvinced by the arguments for sustainability, it is important to link sustainability practices and advice to a clear business case (Sinclair, 2012). Raising SME awareness about the potential commercial benefits of enhanced environmental performance could result in managers being persuaded to adopt a more positive mind-set (Worthington and Patton, 2005). The challenges of environmental protection and social responsibility, when viewed through the appropriate set of business lenses, can help to identify strategies and practices that positively contribute to environment and society whilst simultaneously driving economic value (Hart & Milstein, 2003). This chapter is intended to propose such a useful, 'environmental business' lens.

The rest of the chapter is structured as follows: Section 6.2 focuses on the elements of capacity development, as detected from the primary research, which can enable a company to operate as an environmental business. Following from this, Section 6.3 looks at how SMEs can transit from an economic-led style of capacity development to an environmental business one. Section 6.4 then presents a final model of the transition process, while Section 6.5 provides a chapter summary.

6.2 CAPACITY DEVELOPMENT ELEMENTS CRUCIAL TO TRANSITION

As has been covered in Chapters 4 (Section 4.2) and 5 (Section 5.2), capacity development can be structured into various activities and themes, as summarised in Figure 6.1 below. The research findings also indicate that companies tend to view capacity development mainly from an economic perspective, with regulatory, stakeholder, economic, technical and behavioural factors acting as major constraints. Furthermore, while SMEs are aware of the need to be socio-environmentally conscious, this awareness does not always translate into actual practice due to economic considerations. Instead, SMEs are more

likely to apply environmental business values and practices if they perceive them as useful for delivering some form of direct or indirect economic gain.

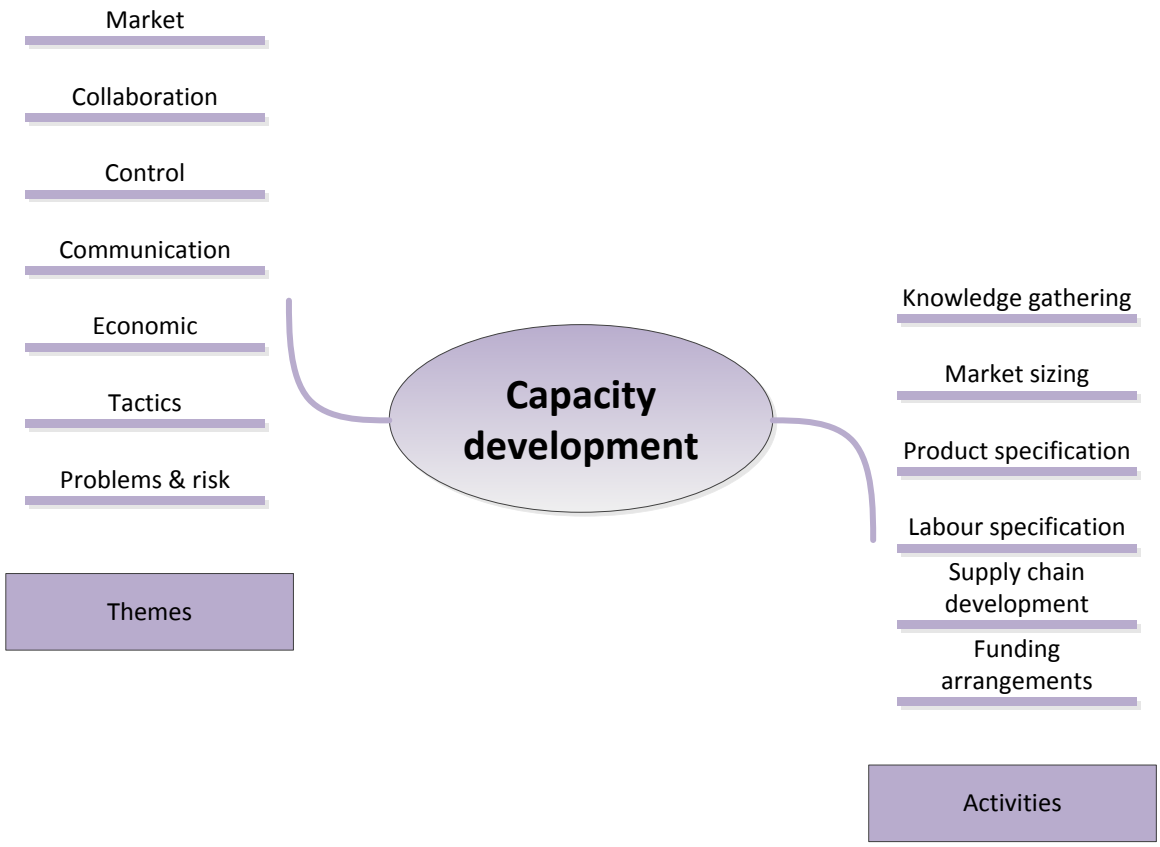


Figure 6.1: Activities and Themes Associated with Capacity Development

The companies' focus on mainly economic factors finds resonance in previous studies. For instance, based on their socio-technical analysis of the Dutch electricity system, Verbong and Geels (2007) report that energy transitions towards sustainability do not have environmental aspects as their main driver. However, in this research, within the perception of capacity development as an economic-led process, a number of implicit issues were detected through which this perception could be remodelled as a multi-dimensional process. Some capacity development activities which were viewed from an economic angle by the research respondents were found to have a socio-environmental purpose as well. Thus this chapter attempts to propose how the economic-led view of capacity development can be reoriented into a multi-dimensional one that actively takes environmental protection and social responsibility into greater account, as illustrated by Figure 6.2.

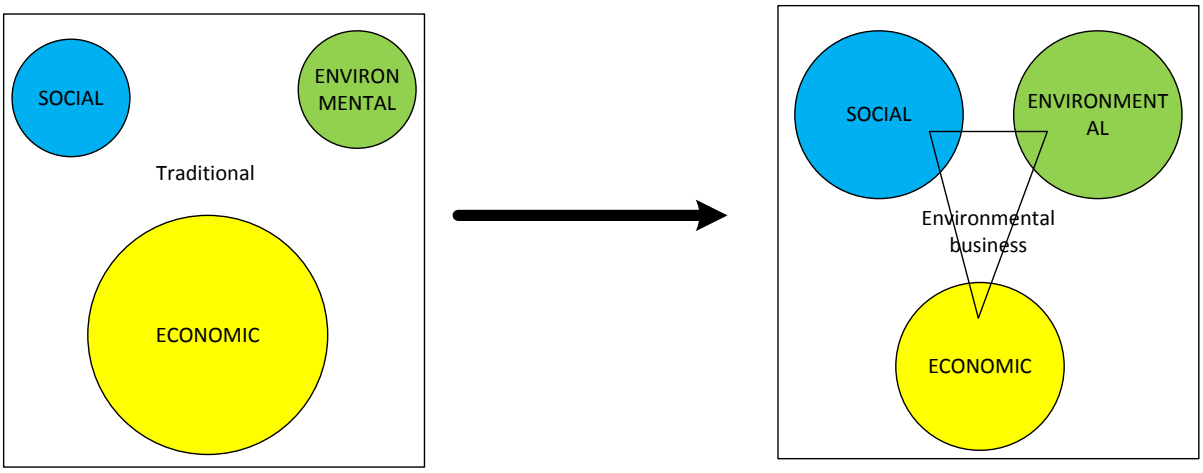


Figure 6.2: The Transition from a Traditional to an Environmental Business Approach to Capacity Development

The analysis of the research data revealed elements of capacity development which can act as linkages to connect economic, environmental and social considerations into an environmental business model of capacity development. As was highlighted in this chapter's introduction, this approach can serve to encourage SMEs to develop capacity within a sustainability context rather than just an economic one, especially as it does not call mainly for the design of new processes, but rather for a shift in how existing practices are viewed by SMEs. It could also provide an economic incentive for companies to operate as environmental businesses. The capacity development elements that can aid the transition from an economic view of capacity development to an environmental business one are discussed below.

6.2.1 Collaboration:

Companies that participated in the scenario planning cases showed a preference for collaborative approaches in the form of Joint Ventures, consortia, sub-contracting of surplus work to supply chain partners, and engagement with policy makers (Chapter 5, Sub-section 5.2.2). Collaboration was found to enable companies operating within the sustainable energy services industry to jointly develop the market and improve their processes.

Collaboration is of economic relevance in the sense that SME companies can jointly increase their capacity to compete more favourably with large organisations, and they can share and transfer economic responsibility for environmental protection and social stewardship to other parties. During the interviews, collaboration was also found to be a way through which sustainable energy service companies can come together to achieve product integration within buildings, rather than focusing on the effectiveness of any single sustainable energy product in itself (Chapter 4, sub-section 4.3.6). This research has identified product integration as an environmental business value necessary for achieving optimum performance of sustainable energy products (Chapter 5, Sub-section 5.3.2), and so

collaboration can be regarded as achieving significant environmental and social outputs in addition to economic ones. Collaboration appears to play a more significant role than traditional business competition in enabling companies to function as environmental businesses. As H1 put it, '*If you're truly trying to do it for sustainable reasons and for value reasons, then you want the whole industry to progress with you'*. H1 similarly alludes that the elements of environmental protection and social responsibility require companies '*to be moving to consortia, sharing ideas and moving in progression forward together* (collaboration) *rather than sort of hiding and kind of keeping everything to themselves and, you know, kind of blocking everyone out* (competition)'.

6.2.2 Jobs preservation:

The socially responsible practice of job preservation, whereby jobs are maintained within the company on a long-term basis, has benefits that can also be evaluated in economic terms. Based on the outputs of the scenario planning cases (Chapter 5, Section 5.5), the preservation of jobs lowers staff hiring and development costs in the future, and it also increases staff loyalty, which has a positive effect on productivity.

While jobs preservation has relevance in terms of both a company's economic performance and its social responsibility, it is important to draw attention to an earlier work by Powell (2001), who at the turn of the 21st century wrote that an emerging characteristic of the business environment is the decline of long-term, secure job arrangements in favour of short-term projects often performed by teams focused on product customisation. Whereas in the late 19th to early 20th centuries jobs were a way of packaging 'work in settings where the same task was done repeatedly', emerging forms of work organisation significantly depart from the older system of sequential work steps and linear design that provided workers with security (Powell, 2001). Rather, they represent a system of pay for productivity, with limited recourse to loyalty or seniority, while workers have become more independent entities, 'increasingly the authors of their own work', rather than an extension of a company's brand (Powell, 2001). The long-term implications of this trend are still considerably unclear in literature, but within this research a conflict for environmental businesses has appeared, namely, how to balance jobs preservation with flexible capacity utilisation and service delivery. This will be mentioned again later in this chapter in 6.2.11.

6.2.3: Promotion of Socio-environmental Benefits of Products in Economic Terms:

This issue is relevant to sustainable energy service companies and other companies that provide environmental goods and services, rather than to businesses in general. The findings from this research indicate that in addition to their environmental usefulness, sustainable energy products provide building users with socioeconomic benefits. These include a drop in energy bills, an additional income stream for building occupants through the sale of electricity back to the grid, health improvements for building

occupants, and a potential increase in the value of a property (Chapter 4, Sub-section 4.3.1; Chapter 5, Section 5.5).

As has been covered in Chapter 2 (Section 2.2), sustainable energy goods and services are often promoted to the public as being useful because of their role in protecting the environment. However, despite the positive perception of environmental protection by the general society, the public's willingness to back this perception with the actual purchase of environmental products is limited. Unless legal pressure forces people to purchase sustainable energy goods and services, people have to become motivated enough to choose to purchase. Thus, it is useful to promote sustainable energy goods and services in a way in which the public would be better inclined to purchase them. Based on the economic potential of sustainable energy products which the research findings point to in Chapter 5, Section 5.5, it can be argued that the promotion of these products in economic terms by sustainable energy service companies could attract further demand. For instance, rather than emphasizing the drop in carbon emissions that would arise from increased energy conservation in buildings, marketers should focus more on using savings in energy bills, or the personal health benefits of energy-efficient buildings, as selling points. This position is supported in literature (e.g. Miller et al., 2008; Boonekamp, 2006; Wiser, 1998). Since market demand is necessary in order for a company to make profit from its business, a company's economic success is assured when potential customers perceive its product to be of economic value to them.

6.2.4 Environmental accreditation:

The pursuit of environmental accreditations would require companies to improve their environmental performance as a pre-requisite for gaining them. After they have been acquired, environmental accreditations then enhance the companies' prospects of winning public sector work in particular (Chapter 4, Sub-section 4.3.1, and Chapter 5, Section 5.5, indicate that environmental criteria makes up a part of public sector contract eligibility requirements). In this way, environmental accreditation acts as a means by which companies can reduce their negative environmental impacts in order to ultimately achieve economic gain. The research data also points to further sources of economic benefit apart from the company gaining competitive advantage. These include cost savings from energy and waste reductions (Chapter 4, Sub-section 4.3.1), a positive public image, and a reduction in insurance premiums (Chapter 5, Section 5.5). In the course of achieving these gains, the company also achieves positive environmental impacts such as improved material and energy efficiencies, and increased emphasis on auditing and specification (Chapter 4, Sub-section 4.3.2).

A clear virtuous cycle element can be detected with regard to accreditation's benefits in the sense that while high environmental performance is required for a company to obtain accreditation, the accreditation process can in turn improve the company's economic performance. Beyond this economic-environmental link, it could be argued that there is an environmental-environmental interplay

as well. This is because the process of gaining accreditation, and the subsequent need to maintain the certification, could dispose companies towards being environmentally alert on a continuous basis, thus improving the company's future environmental performance.

However, there is a need for caution against over-optimism about the relevance of environmental accreditation to companies. The process of becoming eligible for accreditation requires a lot of attention to be paid towards a company's environmental performance, and the consequences of/barriers to this include an increase in staff training requirements, increased capital expenditure, and frequent audits (Chapter 4, Section 4.3). A challenging business climate also reduces the priority given to environmental standards in SMEs. One of the interviewees, A1, stated that '*our clients aren't going to pay us extra money because we are a zero-carbon business*', and that, '*We have to strike the balance of being far enough ahead of the curve to be seen as an organization that's leading on this* (environmental standards), *but not so far ahead of the curve that we are in the wrong place …at the end of the day it's about being a profitable business. And whilst we have all these values, there's no point in having them if we're not a profitable business*'. Hilary's (2004) work titled 'Environmental Management Systems and the Smaller Enterprise' provides further insight on advantages, disadvantages and barriers associated with SMEs' adoption of high environmental certification standards.

6.2.5 Energy efficiency:

Companies' internal focus on energy efficiency is a notable environmental practice as it helps companies to reduce the energy and carbon emissions impacts of their activities. The reduction in energy usage also translates to a drop in companies' energy bills (Chapter 4, Sub-section 4.3.1), which lowers recurrent expenditure. In this manner, energy efficiency doubles as both an economic and an environmental measure. However, the economic case for energy efficiency may not in itself guarantee that SMEs will pay more attention to the practice. The research findings indicate that limited priority is attached to energy efficiency and other sustainability-related practices, due to company's perceptions of sustainability as a secondary concern (Chapter 4, Sub-section 4.3.1). This situation can be altered if companies stop viewing energy efficiency as a symbolic gesture that is useful only as a public relations demonstration of their 'concern' for the environment, or a means of showing compliance with environmental regulation. Rather, they should view energy efficiency as a part of their core economic strategy.

6.2.6 Waste reduction and recovery:

Apart from lowering companies' negative environmental impacts, waste conversion and reduction reduce materials consumption, landfill tax payments, and the quantity of waste equipment (such as skips) that a company requires, thus benefitting the company financially (Chapter 4, Sub-section 4.3.1). Just like energy efficiency, waste reduction and recovery have the potential to fulfil both an

environmental and an economic role in companies if included as part of a capacity development strategy. However, like energy efficiency, sustainable waste management was found during the research to have limited priority attached to it as a significant economic contributor to companies' operations (Chapter 4, Sub-section 4.3.1). There is consequently a need for SMEs to integrate waste conservation and recovery better into their core financial planning, rather than regarding it as a tokenistic public relations or compliance exercise that has little bearing on their economic focus.

6.2.7 Customer inclusion:

The involvement of potential users of sustainable energy services in the preparations for the UK Green Deal programme was interpreted within this research as an environmental business value (Chapter 5, Sub-section 5.3.5). This is due to the role it can play in minimising social problems associated with the installation of sustainable energy products in buildings. The research findings indicate that companies conduct community engagement and include building users in the capacity development process with the economic aim of promoting their services and increasing the number of potential customers (Chapter 5, Section 5.5). However, this local outreach is also useful for raising awareness about how building occupants can exhibit proper energy behaviour that would ensure that installed sustainable energy products fully deliver their intended social and environmental benefits.

Consequently, the inclusion of customers in the capacity development process can be regarded as having economic, environmental, and social significance. Companies can use it as a means of expanding their market reach, while at the same time it could serve as a means of gaining feedback about how to alleviate social issues concerned with companies' operations. It could also serve as a medium by which companies can educate people about environmentally sustainable practices in order to ensure that adverse environmental impacts are minimised along a company's entire supply chain, rather than solely within the company. As Isaksson et al. (2010) put it, environmental harm is created in supply chains and company business ethics should therefore be extended from the company to the entire chain, from the first supplier to the last customer.

6.2.8 The maintenance of high quality standards:

One of the findings from this research is that the application of environmental business practices limits opportunities for trade-offs between product and service quality on the one hand and business costs on the other (Chapter 4, Sub-section 4.3.1). In other words, a company's commitment to environmental business practices restricts its ability and intention to sacrifice quality in favour of cost. However there was little indication from the research results that companies particularly regard quality in a socio-environmental sense. Instead, companies appear to treat it mainly as a means of enhancing corporate reputation and market competitiveness, meeting clients' warranty expectations, and complying with regulatory requirements (Chapter 5, Section 5.5). This suggests that in practice, companies may be more

inclined to value quality in terms of its economic and regulatory contributions to business success, rather than its environmental contributions. Despite this situation, focus on product and service quality serves to enhance the technical performance of a sustainable energy product upon its installation in buildings, and high technical performance in turn ensures that the installed products have a greater chance of fulfilling their social and environmental potential in buildings. In this regard, the maintenance of high quality standards has economic, social and environmental relevance.

However, just as in 6.2.3, this multiple relevance of quality is applicable mainly to companies that provide environmental goods and services. For companies that fall outside this category, high quality standards may hold only economic and regulatory value. Another issue worth mentioning is that the economic potential of high quality standards may be lower for sustainable energy service companies that function as environmental businesses than for other types of commercial organisations, if a previous study done by Rust et al. (1995) is taken into account. Rust et al. (1995) mention that financial gains from quality improvements are more prevalent in the manufacturing and standardised services sectors. This research identifies product integration as an environmental business value (Chapter 5, Sub-section 5.3.2), and the implementation of this value relies more on customisation, which is more cost-intensive than a standardised approach. It follows that the added cost detracts from any financial gain provided by an adherence to high standards of product and service quality.

6.2.9 Skills and work experience provision:

The socially responsible practice of jobs preservation was referred to by research respondents. The interviewee K1, for instance, mentions: '*One of the things we ask about, as I mentioned, was about jobs and training opportunities for so-called sort of disadvantaged members of the community'*. The research also provided further information about how companies seek to utilise this practice. Work experience provision was found to be exhibited by companies through apprenticeship programs (Chapter 5, Section 5.5) and the training of socially-disadvantaged members of society (Chapter 4, Sub-section 4.2.2). Whilst having a social benefit, this practice also provides companies with a steady and relatively low-cost source of labour, thus benefiting companies economically. Skills and work experience provision can thus be regarded as being both socially and economically viable.

However, challenges associated with skills and work experience provision should also be taken into account. The practice requires SMEs to invest in training the beneficiaries, which puts pressure on companies' financial, knowledge and labour capacity. For instance, the use of Green Deal preparation activities as a platform to provide the Not in Education, Employment or Training (NEET) segment of society with work skills requires significant economic and training commitment on the part of companies (Chapter 5, Section 5.4). Collaboration, which has been mentioned in 6.2.1, could play a role in lessening this burden for SMEs, in the sense that companies would be able to leverage the resources and infrastructure of other organisations in order to achieve greater cost-effectiveness

alongside social responsibility. For instance, Porter and Kramer (2002) suggest that the in-house provision of training by companies may be a relatively expensive way of strengthening a local base of advanced skills, and that financial contributions by a company to a training or educational provider could be a more veritable example of cost-effective 'strategic philanthropy'. SMEs could refrain from maintaining independent skills and work experience programmes, and instead tap into wider networks involving the participation of other groups such as government bodies, further/higher education institutions, and training and funding providers. This approach would lessen the strain on SMEs' resources, enable SMEs to take advantage of the better expertise of organisations that are more capable of organising skills provision programmes, and position SMEs to influence the development of skills standards at a local and/or national level.

A pragmatic and coordinated approach to skills and work experience provision in this manner could thus have the net effect of enabling SMEs to take advantage of the economic benefits of providing skills and work experience opportunities to society, whilst reducing the direct risks, costs and responsibilities associated with skills provision efforts. In the case of sustainable energy service companies in particular, if the companies adopt the environmental business value of reorienting skills away from traditional building practices, and towards the achievement of optimum environmental performance of sustainable energy products, then the environmental potential of skills provision programmes becomes enhanced. In this manner, skills provision can function as an environmental measure in addition to its economic and social roles.

6.2.10 Personal-style communication:

The term 'personal-style communication' or 'personal-style interaction' is used in this thesis to describe business relationships that go beyond the formal specification and execution of contractual agreements to focus on achieving a more personal feel. Companies investigated in the scenario planning cases were found to favour a not-too-formal mode of interaction with clients, supply chain partners, and potential customers. This enables the companies to arrange flexible payment terms; reverse orders for materials at short notice; increase clients' tolerance for setbacks in work completion, and foster a more even relationship with clients rather than a formal one in which the client dominates (Chapter 5, Sub-section 5.2.1). These benefits are largely of economic relevance. Personal-style communication also complements the practice of collaboration, which has been introduced in 6.2.1, by virtue of its potential to strengthen business relationships. Ulaga's (2003) work supports this position.

6.2.11 Flexible capacity utilisation and service delivery:

Both literature (Chapter 2, Sub-section 2.2.3) and the primary research (Chapter 4, Sub-section 4.2.3) point to the high degree of uncertainty that characterises the UK sustainable energy services market. This creates problems for accurate capacity planning and market evaluation, which could have

significant financial repercussions. A weak financial performance could in turn serve as a disincentive for companies to operate within an environmental business context rather than a strictly economic one.

In order to mitigate this situation, a number of practices by companies which participated in the research can readily serve as a means of implementing a flexible usage of capacity. This is in order for capacity not to severely exceed or trail behind demand, and for capacity investment decisions to focus on maintaining the least possible amount of capacity, increasing this as demand improves. Companies could operate on a contract-to-contract basis, rather than as a continuous business, and they could implement this by using the Just-In-Time method and by relying on multiple rather than single partnership options (Chapter 5, Sub-section 5.2.6). The former method reduces inventory, cuts down incidents of non-productive capacity, and reduces waste, which, as has been mentioned in 6.2.6 above, translates into economic and environmental benefits. The maintenance of multiple partnerships would ensure that companies have sufficient supply chain capacity to draw upon if demand abruptly increases, and that backup partners are available in case existing ones suddenly become unable to continue supporting the company to complete on-going work (Chapter 5, Sub-section 5.2.2).

Flexible capacity utilisation is relevant to the environmental business concept due to its economic and environmental potential. The environmental business value of skills reorientation and diversification (Chapter 5, Sub-section 5.3.1) is particularly compatible with the practice of flexibility in the sense that it focuses on making companies' employees suitable for providing sustainable energy services in addition to traditional building and construction services. In this way, the same labour capacity can be utilised for a variety of different tasks, depending on the pressures attached to a specific task at a particular point in time. However, there also appears to be conflict between flexibility and the practice of jobs preservation, which has earlier been identified as another capacity development element crucial to the environmental business concept. Companies were found during the research to favour engaging workers on short-term contracts, rather than on a long-term basis, in order to cope with the uncertain markets in which their companies are operating (Chapter 5, Sub-section 5.2.6). A way of reconciling the need for jobs preservation with the need to achieve flexibility of labour capacity could be for companies to rely on flexibility only in situations of high demand uncertainty and to minimise their reliance on it when demand becomes more secure.

6.2.12 Supply chain localisation:

SHAP participants endorsed the localisation of the supply chain for the production of sustainable energy goods and services. A 24/05/2012 field note excerpt reads: '*Members recommended … the encouragement of UK manufacturing, either of new products or under licence'*. Another reads: '*Members identified … the ability and/or need for the UK to aspire towards a local manufacturing base and supply chain for sustainable building products'*. Supply chain localisation was interpreted to be an environmental business value (Chapter 5, Sub-section 5.3.3). It has the social benefit of fostering greater

accountability for job creation at the community level. It also allows for closer environmental monitoring of companies' operations, and it reduces the distance across which materials and labour can be transported, which in turn lowers the carbon footprint of fossil-fuel transport. In this manner, supply chain localisation can play social and environmental roles within the context of an environmental business.

The application of supply chain localisation is not without practical constraints, however. Within the collected primary data, there is no evidence that significant economic benefits would accrue to a company if it practices localisation. The implementation of the practice could restrict economic opportunities that lie outside a company's local base, and a conflict is set up between localisation and globalisation (Chapter 4, Sections 4.3.1 and 4.3.5). Accordingly, P1 wonders: '*The thing I always struggle with, though I promote this (localisation), is thinking about the global economy, because it is a global economy now. So if we start doing all this stuff (production of goods and services) here, what does it mean for, you know, other parts of the world who* (sic) *may have previously been in that supply chain*?' Future studies could focus more on how to resolve the barriers to supply chain localisation rather than simply promoting its benefits.

6.2.13 Selection of business partners with a similar ethos:

The analysis of the research data indicates that environmental businesses would need to work with like-minded partners in order to achieve genuine environmental and social impacts. Relevant interview quotes include:

'*I think the fact is that if you're a sustainable company and your core values are sustainable, then you'll use other sustainable companies … Our clients generally have common values to us. We haven't really worked with anybody that's just after a money-making scheme really*' (H1).

'*We want contractors, supply chain contractors and suppliers, to have the same ethos as ourselves in terms of what we're trying to achieve*' (J1)

Likewise, relevant scenario planning excerpts include:

'*I've been looking at organisations that comes in and works* (sic) *under us in terms of delivering the project to our ethos*' (IR2)

'We'd have to rely on a supply chain that was on parity in terms of quality and procedures, accreditations etc.' (AR2)

Based on the findings, the research derives a proposition that if companies that pay attention to the implementation of environmental business values and practices select business partners that do the same

and have similar quality and accreditation standards, then socio-environmental impacts can be better managed along the supply chain.

There is no evidence within collected data that the selection of business partners with shared standards and values improves a company's economic performance. Indeed, the findings suggest that it could actually increase a company's business costs, as the company may forego partnership with firms that are less similar to it but which offer cheaper quotes (Chapter 4, Sub-section 4.3.5). An interviewee, A1, comments: '*As a business we wouldn't procure somebody just because they were cheaper than somebody else. We have to have certain standards and values*'. The limited economic potential of this practice thus gives rise to the possibility that companies may choose not to be entirely consistent with this approach. For instance, companies may be reluctant to terminate their partnership with another firm solely on the basis of poor environmental and/or social performance, and may instead prefer to encourage partners rather than demand strict adherence to socio-environmental responsibility. To illustrate this, interviewee K1 states that if a supplier committed an environmental breach, '*we could say, 'Right, we're switching to another supplier', but I don't feel like that's the right course of action*'. Rather, the company would say: *'Alright, you know, we're your customers, not acceptable what you're doing', and, you know, 'Convince us that you'll address it'*. A1 remarks that his organisation's supply chain is structured into various tiers, and that to be in the first tier a business partner has '*to be a lot closer aligned to our values*'. However, he goes on to concede that '*it doesn't mean to say that we dismiss anybody that isn't aligned with them* (the company's values)', only that '*we'd certainly be looking for them to be making a commitment to addressing those issues*'.

The adoption of mutual standards by a company and its partners could be further constrained by situations in which the organisations do not all derive the same level of benefits and/or burdens from the shared standards. Organisations that consider environmental business values and practices to be of limited benefit could attach less priority to them than organisations that think otherwise, thus leading to an uneven implementation of the environmental business concept across the business network. Also, the degree of control a company can wield over its business network should be taken into consideration. A company's level of control would affect the extent to which it can continuously influence environmental and social behaviour in its network.

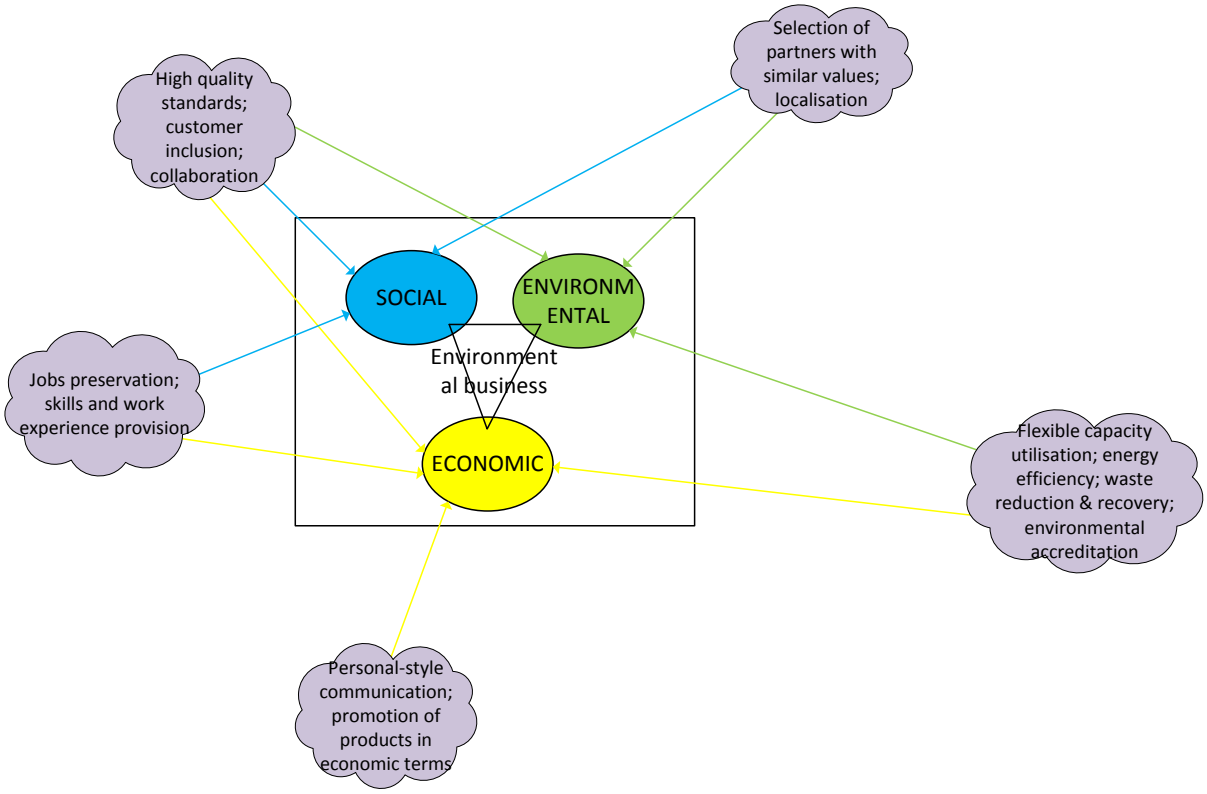


Figure 6.3: Elements of Capacity Development that Would Enable Companies to Function as Environmental Businesses

As Figure 6.3 above illustrates, the environmental business elements of capacity development can be grouped into five categories depending on which aspect of the environmental business philosophy they contribute to. Personal-style communication, and the promotion of products in economic terms, provide economic contributions. Jobs preservation, and skills and work experience provision, provide economic and social outputs. Flexible capacity utilisation and service delivery, energy efficiency, waste reduction and recovery, and environmental accreditation all contribute to the economic and environmental spheres. Selection of partners with similar values, and supply chain localisation, are relevant to the social and environmental. Customer inclusion, the maintenance of high quality standards, and collaboration contribute to all the three aspects of economic, social, and environmental.

6.3 MODELLING THE TRANSITION PROCESS

This section models how capacity development can be adjusted from a traditional to an environmental business approach. A legend for the diagrams that will be presented in the section is given in Figure 6.4 below. It is also important to note that only two of the five environmental business values identified in Section 5.3 of Chapter 5 (product integration, and skills reorientation and diversification) are referred to in this section as 'environmental business values'. Two others (supply chain localisation, and customer inclusion in capacity development) now function as 'transition' or 'environmental business elements of capacity development', based upon the previous section of this chapter. This is because

they play a more direct role than the first two values in facilitating the transition of SMEs from traditional to environmental business capacity development. The fifth value, a longer-term view of business success, is not referred to in this section, because the data analysis did not set it up to feature. Nevertheless, its status as an environmental business value should not be overlooked.

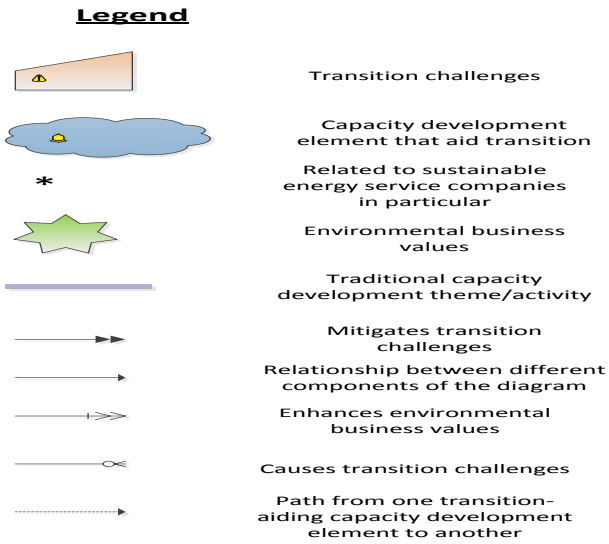


Figure 6.4: Diagram legend

As has been previously mentioned, the research data provides information about the activities (knowledge gathering, market sizing, product specification, labour specification, supply chain development, and funding arrangements) and themes (economic, market, problems and risk, control and influence, communication, collaboration, and tactics) associated with capacity development. These activities and themes are directed mainly towards the fulfilment of economic goals such as income generation and a positive corporate image. In this regard, traditional capacity development is related to the environmental business concept, which also seeks to achieve favourable economic outcomes for a commercial organisation. The main difference between the two business modes is the greater degree of attention paid by environmental business to environmental protection and social responsibility. A SME operating as an environmental business would actively develop its capacity to meet environmental and social goals and link them to its economic goals as well. A company relying on the traditional mode of capacity development would be less equipped to address environmental and social issues from the onset, fail to integrate them into its economic strategy, and respond to them only reactively, e.g. in order to comply with regulation or to make a symbolic public relations gesture.

With reference to the provision of sustainable energy services in particular, UK SMEs functioning as environmental businesses would need to pay attention to the issue of unstable market demand as part of their economic concerns. They would also need to ensure that sustainable energy products are installed and operated in buildings in such a manner that they provide optimum environmental and

social benefits (Figure 6.5). These considerations are less relevant to companies that are not involved in the sustainable energy sector of the building industry, and companies that operate in markets in which demand is more secure. Due to the research's focus on sustainable energy service companies, the model being presented in this chapter proposes a few measures that are specific to this class of companies. However, despite this, the findings of this research concerning how companies can function as environmental businesses are applicable to commercial organisations in general to a significant extent.

As has been discussed previously in Chapter 2, Section 2.2, the risk of sustainable energy products failing to achieve optimum environmental and social effects in buildings upon installation could arise due to issues such as improper product installation within buildings, and the failure of building occupants to display responsible energy behaviours and operate installed products in an effective manner. While conventional capacity development pays attention to this risk, it could be argued that this stems largely from an economic perspective. After all, the failure of sustainable energy products to reduce energy bills for building users (a positive social effect) could hold negative repercussions for companies' brand image and reduce demand for their services, thus affecting their income. The problem of poor product performance can be addressed through the environmental business values of product integration and skills reorientation and diversification (Figure 6.5). In this regard, the values provide a route through which environmental business can be introduced to traditional capacity development and its problems.

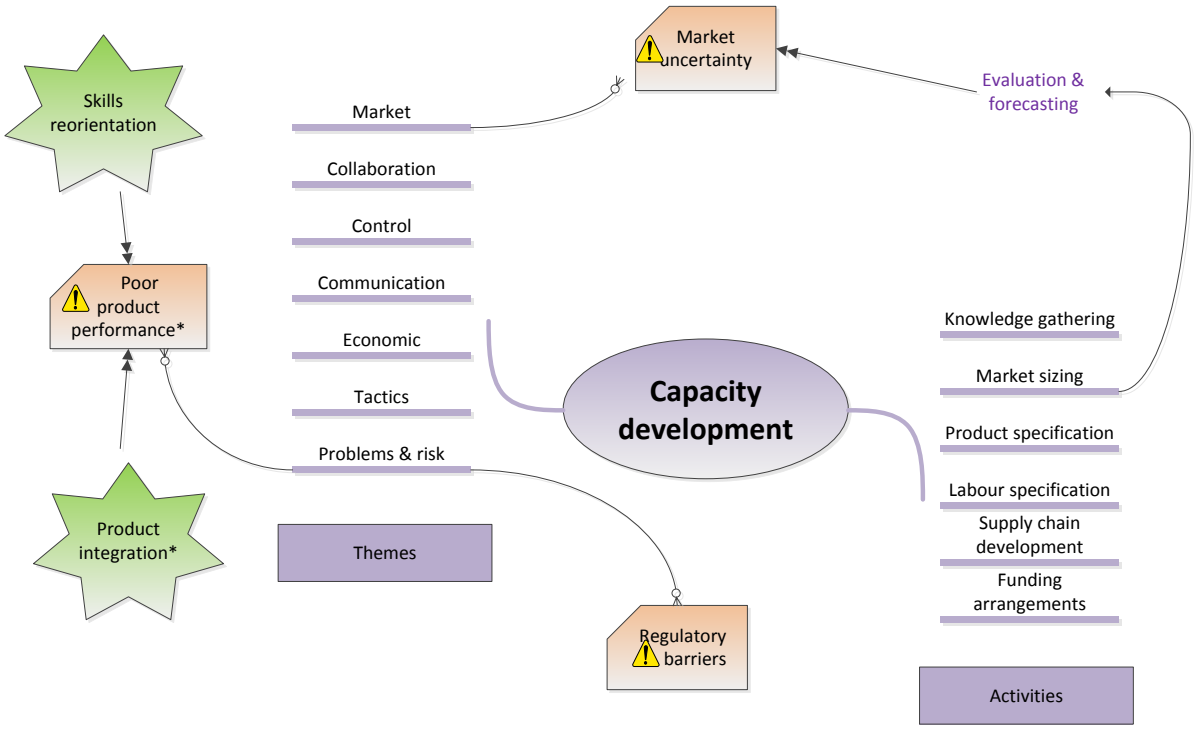


Figure 6.5: Capacity Development and Related Problems

Opening up this route further, some of the environmental business elements of capacity development which have been identified in Section 6.2 can combine with traditional elements to address the problems. The promotion of sustainable energy products and services in economic terms can contribute towards increasing customer demand, while flexible capacity utilisation and service delivery can enable companies to better cope with market uncertainty. These environmental business elements can complement the traditional practice of market evaluation and forecasting to address the market uncertainty problem, as illustrated in Figure 6.6. Likewise, collaboration of companies with policy makers in decision-making activities can alleviate regulatory barriers. The challenge of poor product performance would be further addressed by companies' commitment to a high quality of service methods and products, as the technical performance of installed products would be enhanced as a result, while the company gains economic benefits due to the enhancement of its corporate reputation. The inclusion of customers in the capacity development process is also relevant to the enhancement of product performance, as companies would be able to educate the public on the best use of sustainable energy products whilst receiving feedback that can be applied towards service improvement.

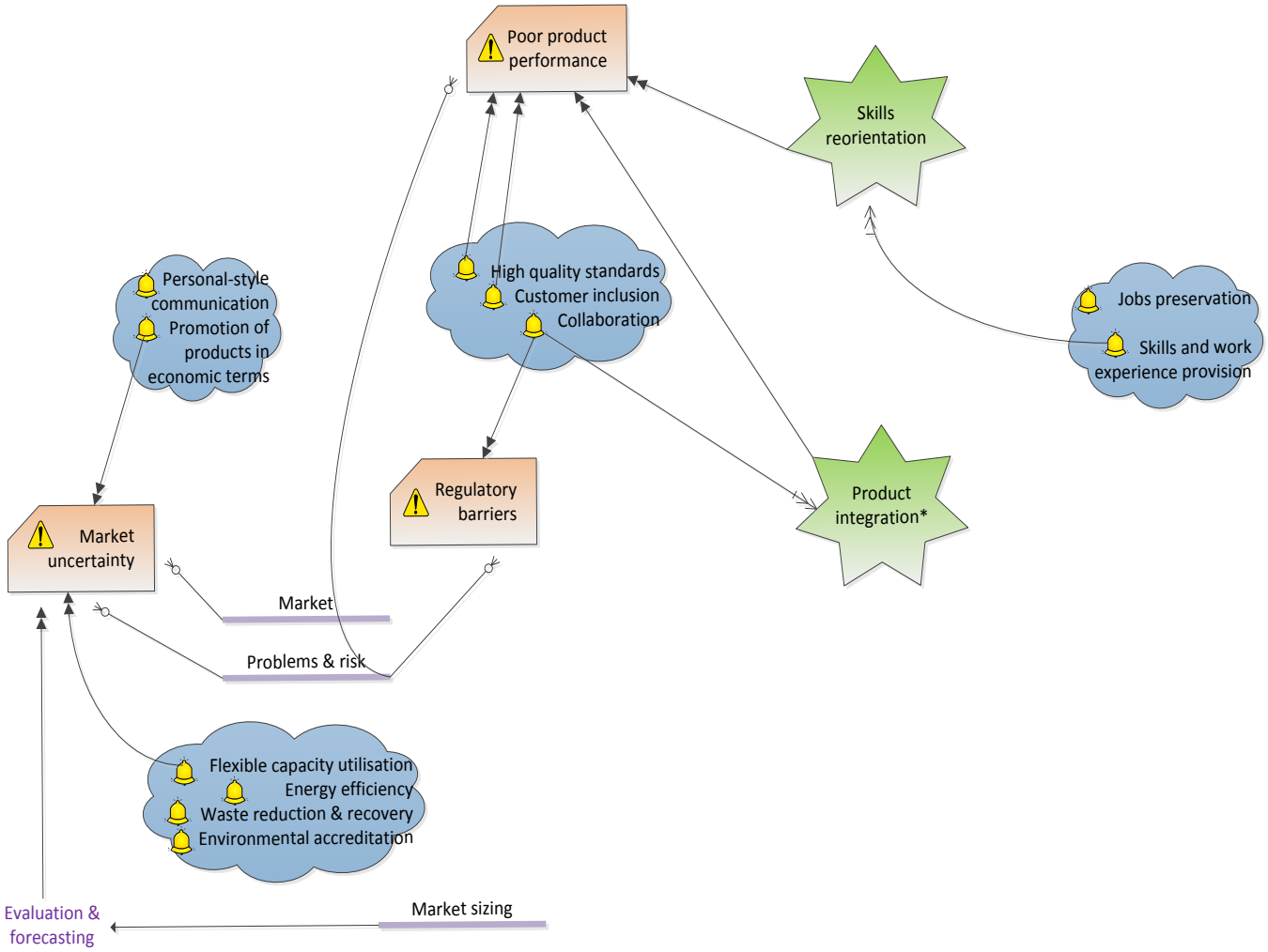


Figure 6.6: Relevance of Environmental Business Elements of Capacity Development to Traditional Problems

However, the environmental business concept introduces new problems of its own, as Figure 6.7 below illustrates. Its restriction of trade-offs between cost and quality, which has been mentioned in the previous section, can increase business costs. So also can a company's selection of business partners that share a similar socio-environmental ethos with it, as this can come at the expense of cheaper partnership options with organisations that are less concerned about the environment and society. Supply chain localisation sets up a conflict with the established business practice of globalisation, and the maintenance of high quality standards makes materials specification more intensive (Chapter 4, Sub-section 4.3.2). Other unfavourable consequences of environmental business that have been identified in this research include the restriction of economic opportunities for companies (Chapter 4, Sub-section 4.3.1), while the environmental business value of skills reorientation and diversification creates further training considerations for a SME (Chapter 5, Sub-section 5.3.1). These issues would need to be adequately covered in a capacity development plan in order for companies to transit from a traditional to an environmental business approach.

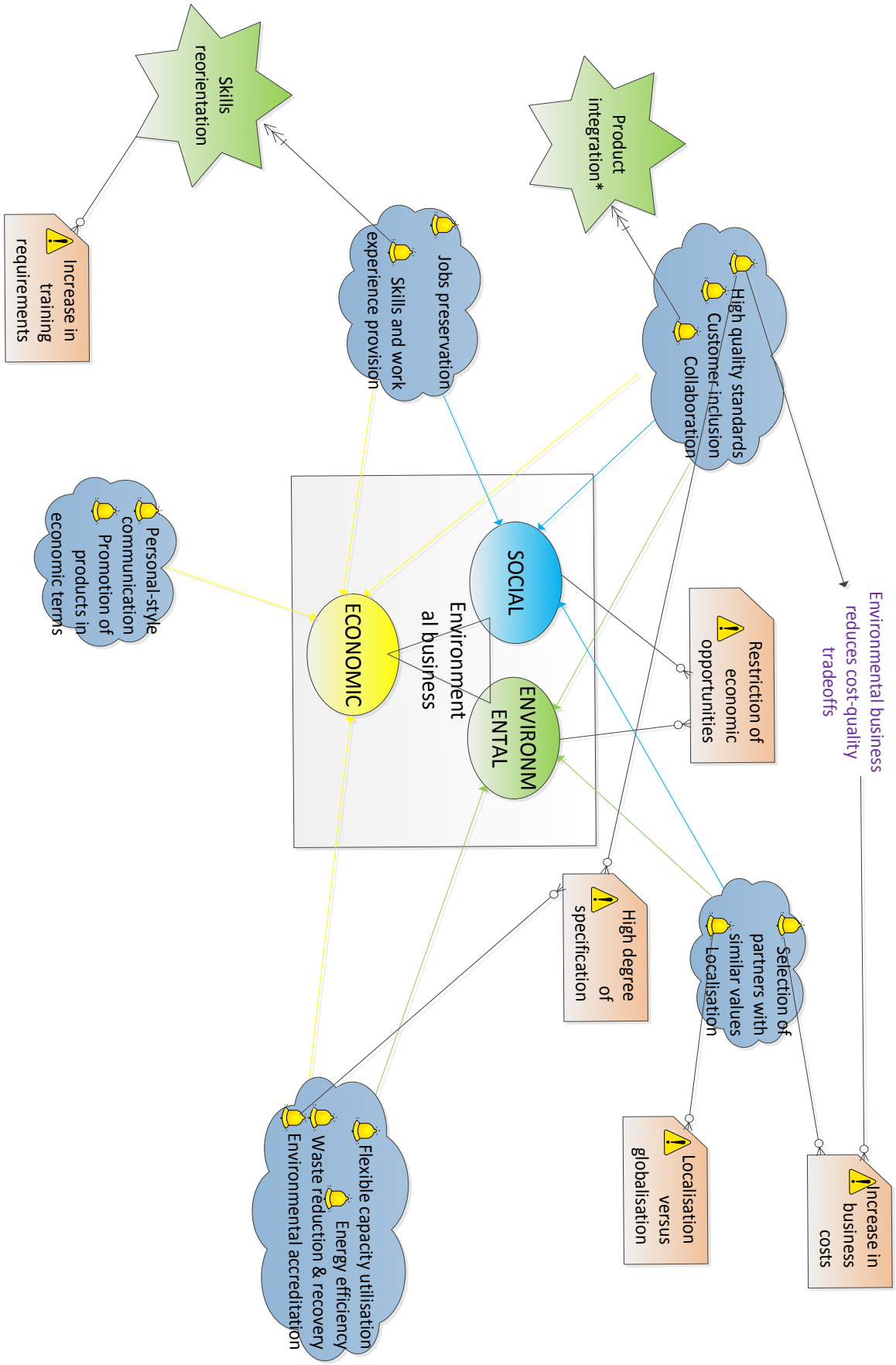


Figure 6.7: Problems Associated with Environmental Business

The issues and the ways to alleviate them can both be described as lying within the same source. For just as environmental business creates new economic problems, some environmental business elements of capacity development provide economic contributions that can alleviate these problems. These elements have been previously identified in this chapter and include flexible capacity utilisation, energy efficiency, waste reduction and recovery, collaboration, high quality standards, customer inclusion, personal-style communication, the promotion of products and services in economic terms, jobs preservation, skills and work experience provision, and environmental accreditation. In order for SMEs to transit from a traditional to an environmental business capacity development approach, it is crucial for these elements to be given a greater degree of acknowledgment in conventional economic planning. Companies should actively look to harness the potential of these elements to benefit a company's income generation and cost savings, rather than simply featuring them as a public relations gesture or to achieve regulatory compliance. Also, the conflict between localisation and globalisation can be mitigated by the application of other environmental business values and practices to the infrastructural capacity of a company and its business network. For instance, where it is not possible to fully practice localisation due to limited local supply chain capacity and resources, the use of green vehicles for materials distribution along the supply chain would serve to compensate for the extended length of the chain, as it would lead to a drop in carbon emissions. Figure 6.8 summarises these points as well as highlights the capacity development themes and activities that are most affected by the environmental business-related problems mentioned in the previous paragraph.

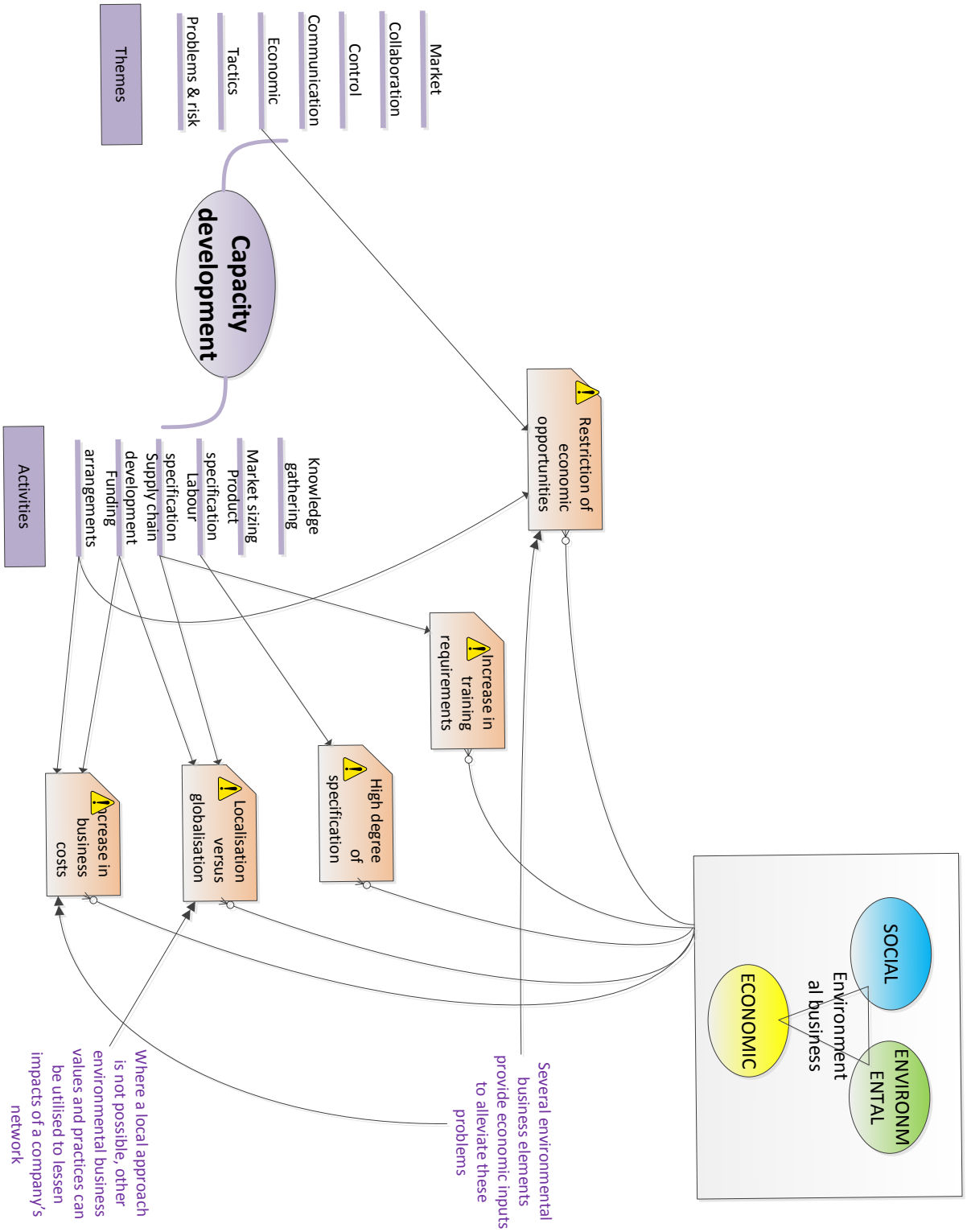


Figure 6.8: Transition Challenges and Their Links to Traditional Capacity Development

Figure 6.9 further identifies linkages between traditional and environmental business approaches to capacity development, as well as the relationships between different environmental business elements of capacity development. While providing direct economic and environmental benefits of their own, energy efficiency and waste reduction and recovery practices also serve as a prerequisite for environmental accreditation, which then further increases a company's economic potential by making it more eligible to win public sector work and improving its corporate reputation, as has been mentioned in the previous section. The promotion of sustainable energy products and services in economic terms can enhance the potential of customer inclusion to deliver economic benefits to the company. This is because it draws people's attention to the financial, health and other benefits that sustainable energy products hold for them, thus providing motivation to the public beyond merely appealing to peoples' sense of environmental responsibility. Also, collaboration enhances other environmental business elements of capacity development. It enhances the ability of SMEs to jointly control and influence the market, as it enables them to maintain a coordinated supply chain and partnership network. When collaboration is combined with skills and work experience provision, SMEs can jointly pool resources and thus deliver social benefits whilst minimising the costs of doing so. In turn, the social and environmental contributions of collaboration are enhanced when an environmental business maintains relationships with companies that share similar values, as this better enables the implementation of a coordinated environmental business approach across the entire relationship network. Personal-style communication further bolsters collaboration by increasing the flexibility and closeness of work relationships. It can also be useful for facilitating flexible capacity utilisation and service delivery which, alongside a company's absorptive capacity to learn from past experience, would be useful for tackling a situation of high demand uncertainty. The reduction in uncertainty would leave SMEs better able to make capacity investments in the areas of economic growth, environmental protection, and social responsibility. Flexible capacity utilisation and service delivery can also have a positive environmental impact due to its potential to reduce waste.

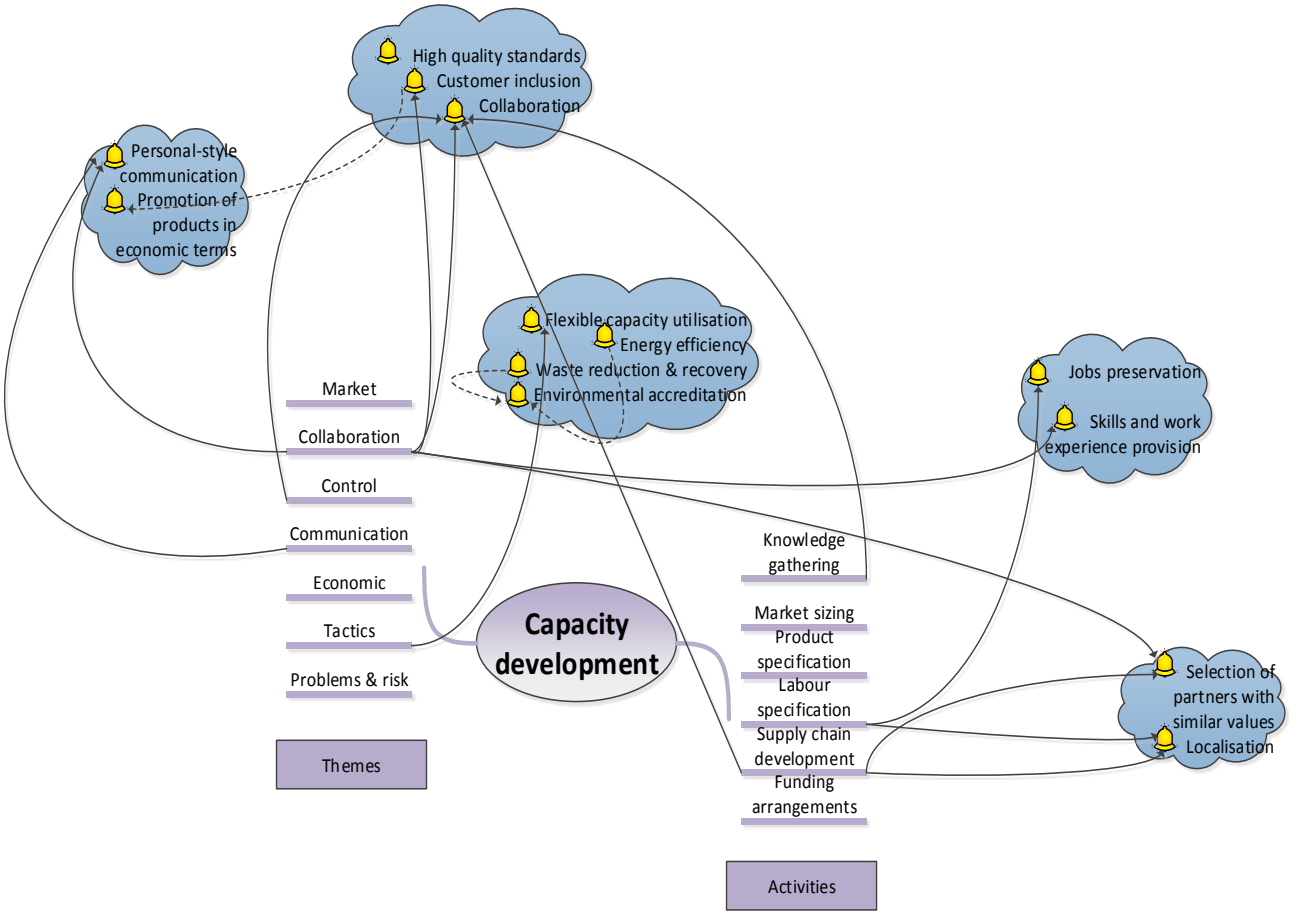


Figure 6.9: Links between Traditional and Environmental Business Elements of Capacity Development

6.4 A SYSTEMS MODEL FOR THE TRANSITION FROM TRADITIONAL TO ENVIRONMENTAL BUSINESS

The research has developed knowledge on how SMEs can make the transition towards becoming environmentally and socially successful whilst maintaining focus on good economic performance. Having identified environmental business elements of capacity development, their interactions with traditional capacity development and each other, and transition challenges, the whole transition picture can be brought together into one systems model, which is presented in Figure 6.10 below. The legend for the model, earlier shown in Figure 6.4, is presented again in Figure 6.10a. The model summarises all that has been discussed in Sections 6.2 and 6.3, acting as a representation of (1) the opportunities that the environmental business philosophy brings to traditional capacity development, (2) the challenges that environmental business brings, and (3) ways to mitigate these challenges. In view of the discussion in the previous two sections of this chapter, the model can serve as a route through which a company can migrate from conventional, economic-led capacity development towards a multi-dimensional approach. The latter, environmental business approach would make environmental protection and social responsibility more significant to a company's economic performance in a manner that is practical and beneficial.

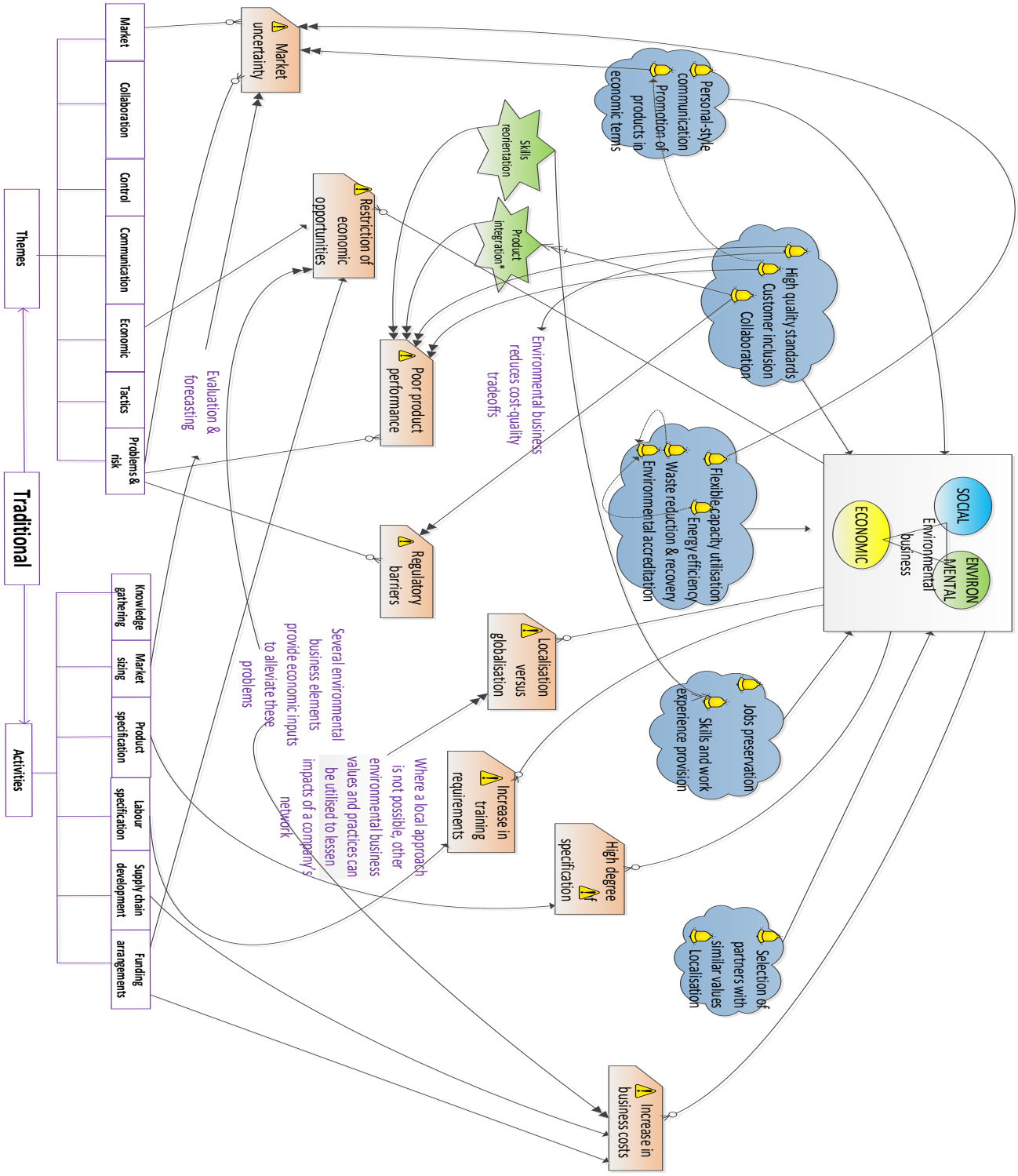


Figure 6.10: Transition of Capacity Development from a Traditional to an Environmental Business Context

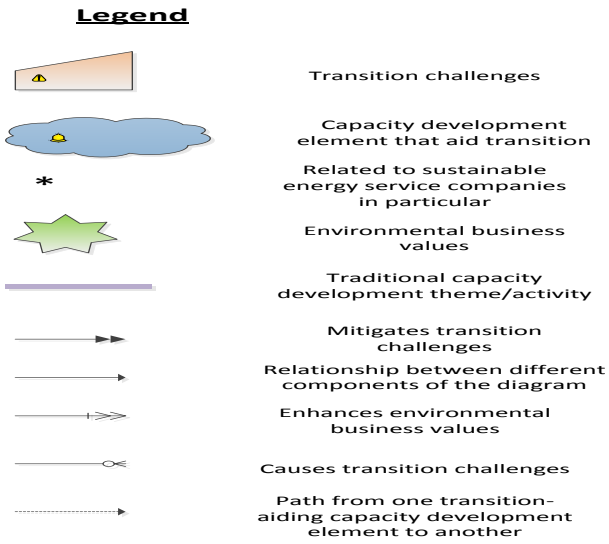


Figure 6.10a: Legend for the Systems Model

The capacity development elements looked at in Section 6.2 of this chapter can be applied to bridge gaps in the transition process to ensure that economic, environmental and social outputs are achieved, as has been discussed in that section. As the model shows, the practice of skills and work experience provision complements the environmental business value of skills reorientation, as companies could use the practice as a medium for extending socio-environmental awareness beyond its immediate workforce to beneficiaries of skills and work experience programs. On a similar note, collaboration is relevant to the environmental business value of product integration, as it can enable various companies that each produce different sustainable energy goods and services to formulate a joint approach. Indeed, collaboration is very crucial to the overall transition effort in the sense that companies can leverage the capacity of other organisations, rather than just their own, when implementing any of the transition measures. For instance, rather than simply conducting in-house provision of skills and work experience, companies can plug into wider skills development networks involving the participation of other bodies such as government agencies, further/higher education institutions, and training and funding providers.

The transition from a traditional to an environmental business mode of capacity development is not without its contradictions, though. Flexible capacity utilisation is considerably at odds with the practice of jobs preservation, as it encourages the use of short-term labour arrangements, in contrast with the longer-term outlook of the latter practice. Both practices have their role to play within an organisation; short-term arrangements are more suitable for uncertain markets in which SMEs may have to maintain much of their labour capacity for only short periods of time. Jobs preservation on the other hand delivers its benefits (e.g. increased staff loyalty, reduced staff development and recruitment costs) over an extended period of time. Both approaches can be included within the same business framework, but the degree to which a company would rely on one at the expense of the other would be subject to the capacity development situation in which the company is operating at a given point in time. In times of

uncertain or insufficient market demand, a company would utilise its labour capacity flexibly by depending more on contingent labour than on permanent labour. However, as demand becomes more stable, this practice becomes less cost-effective to implement, and so a company could become more dependent on permanent labour instead.

While the model takes account of a range of business conditions when proposing an environmental business approach to capacity development, the limitations of this to the dynamic nature of the business environment, in particular, need to be acknowledged. The economic, social, regulatory, and technical parameters that characterise the model (such as uncertain market demand; limited societal awareness about sustainable energy generation and usage; government intervention in the market via the Green Deal and ECO schemes; and the intermittency and limited efficiency of sustainable energy products) existed at the time of conducting this research and may be subject to change later. This implies that the model may not be sufficient to address new and different conditions that might emerge in the future. Consequently, the model would need to be revisited and revised to take account of future, currently unforeseen, market and regulatory developments. It should also be noted that currently, the model can only be validated based on the use of suitable and effective data collection and analysis methods during the research. Scope exists for further validation in terms of testing the model empirically within companies. This will be pursued in future work.

6.5 SUMMARY

This chapter has looked at how the capacity development process could be remodelled from a traditional economic concept to an environmental business one. The research findings highlight various elements of capacity development which SME companies traditionally perceive within a mainly economic, social, or environmental context. This chapter has focused on showing how these elements can function as environmental business enablers that link the economic, environmental and social contexts together rather than being restricted to any particular one. In this way, the research provides a representation of how companies can achieve their economic aims while preventing the creation of new negative social and environmental impacts. It is intended that such a representation of capacity development could encourage SMEs to view the process not just in the traditional economic sense, but also as a means of addressing environmental and social issues. It could encourage SMEs to regard environmental protection and social responsibility not as an additional burden, but as an already integral part of capacity development. While the research has focused mainly on service companies operating within the building sector, its outcomes can be applied to companies in other sectors as well.

The chapter proposes the following pragmatic approach, based upon the analysis of the research data, by which SME companies can operate as environmental businesses and deliver positive social and environmental outcomes alongside economic success. Flexible capacity utilisation and service delivery should be implemented through which the companies could address demand uncertainties. This strategy

should be complemented by a collaborative and local approach to business in order to share responsibility for capacity development among several parties. It should also be complemented by personal-style communication with clients and partners that share similar values with the company, in order to enable the maintenance of flexible work relationships. Companies should implement energy efficiency, waste management, job preservation, skills and work experience provision, maintenance of high quality standards, maintenance of a high level of environmental accreditation, and customer inclusion, as part of a conscious drive to enhance income generation and competitive advantage, rather than merely as symbolic goodwill gestures. Where companies are involved in the provision of environmental products (in the case of this research, sustainable energy goods and services), the products should be promoted not just in terms of their socio-environmental benefits, but also in ways that appeal to the economic and convenience-based interests of potential customers, in order to further position the products in the mainstream rather than as alternative choices.

CHAPTER 7

CONCLUSION

7.1 A REVISIT OF THE RESEARCH PROBLEM, METHODOLOGY AND OUTPUTS

This thesis has looked at how SMEs that provide sustainable energy services for UK buildings can develop their capacity in the manner of an environmental business. In this way, existing social and environmental problems associated with energy use in buildings can be sufficiently addressed while minimising the creation of new problems.

Business enterprises are a dominant form of social organisation and are significant contributors to the impacts of human socio-economic activities on the environment and society. These activities have resulted in various adverse environmental and social effects, such as climate change, energy loss, loss of habitats, land degradation, social inequalities and conflicts, and air, water, soil and noise pollution. The production of goods and services is mainly conducted by business organisations for the purpose of economic gain, and since production activities have greatly contributed to environmental and social harm, businesses are coming under increasing pressure to achieve better environmental and social performance in addition to their traditional economic functions.

Many environmental goods and services have been created to mitigate adverse environmental impacts, and businesses have been formed around these products. Companies that provide sustainable energy services for buildings fall under this category of businesses. However, the assumption that sustainable energy service companies are by default part of a sustainable solution overlooks a number of considerations. If companies provide sustainable energy services in a non-sustainable manner, then new social and environmental problems may be created as companies attempt to tackle existing ones. This situation is further compounded when sustainable energy products installed by service companies in buildings fail to achieve the intended level of technical performance, and when the products achieve only limited market penetration. The net outcome of this situation is that new environmental and social problems may be created, while existing ones associated with energy use in buildings may not be significantly reduced, thus leading to an overall intensification of environmental and social damage. It is, thus, necessary for sustainable energy service companies to operate in such a manner as to minimise or eliminate the possibility of this situation occurring. Such a preventative approach is best implemented at the capacity development stage of operations, as this stage represents the preparatory point before the eventual provision of services. However, due to resource constraints, SMEs may be unable to effectively implement capacity development in an organised manner compared to large organisations, and they may also be less inclined than larger firms to pay greater attention to environmental protection and social responsibility if they perceive that these do not provide economic benefits for them.

This research aimed to analyse how SME sustainable energy service companies can develop capacity in the manner of an environmental business. It focused on how companies can change to an

environmental business system, looking at the current operational approach of sustainable energy service companies and exploring opportunities that lie within it. The primary research was set within a pragmatist philosophy which required a delivery of usefulness as part of the research enquiry. A two-stage data collection and analysis methodology was used to conduct the primary research. The first stage consisted of both (1) participant-observation of a major housing energy-efficiency program in the West Midlands, and (2) interviewing of management-level staff of sustainable energy service companies, in order to investigate the capacity development process, and for determining the inherent social and environmental business practices that lie within companies' capacity development. It also provided an insight into the UK sustainable energy services market, which while having significant potential for growth (due to government-led initiatives such as Green Deal), is currently beset with uncertainty. However, the first stage of the primary research gave little indication of the practical extent to which sustainable energy service companies could develop capacity as environmental businesses. Thus, a second stage was conducted which involved scenario planning exercises in 5 companies, in order to determine the degree to which these companies are willing and able to operate as environmental businesses when capacity (1) leads demand, (2) lags demand, and (3) exists in approximate equilibrium with demand.

The participant-observation of the Sustainable Housing Action Partnership's (SHAP's) Green Deal Preparation programme identified major existing social and environmental problems related to mitigating energy usage within the building stock. In addition, major new problems that could arise from companies' efforts to meet the additional market demand, that was projected to be created by Green Deal, were identified. These potential new problems are the additional emissions generation, energy consumption and waste generation that would be caused by companies' conventional economic activities. They also include the disruption that the installation of sustainable energy products would cause to building occupants and existing housing structures and fittings, and an inadvertent rise in energy costs due to the limited capacity of the country's electricity grid network to absorb the additional power that would be generated by renewable energy technologies, such as solar PV, upon their installation in buildings

The SHAP programme's estimation of the size of the entire UK sustainable energy services market was identified as being limited, as it focused mainly on the procurement, distribution and installation of the products which the SHAP participants expected to lead the market, namely, insulation and window glazing. The estimate for the West Midlands market, however, was more complete and was put at around £3 billion. This figure did not take account of maintenance and monitoring services. Thus, it can be assumed that the inclusion of these additional services would further increase the value of the market. However, this huge economic potential for the sustainable energy services market was dampened by capacity development barriers which were related to economic, regulatory, stakeholder, technical and behavioural issues. These barriers include the current uncertain funding mechanism of the Green Deal,

insecurity of market demand, and high upfront investment costs (economic barriers). Market potential is also threatened by policy inconsistencies, time uncertainties associated with Green Deal, the complexity of the current stakeholder networks, supply chain unreliability, the vulnerability of smaller companies to being crowded out, and limited skills for the maintenance of installed products. In addition, other major barriers include the difficulty of integration of modern products into existing buildings, and inadequate public awareness about sustainable energy products and responsible energy behaviour.

In this way, the SHAP study explored the 'environmental business values' inherent in companies that provide sustainable energy services for buildings, as it revealed how companies wished to act in the business world. These values are: a reorientation and diversification of skills away from more traditional work approaches in the building sector; the integration of different products (rather than simply the effectiveness of any single product in itself); supply chain localisation; the adoption of a longer-term view of business success; and the effective inclusion of building users in the capacity development process.

The interviews of managers within these companies provided information about the opportunities for, and barriers to, environmental and social business practices associated with the development of their business capacity. The interview respondents perceived socio-environmental responsibility to hold both benefits and detriments for their company. Benefits included the reduction of business costs due to energy savings and reduced waste, and an enhancement of the prospect of winning public sector work. Socio-environmental responsibility was also perceived by interviewees to foster a preference for collaboration rather than competition. Detriments include an increase in the need for skills training of staff; conflict between localism and globalisation, particularly about local supply chain development and lower-cost international suppliers; and the rejection of cheaper partnership options in favour of more expensive ones with organisations that share similar socio-environmental principles. Environmental business development requires a higher level of initial investment, a restriction of options about what equipment and infrastructure can be used, and a higher specification of products.

The insight provided by the first research stage into the practice of companies was used to explore how companies could change to support more environmental business operations. It was used to create 3 scenarios, which were used in scenario planning exercises involving five companies. The results from the exercises showed that the companies demonstrated a significant degree of awareness about, and application of, environmental business values and practices. However, the main motives behind this behaviour were economic growth and benefit. The companies were found to be generally less receptive to environmental business values and practices where these were not perceived as being useful for delivering financial gain. The companies' provision of sustainable energy services was, thus, largely influenced by the high economic growth potential associated with the business, rather than any socio-

environmental driver. In effect, the companies generally regard the provision of sustainable energy services as just another business area, rather than as a special means to demonstrate long-term commitment to the reduction of energy loss, carbon emissions, and fuel poverty within the built environment.

Based upon these results and the desire for positive change in companies, the research argued for an adjustment of capacity development from the singular, economic-led process currently dominating practice and literature, to a multi-dimensional, environmental business one. To enable this, the research focuses attention on latent social and environmental functions contained within traditional capacity development, and their potential to act as a bridge between traditional and environmental business capacity development domains. In this way, it intends to pragmatically encourage companies to view capacity development less as a wholly economic process and more as a sustainability-related one. Likewise, attention needs to be drawn to the economic benefits of social and environmental business practices in order to provide an incentive for companies to implement these practices. Since this approach mainly calls for a shift in how the existing capacity development process is viewed, rather than for the design of new processes, it would serve to lower companies' resistance to change.

In order to facilitate this shift, the research presented the proposal through a systems model that represents the traditional business focus on economic success while at the same time highlighting the interconnections between economic, environmental and social issues. This acknowledges the high priority attached to economic considerations by businesses, but also ensures that wider social and environmental issues are not overlooked. Various elements of capacity development were identified in the model which, while traditionally viewed from an economic perspective by companies, also have the potential to deliver environmental and social benefits, and vice versa. The proposal holds that SMEs should utilise environmental and social practices not as symbolic gestures of goodwill to the public, but as part of an active strategy aimed at enhancing economic performance and competitive advantage. Practices compatible with this approach include energy efficiency, waste management, maintenance of high environmental accreditation standards, job preservation, skills and work experience provision, and supply chain localisation. In order to respond to the uncertain nature of the UK sustainable energy services market within the building industry, companies can complement these practices with flexible capacity utilisation and service delivery. They can share responsibility for capacity development among several supply chain parties through increasing their reliance on collaboration, and support flexible work relationships and shared values through closer communication with clients and partners. They can develop business partners that also adhere to their environmental business values and practices. The social and environmental benefits of this delivery of sustainable energy goods and services can then be promoted to potential customers in ways that appeal to their economic and other personal interests, rather than from a strictly socio-environmental standpoint. Further, engagement in shared learning with building clients and users can also be pursued during the capacity development stage of business

operations in order to further promote sustainable energy services and gain useful feedback from building users as early as possible.

7.2 A REFLECTION ON THE RESEARCH JOURNEY

At a personal level, the research has enabled the author of this thesis to develop his skills and experience in the area of social research. The author's early academic and professional backgrounds were in Chemical Engineering, and so before he commenced this research, he was only familiar with research methods and philosophies that are used within the engineering field. He had practiced laboratory experimentation and was used to statistical analysis, and he maintained a positivist approach to research problems. He began this particular research because of his interest in the issues of energy, sustainability and the environment. However, upon the commencement of the research, and under the guidance of his supervisors, he began to understand that his previous research orientation would not be very compatible with the kind of research he was now conducting. He was made to realise that a vital goal of research is to not to quickly and automatically start looking for a solution to a problem, but instead to understand the nature of the problem. He also became more aware that indeed there may not always be such a thing as an absolute or real solution to a problem, and that reality itself is merely a construct of people's subjective perceptions. He learnt that a researcher should take full account of the different meanings that people attach to a thing, rather than attempt to create his/her own meaning in isolation. Essentially, the most significant event in the author's research journey was his development from a positivist to a phenomenological mind-set. The knowledge and capabilities he gained as a result enabled him to utilise qualitative research methods effectively. In addition, the multidisciplinary nature of the research problem afforded him an opportunity to widen his knowledge in a number of different areas, including the development of processes and strategies in companies; sustainability; construction and operational issues related to buildings; building regulations and policies; interactions between technical and social factors; and how these interactions can affect the performance and market success of products. Overall, the research was not merely an academic activity but a major opportunity for the author's personal and professional development.

The manner in which data was collected and analysed during this research was mainly based on literature study concerning which philosophy and methods would be most suitable for addressing the research problem. This knowledge guided the research effort to obtain valid, reliable data and analyse these properly. However, the actual experience of doing research threw up a couple of new insights in addition to that gained from literature sources. These are highlighted in the subsequent paragraphs.

During the interviews, several occasions were noted in which the interviewees wandered outside the scope of the question being asked, despite the interviewer's best efforts to ask questions in a clear manner. Literature sources do emphasize the significant responsibility placed on the interviewer to develop an effective relationship with the interviewee which would ensure that meaningful data is

obtained. However, the literature also largely portrays the interviewing process as one in which the fostering of a good relationship between the interviewer and the interviewee, coupled with careful development of the interview questions, is wholly sufficient to ensure a concise response on the interviewee's part. Based on the experience of interviewing during this PhD research, this viewpoint, while relevant, does not always play out in actual interviews, and its non-manifestation seems to occur at a considerable frequency, not just in interviews, but in scenario planning sessions as well. It is thus recommended that future studies on qualitative research methods methodology focus more on this counterintuitive element in order to better prepare researchers to address it when it occurs.

The semi-structured nature of the interviews resulted in a situation in which the respondents, in the course of answering a particular question, sometimes gave responses to other questions as well which had not yet asked. This incident, coupled with the one described in the paragraph above, meant that the interview questions were not always applied in the exact manner in which they were prepared, but had to be readjusted to fit the direction in which each individual interview was heading. This highlights the challenge of using pre-set questions outside of a structured interview format. However, care was taken to ensure that all intended areas of inquiry were ultimately addressed by the respondents.

Based on knowledge gained from literature about possible data capturing and storage options (see section 4.5.1), an audio recorder was used to capture and store data during the interviews and scenario planning sessions, due to its ease and speed of capturing coupled with its relatively unobtrusive nature. However, as previously mentioned in section 4.5.3, the scenario planning sessions featured company management teams rather than individual respondents, and three Managers/Directors took part in each session. As a result, during the coding of data it was sometimes challenging to distinguish one participant from another. In this regard, the use of video recorders for scenario planning sessions appears a more advantageous option, as it combines ease and speed of data capturing with a distinction of respondents from each other. However, due to the obtrusive nature of video recorders, there is a risk of the respondents' behaviour being altered (Pope et al., 2006; Mulhall, 2003). As a result, the benefits of video recording may be fully utilised only if the participants in the scenario planning sessions are comfortable with being recorded in this manner, or indeed if they are unaware that they are being recorded (as in the case of covert research).

7.3 REFLECTIONS ON RESEARCH ACHIEVEMENTS

The research problem of SMEs developing capacity in the manner of an environmental business was addressed through a focus on five objectives (Chapter 1, Section 1.2). The extent to which these objectives were achieved is discussed below.

Objective 1: To critically review theory concerning capacity development and the environmental business concept

The research presented literature on the environmental and social limitations of conventional business and economic systems, and provided insight into the main descriptions of environmental businesses. This literature revealed the variables of capacity development situations, and the business requirements for capacity to be developed. However, this literature showed different perspectives on capacity development and this required a selection of issues useful for the fulfilment of the research aim. This revealed the multidisciplinary nature of the research, which did not allow an analysis of complete literature domains, thus leaving potential gaps. The various sub-concepts of the research, which include environmental business, capacity development, SMEs, sustainable energy goods and services, and the built environment, had not been linked together in the literature, and so it was difficult to validate connections between capacity development and environmental business concepts. The final presentation was limited to explaining the problems identified within the practice study as supported by the pragmatist philosophical stance.

Objective 2: Investigate the capacity development process in SME companies that provide sustainable energy services for buildings

In order to achieve this objective, the research provided insight into capacity development activities and barriers of companies eager to exploit opportunities in the sustainable energy service field. This provided data from which environmental business values could be interpreted, but it was limited by the situation of the think-tank nature of the SHAP organisation and so did not provide a complete picture of the practical realities of capacity development in SMEs. Also, the SHAP Green Deal Preparation Programme focused mainly on residential buildings as opposed to other building types such as office and industrial buildings. Residential buildings are responsible for most of the energy consumption within the built environment (Brown & Vergragt, 2008; Von Paumgartten, 2003). However, it is possible that the focus on this category of buildings would overlook capacity development issues that are particularly relevant to the non-residential building sector.

Objective 3: Determine the implications of operating as an environmental business for companies' capacity

Through interviews with senior managers in SMEs, information was gained on the benefits and barriers that companies could gain by implementing environmental business practices. This has significant practical relevance. However, little insight was determined into how far the benefits and disadvantages would actually influence companies' decision to operate, or not to operate, as an environmental business. This requires further work.

Objective 4: Determine the extent to which companies are prepared to adhere to environmental business values and practices in different capacity development situations

Information was gained through scenario planning exercises on the practical extent to which SME companies would operate as environmental businesses in the face of changing market demand. The exercises themselves were limited and the number of companies involved was not comprehensive; however, pragmatically this revealed for the first time the latent opportunity that exist within the current practice of such businesses to support a different capacity development process.

Objective 5: Develop a model of how capacity development can be adjusted from a traditionally economic perspective to an environmental business one

A systems model (Figure 6.10) was created which this research argues can assist businesses in their understanding and operationalise the environmental business philosophy, and with which they can conduct capacity development in uncertain markets. Although complex and limited in application, this model introduces a visualisation of the possibilities of change as well as a route to positive environmental decision making.

The research achieves its aim of presenting how SME companies, that provide sustainable energy service companies for buildings, can carry out capacity development whilst maintaining the values and practices of an environmental business. In this, it makes a number of contributions to existing knowledge. Firstly, it shows that SME's, even sustainable energy service companies, develop capacity within a conventional economic model which limits their environmental business potential. Nevertheless, it reveals that these businesses do have latent environmental business capabilities which can work positively for economic, social and economic deliverables. Thus, business decision-making, which is currently dominated by economic models, can be influenced by exposure to the wider implications of their outcomes and benefits of operating through environmental-business values and practices. Businesses can become more encouraged to operate as environmental businesses if they can perceive that environmental business values and practices which can be used to overcome business barriers formed by the conventional economic model. Finally, the systems model that was created and summarised in figure 6.10, is a significant development in the field both for practical change and for theoretical representation. This integrates the different environmental business elements of capacity development into one single framework. By exploring each of them within a single business approach rather than in isolation, the research provides a more comprehensive and pragmatic picture of how they can be implemented. The research indicates that the transition from a traditional to an environmental business form of capacity development does not so much require wholesale change as much as a modification of how capacity development is conventionally viewed by companies.

The outputs of this research provide an understanding of how UK sustainable energy service SMEs could operate more as environmental businesses. In so doing, they could avoid the creation of new environmental and social problems while addressing existing ones, ensure high levels of technical performance of installed sustainable energy products in buildings, and respond to market uncertainties.

While this research looks at how companies can contribute towards environmental protection and social responsibility, it recognises that it exaggerates the role of companies over that of government. The responses of the research participants suggest that the sustainable energy sector of the building industry is currently very reliant on governmental intervention for its growth. Without the involvement of government in influencing market demand and supporting the cost of doing business, sustainable energy service SMEs would be hard-pressed to devote resources to social and environmental performance concerns beyond just survival. Previous research (e.g. Sovacool, 2009; Brower, 1990) has repeatedly called for government to influence, via regulatory tools, an increase in the extent to which the fossil energy industry internalises negative social and environmental externalities linked to the production and use of fossil energy. In this way, a more level playing field can be created for both fossil and sustainable energy products. The ability of sustainable energy service companies to operate as environmental businesses in the building sector is also very reliant on sustainability developments in other sectors such as transportation and manufacturing, as the distribution and installation of renewable energy technologies, insulation, window glazing, and other sustainable energy products are reliant on these other industries. Likewise, sustainable energy cannot be considered in isolation to other areas of sustainability in buildings, such as water conservation, waste management, and habitat preservation. The outputs of this research need to be utilised in conjunction with the findings of studies conducted on these other areas and industries.

Despite the achievements that have been identified, the research outputs are affected by a number of limitations. While the empirical research attempts to look at companies that procure, distribute, install, and maintain a wide variety of sustainable energy products in buildings, it does not always succeed in uniformly covering all the goods and services that fall under the sustainable energy category. For instance, companies that specialise in insulation featured more frequently in the primary research than, for example, companies that specialise in micro wind turbines. The main reason for this development is that some companies were more accessible than others during the research period. While sustainable energy service companies share many similar business challenges regardless of the respective products they deal in, it is possible that the broad approach taken by this research may have overlooked some issues that are more specific to some goods and services than others.

It should also be restated that the research was conducted mainly within the West Midlands county of UK, and that this should be taken into account when attempting to generalise the research findings to the whole of UK and beyond. The West Midlands does serve as a microcosm of the UK building stock

to a significant extent. It constitutes almost 10% of UK households, hosts the UK's second largest base of economic activity, and is a leading region in the implementation of sustainable energy measures in new and existing buildings (Laughlin et al., 2012; AWM, 2009). However, it may not necessarily reflect the unique challenges being encountered by sustainable energy service SMEs in other parts of the UK and in other countries.

7.3 FUTURE WORK

While this research has focused particularly on sustainable energy service SMEs, the research outputs need to be extended to other classes of business, regardless of their respective fields. The promotion of socio-environmental benefits to consumers, customers and clients needs to be extended beyond sustainable energy service companies. The nature of flexible capacity utilisation and service delivery in uncertain markets is appropriate to all sectors, but each must be addressed individually to establish generic features.

Environmental protection, social accountability, and quality management systems are vital to every company's operation as an environmental business. However, as has been covered in this research, these systems do not always guarantee a rise in customer purchases or a major improvement in a company's economic performance. Thus, it is important that scholars continue to seek out ways by which the interdependency of environmental, social, and economic success factors can be revealed and the benefits increased in business decision making. In this respect, this qualitative research could benefit from a quantitative study that attempts to evaluate the financial performance of companies that make the transition from a traditional to an environmental business approach to capacity development. Such a study would provide specific statistical information about the contributions of environmental protection and social accountability to a company's economic success.

In the light of new social value legislation, future research could focus on the wider benefits of job preservation and creation, which were identified as relevant to the transition to environmental business situations in Chapter 6. Flexible capacity utilisation and service quality delivery were also identified as significant positive elements for the development of companies. However, the systemic effects of the social problems resulting from flexible capacity utilisation in companies, through for instance offering employees only short-term contracts, could run contrary to the principle of sustainable social development. Thus, all future studies must address the wider system problems that transition poses to a sustainable environmental, social and economic situation.

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APPENDICES

A1 DATA TABLES AND SAMPLES

The primary research data was recorded in the form of field notes for the participant observation data, and audio transcriptions for the interviews and scenario planning exercises. Tables of these different sets of data are presented in this section, as well as a sample of each one.

A1.1 Field Notes

All field notes include the date of the SHAP meeting being reported. SHAP participants were divided into 4 'Task-and-Finish' groups throughout the programme, and so the field notes referred to the group/groups that was/were in attendance on the date of the meeting being reported. Where a particular member or members made an important contribution to the meeting (e.g. through a statement), the person/persons was/were referred to in the field note using his/her/their initials. Table A1 below gives details of the field notes, with the field note sample highlighted. Group 3 was observed most of the time because its responsibilities were most closely related to the issue of capacity development.

No.	Date of meeting	Task-and-Finish Group
1	28/02/2012	2
2	02/03/2012	1
3	05/03/2012	3
4	07/03/2012	3
5	22/03/2012	3
6	27/03/2012	3
7	12/04/2012	2 & 3
8	13/04/2012	3
9	17/04/2012	3
10	20/04/2012	3
11	23/04/2012	3
12	25/04/2012	3
13	26/04/2012	3
14	30/04/2012	1, 2, 3 & 4
15	22/05/2012	3
16	24/05/2012	1, 2, 3 & 4
17	25/05/2012	3
18	26/06/2012	3
19	27/06/2012	3

20	**28/06/2012**	**3**
21	02/07/2012	3
22	03/07/2012	1 & 2
23	04/07/2012	3

Table A1: Table of Field Notes

Field note number 20 highlighted in the Table above is presented below.

26/06/2012

SHAP Task-and-Finish Group 3

Specific participants identified: PD and TO

PD and TO relied on the DECC Final Stage Impact Assessment to estimate the future uptake of insulation and heating measures in the UK.

PD and TO projected the new uptake of solid wall insulation in UK houses that will occur by 2022, excluding installations that will be done under the Affordable Warmth programme. 6.9 million properties were found to require solid wall insulation, of which almost 4.5 million have pre-1966 9-inch solid brick walls, while about 2.4 million have other types of solid walls. Of the total number of 6.9 million properties, 955902 properties (13.85%) were projected to take up solid wall insulation by 2022. 253629 properties in the Carbon Saving Communities Group will take up solid wall insulation under the ECO programme. 702273 properties that are not in the Carbon Saving Communities Group will take up solid wall insulation under the ECO programme. The total take-up of solid wall insulation in 2013 was projected to be 75000-110000. The total take-up of solid wall insulation in 2014 was projected to be 105000-155000. The total take-up of solid wall insulation in 2015 was projected to be 190000-229000.

PD and TO projected the new uptake of solid wall insulation in UK houses that will occur by 2022 under the Affordable Warmth programme. 1143 properties were projected to take up solid wall insulation.

PD and TO projected the overall new uptake of solid wall insulation in UK houses that will occur by 2022. 957,046 properties were projected to take up solid wall insulation. Of this number, 732,932 will take up internal solid wall insulation while 224,114 will take up external solid wall insulation.

PD and TO projected the new uptake of cavity wall insulation in UK houses that will occur by 2022, excluding installations that will be done under the Affordable Warmth programme. About 5.78 million properties were found to require cavity wall insulation, of which about 2.6 million were classed as ‘Easy-to-treat’ while almost 3.2 million were classed as ‘Hard-to-treat’. Of the total number of 5.78

million properties, 2,517,099 properties (43.56%) were projected to take up cavity wall insulation by 2022. 640,941 properties in the Carbon Saving Communities Group will take up cavity wall insulation under the ECO programme. Almost 1.9 million properties from outside the Carbon Saving Communities Group will take up cavity wall insulation under the ECO and Green Deal programmes.

PD and TO projected the new uptake of cavity wall insulation in UK houses that will occur by 2022 under the Affordable Warmth programme. 184,704 properties were projected to take up cavity wall insulation.

PD and TO projected the overall new uptake of cavity wall insulation in UK houses that will occur by 2022. About 2.7 million properties were projected to take up cavity wall insulation. Of this number, over 1.2 million are 'easy-to-treat' properties while almost 1.5 million are 'hard-to-treat' properties.

PD and TO projected the new uptake of loft top-up insulation in UK houses that will occur by 2022 under the Affordable Warmth programme. 591,818 properties were projected to take up loft top-up insulation.

PD and TO projected the new uptake of loft top-up insulation in UK houses outside the Affordable Warmth-eligible group that will occur by 2022. 700,226 properties were projected to take up loft top-up insulation combined with either solid wall insulation or cavity wall insulation. 124,974 properties were projected to take up loft top-up insulation alone. 153,872 properties in the Carbon Saving Communities Group will take up loft top-up insulation under the ECO programme. 51,654 properties from outside the Carbon Saving Communities Group will take up loft top-up insulation under the Green Deal programme.

PD and TO projected the overall new uptake of loft top-up insulation in UK houses that will occur by 2022. Almost 5.8 million properties were found to require loft top-up insulation, of which almost 2.3 million are have filled cavity walls, about 1.61 million have unfilled cavity walls, and about 1.8 million have solid walls. Of the total number of 5.8 million properties, over 1.6 million properties were projected to take up loft top-up insulation. Of this number, 210,299 will take up loft top-up insulation along with solid wall insulation, 628,987 will take up loft top-up insulation along with cavity wall insulation, and 797,344 will take up loft top-up insulation alone.

PD and TO projected the overall new uptake of draught proofing combined with window glazing in UK houses that will occur by 2022. 222,163 properties were projected to take up draught proofing combined with window glazing.

PD and TO projected the overall new uptake of floor insulation combined with solid wall insulation in UK houses that will occur by 2022. 140,867 properties were projected to take up floor insulation combined with solid wall insulation.

PD and TO projected the new uptake of replacement gas boilers in UK houses under the Affordable Warmth programme that will occur by 2022. Approximately 90000 replacement gas boilers were projected to be installed per annum between 2013 and 2022.

PD and TO estimated the cost of installing solid wall insulation in houses based on the property type. The mean cost of installing internal solid wall insulation in a large detached house was found to be £8147, while the mean cost of installing external solid wall insulation is £13800. The mean cost of installing internal solid wall insulation in a small detached house was found to be £5556, while the mean cost of installing external solid wall insulation is £10300. The mean cost of installing internal solid wall insulation in a large semi-detached/end-of-terrace house was found to be £5806, while the mean cost of installing external solid wall insulation is £10650. The mean cost of installing internal solid wall insulation in a small semi-detached/end-of-terrace house was found to be £4688, while the mean cost of installing external solid wall insulation is £9100. The mean cost of installing internal solid wall insulation in a large mid-terraced house was found to be £4906, while the mean cost of installing external solid wall insulation is £9400. The mean cost of installing internal solid wall insulation in a small mid-terraced house was found to be £3838, while the mean cost of installing external solid wall insulation is £7950. The mean cost of installing internal solid wall insulation in a large top-floor flat was found to be £5186, while the mean cost of installing external solid wall insulation is £9800. The mean cost of installing internal solid wall insulation in a small top-floor flat was found to be £3939, while the mean cost of installing external solid wall insulation is £8100. The mean cost of installing internal solid wall insulation in a large non-top-floor flat was found to be £4510, while the mean cost of installing external solid wall insulation is £8850. The mean cost of installing internal solid wall insulation in a small non-top-floor flat was found to be £3830, while the mean cost of installing external solid wall insulation is £7950.

PD and TO estimated the cost of installing sustainable energy solutions per each measure installed in buildings. Easy-to-treat cavity wall insulation was found to be £500 per measure. Hard-to-treat cavity wall insulation was found to be £1875 per measure. 150mm-250mm loft insulation was found to be £300 per measure. Condensing gas boiler was found to be £2500 per measure. Floor insulation was found to be £400 per measure. Double-glazing was found to be £4500 per measure. Flue gas heat recovery system was found to be £400 per measure. Draft-proofing was found to be £100 per measure.

All the above data were then used to project the future uptake of insulation and heating measures in the West Midlands region in particular. SHAP Task-and-Finish Group 3 members made the assumption that the West Midlands represents 9.5% of the UK housing stock. This assumption was made on the basis of the AWM 2009 Low-carbon Housing Report.

A1.2 Interview Transcripts

The interview transcripts use the notation 'I' to refer to the author of this thesis, and the notation 'R' to refer to the interviewee. Where abbreviations or phrases that are not listed in the thesis' Glossary and Abbreviations section were used by the author or the interviewee, an explanation of these terms is provided. Within the interview text, the phrase *'name withheld'* is used to hide the identity of an individual or organisation where these parties have not given their consent for their identity to be included in the transcript. The term *'unclear'* is used whenever the author could not identify a spoken word or phrase during the transcription of the audio recording. Sometimes, the author would insert an explanatory word or phrase (in parenthesis) into the transcript in order for the reader to better understand the interview conversation, or in order to describe a non-verbal gesture (e.g. a laugh) made by the interviewee.

Table A2 provides details of the interviews, with the interview sample highlighted.

Interviewee	**Title**	**Service offered by Company**
A1	Sustainable Technologies Manager	Supply of various renewable energy technologies
B1	**Strategic Sales Director**	**Supply and installation of various renewable energy technologies**
C1	Director	Installation and maintenance of solar PV
D1	Commercial and Customer Lead	Supply and installation of various renewable energy technologies and insulation products
E1	Managing Director	Installation and maintenance of solar PV and wind turbines
E2	Director	Installation and maintenance of solar PV and wind turbines
F1	Environmental Consultant	Supply and installation of various renewable energy technologies

G1	Director of Sustainable Development	Installation of renewable energy technologies and insulation products
H1	Sustainable Design Consultant	Sustainable building design
I1	Sustainability Director	Supply of various renewable energy technologies
I2	Business Development Manager	Supply of various renewable energy technologies
J1	New Business Director	Supply of insulation products
K1	Business Development Manager	Procurement of various renewable energy technologies
L1	Managing Director	Installation and maintenance of various renewable energy technologies
M1	Director	Installation and maintenance of solar PV
M2	Director	Installation and maintenance of solar PV
N1	Chief Executive Officer	Sustainable building design
O1	Manager	Procurement of different sustainable energy products
P1	Chief Executive Officer	Supply of various renewable energy technologies
Q1	Commercial Manager	Supply and installation of various renewable technologies and insulation products

Table A2: Table of Interviews

The highlighted interview in Table A2 is presented below.

AC refers to Alternating Current

BREEAM refers to Building Research Establishment Environmental Assessment Methodology

DC refers to Direct Current

DECC refers to Department of Energy and Climate Change

LED refers to Light-Emitting Diode

I: Ok so erm, if you don't mind I will ask you some questions concerning this issue. Your responses should provide useful information. So first of all, can you give a brief introduction to yourself, your company and what it does with respect to the issue of providing sustainable energy solutions for buildings?

R: Ok, well I'm *(name withheld)* and I'm the Strategic Sales Director for a Company called *(name withheld)*, which has a number of brands. One of the well-known brands is *(name withheld)* and that's a business that funnily enough started in Sheffield and sells insulation. So we provide insulation and insulation installation services for er, commercial and non-commercial buildings in the UK and we also have an operation in Europe which is at the least the size of the UK. My job is to look at future sales strategy, therefor looking at the way the world is changing, economically, environmentally but particularly within a business context to understand whether we are facing our resources at the right opportunities and also what opportunities are likely to grow or decline over the next few years. So I have an interested also in the political climate and the economic climate in the country hence the reason I was at the conference today. I've also got, just for your information, two other hats that I can wear. I am the chairman of the *(name withheld)* external affairs committee. What that is, the construction products association represents product manufacturers and distributers in the UK supplying the construction industry. All up it's about 50 billion turnover in the UK and the *(name withheld)*'s external affairs committee is the one that promotes its policies and promotes it operation in the UK, therefore looking at Government legislation and how to help guide government. The final hat that I wear is as the chairman of the *(name withheld)*, modern built environment knowledge transfer network which is a very long title but this is the innovation group for the government. It's the innovation agency and I chair the building and environment committee, the one that looks for innovation for construction.

I: I've heard of [unclear] that's pretty impressive so far.

R: So I've got a lot of opinions, whether they're right is another matter.

I: Ok, so now, at this stage the whole emphasis on making buildings more energy efficient and to reduce the emissions associated with energy use. Now, what are the responses, when you take in to particular consideration this issue, because I mean the fact that by trying to solve the existing energy problem there is a risk of from a business perspective of over complicating this situation if not done properly, What are there any special environmental or social considerations that you have?

R: I think that one the, looking at the fundamentals, one of the problems with the focus on global climate change and response to making energy efficient is the idea that individuals and even businesses care so much about the issue that they will spend their money on it just to support the issue. I don't think that's very realistic, I think that most individuals may care about the environment but if you ask them to spend ten thousand pounds supporting it that's a different matter. I think the same goes particularly for business and to quote an example, earlier this year I was in a workshop with 60 other companies talking to the *(name withheld)*, which I think is an energy saving body that has been set up as a leading light with investment from a lot of large corporations and they were trying to carry out research, understanding about how the way in which retrofitting houses is going to work and at the end of the day, literally the end of the working day when we'd had the workshop about how this would look and how people might react or not erm the question was asked, "What are you going to do? What are you going to do to solve this country's energy issues?" and my response was "I'm here representing my business and my business is going to do absolutely nothing about reducing the governments energy obligations because it's not our job. Our job is to produce a return for the shareholders so we have to have a business proposition. If you want us to install measures that people will pay for and we can make money doing it then we'll do that, that's great. If there is an environment where lots of people want it to be done and we can do it very well and do it economically and make some money, that's ok, we'll do that. There's nothing wrong with making money, but we have to be able to make enough profit to justify the expense that we're going to take in creating the teams to carry out this work. But the idea that we would do it for free or the idea that we would do it for nothing is fanciful and yet what seems to be happening is on the one hand a Government rhetoric that says this is important we are going to set laws that drive down the carbon emissions of the country and then on the other hand and it's been left entirely up to the private sector to define ways to do that as if people are now going to care about it and suddenly they're going to want it and what I see is a lack of joining up between the two so I think the risk mentioning about creating the worst impact than not doing anything at all could be that in that vacuum in that void a lot of er potentially cowboy businesses are set up and are doing work to take advantage of funding if it's there or on a slightly brighter note companies do the best job they can but they use poorly installed methods, not understanding them properly and leave a situation that is only marginally better than it was so having spent a lot of money it's only made a partial improvement or in the worst case they might carry out what they think is good work and leave a worse situation, like an uninhabitable property because that have somehow created effects that weren't intended when the

building was first retrofitted. I think there's also economics that comes into this because when you start to look at the cost of retrofitting a house let's say there are properties all over the UK where the cost of refitting them is a substantial part of the value of the building. So, it's not so much of a problem say in central London where you might spend 1/20th or 1/40th of the value of the building retrofitting it but if you're working in a not wealthy part of the UK somewhere further afield, you might find that the retrofitting costs are twenty to thirty percent of the value of the property, in which case it's questionable whether it is worth doing that because of the economics of trying to resell the property. So I think there are economic and practical issues that are at risk here and I'm not sure that the current thinking has taken all of those into account.

I: That's really interesting. It's a practical situation and there are so many things to consider here. On the one hand, like you mentioned there is the economic aim of the company, even though the product that we're talking about are geared towards environmental performance, ultimately it appears to be linked to [unclear] in terms of the economic situation. However; even within the context of this situation can you think of any environmental or social attitudes or actions that your company has taken in this situation of "Alright we…", based on what you've said from a business point of view granted but even within that have you gone out of your way to take environmentally and socially responsible steps to make sure that these things are implemented in the intended way and they do not bring up new environmental issues…

R: I think certainly as a PLC which we are, we're a 3 billion turnover PLC now. Um and that means that we have to act in a responsible fashion, both in a legislative and also investor point of view. So any work that we have carried out has always been carried out with the best of intentions, i.e. with the idea that we are delivering a better result and producing quality work as a result of that so I should make it clear, we supply a lot of insulation, we fit a very small amount of it so when we supply we supply fit for purpose materials going for the correct applications. I mean that's probably no less than you'd expect from a PLC is that we'd be ethical and appropriate in the ways that we operate but I think it's incumbent on companies, large corporations particularly to act in as honourable way as you can, making sure that you are genuinely installing the correct measures at the correct times. In one of our businesses we install cavity wall insulation and there was a report about 12 months ago into the cavity wall insulation business and thankfully our business was ok it performed well but other companies within our sector were criticised quite strongly for providing cavity wall insulation in unsuitable houses. So where there was a risk of water penetration, those houses typically shouldn't have cavity insulation because it acts like blotting paper taking the moisture into the inner leave if there is any rain penetration on the outer leaf so we would refuse to install there but other companies wouldn't. So, in terms of have we gone beyond the normal standards, I think we probably have because we've refused to carry out work that we could have been paid for.

I: Exactly, you're right, issues like this, this sacrifice on your part out of the goodness of your heart for the sake of environment and social…

R: And also because of reputational issues to be fair, I don't want to sound like we're somehow just doing it for the good of the planet, I mean part of it is you know as a business if we have thousands of customers who find that we can act in dishonourable way in one or two cases they might consider that we are dishonourable for them as well which could lead to the loss of business so there's an altruistic part to a degree but there's also a self-protection part. So, it's a bit of a self-fulfilling prophesy as a big company you want to have good standards because that's the way you hold on to your customers and that's what makes you a big company so it's goes round in a circle, you have to keep your standards correct erm, it's much easier, I think the risk in the industry is that there will be a lot of start-up businesses like with Micro Renewables where companies immediately started up and started wandering into peoples houses and er promising them the earth and then charging them a fortune for the facilities that didn't actually work that well and then the company would go bust two or three years later with a legacy of failed installations and peoples deposits that are lost. As a PLC we can't go down that road so we wouldn't. If we had to develop a new solution for a market it'll be a sustainable solution in the economic and legislative sense, so it'll be a solution that's here for the future and not just something that will take advantage of the market for 6 months or 2 years.

I: Ok it's an interesting insight because it's those kind of things that we're trying to find out the extent to which companies go in this regard because the theory is that that extra element is required for a business such as yours, compared with a business that doesn't care, like a bank so it would seem that this criteria might apply to you, not necessarily to other people but it's important to find out how, whether it actually does and how you incorporate it in to the regular process of doing business. So I think I'll narrow it down and we'll head towards specifically towards the SHAP exercise which was about developing business capacity ahead of an expected demand in the future, specifically in the supply chain and skills. Now, concerning your business, what I'd like to ask next is, concerning your business capacity to meet demand ahead of the green deal for instance, the day to day process of developing that capacity in different ways. I'm interesting in finding out from your response how this attention to environmental and social detail in terms of for instance reducing the negative environmental impacts of your business or job creation, how these values impact on your capacity. How does it impact on how you go about developing capacity. For instance say your work force, your labour capacity, how does your adherence to these values affect how you go about recruiting them and maintaining them?

R: Ok, I'll make this comment for the last time and then set it aside. I don't want to sound cynical but most companies don't consider environmental impact and some kind of social well-being as part of their mission in life. It'll be part of what they have to deliver to satisfy their investors and make sure that they are a reputable business because you can't afford to be on the wrong side of regulation but an

example to illustrate that I won't use any more is, a couple of years ago I was talking to a company who said we are a green investment company, we only invest in green sustainable, environmentally friendly projects and I said that's really interesting, why have you chosen to invest in only green and environmentally socially, and they said because the returns are higher, and their view was that the only reason that they had focused on this was because they could make more money out of it. This was a fund that provided capital essentially so I think that we all live in the world we operate in so we have got to be careful about depleting resources but companies are very good at being efficient because that's their job. Their job is to be efficient so I believe that sustainability and efficiency and lowering the impact on the environment that happened when the second factory was ever built in the world because the first factory just used whatever it needed, when the second factory was built the guy said I think I can do that a bit quicker a bit better a bit cheaper, with less waste and fewer men you know I can do something better to make my product stand out from the other factory's product. So I think this has been going on forever and we use another variety of names for it now but I can go back twenty years ago working in manufacturing and we were looking at ways to cut waste, water usage, electricity bills, gas bills because those were big bills. Ways to cut labour force actually and I think, I keep saying I'll leave this at the side but I'd just like to set my stall out really but you know the companies employ people that can produce an economic return for them The idea that if you cut taxes for business, this is a bit political now, you know cut taxes for business they'll employ more people, well they won't, what they'll do is employ more people if demand for their products and services grows. So it's the consumer of those products and services that drives the demand, not the company. You can make as many milk bottles as you like, if people want plastic cartons then milk bottles aren't going to sell so you've got to look at the demand, not at the amount of production. But to come back to your point I'll avoid going down that line again, to come back to your point how have we geared ourselves towards the perceived demand of Green Deal? Well we're busy retraining our staff so that they can carry out whole house measures instead of just cavity or loft insulation. We are reassessing our investment in distribution so we have a number of units at the moment that distribute insulation products we're looking to convert those to distribute more products and also to see whether we can utilise the facilities to haul products that can use a whole house measure. So we're retraining, reorganising and rebranding in one case because we need a way of reaching the domestic markets that we don't have at the moment. So we're investing time and money and mostly money in making ourselves ready to take up the opportunity of the green deal when it arises and yet you know always keeping in mind the business return. I had a discussion earlier in the year with a guy who carried out some retrofit work to reduce peoples energy bills and he was quite scathing about people making money out of that so he did it because he thought it was the right thing to do and I said well that's absolutely fine and I'm not knocking your business but do you do it for free? He said no I don't do it for free what I do it for is just a little bit more than my cost and I said well that's absolutely fine, so does everybody else. You know, this is the way the world has to work, you can only do so much for free because if you've only got a hundred pounds, once you've

spent it it's gone so you have to do something that is sustaining so if it's going to cost a £100 and you charge £102 you've got £2 to invest in the next one and this is not unusual, that's normal business and I think somehow you get a tangling up of the discussion. On the one hand we have got to save energy because of climate change, environmental impact and social concerns and on the other hand there's this nasty beast called business that comes along and wants to make money out of that and somehow these two things are incompatible – I don't think they are. I think if it really is the case that we can't afford not to invest in better insulation, if it's true that we can't afford not to improve the quality of housing stock then there should be a very easy business case that says this is why it is going to work and it should work from an individual level, as in a private householder, right the way through to a corporation who would see the value of their assets improve if they could show that they were low energy usage. I'm straying off the question you asked which was about investing and preparing and as I said we are training staff, we are looking at our operations and realigning our operations in order to take advantage of the market.

I: Ok then, two things, feel free to wander off back to the question any time. It is a part of this, we are dealing with reality as well and it's about shaving off all of the rhetoric and dealing with practicalities so if you feel like it you can do it as many times as you want and subsequently my remaining questions will be along this line concerning how these environmental and social issues have an effect on the rest of the capacity or at least to cut the whole process short apart from legal I just bring up four or five more. Ok so concerning how you go about selecting and maintaining your supply chain and your wider business relationships, how does the current situation of the environmental and social risk as we've talked about before impact on how you go about this?

R: I tend to think carefully about the words people have used, not because I want to be clever but because I want to be sure I understand it. So you mentioned environmental impacts and how much of an impact it has on our selection of suppliers and the truthful answer is that it doesn't. There are practical issues that become environmental issues, for instance if we had to ship product in from 10 thousand miles away, that would environmentally less satisfactory than bringing product in from a local supply on the basis that they use the same materials the shipping cost would be an environmental impact that would be very negative but you can immediately see that on a practical not that it's unlike that products that are shipped 10 thousand miles are likely to be very competitive in price when they arrive. The very fact that they can't be shipped that far stops them being shipped that far and stops them from being an environmental consideration but it's not actually the reason why equally the weakness of a supply chain that's based on a 10 thousand mile delivery route is that if anything disrupts that, and we've all seen some of the problems that have happened in recent times, then your supply chain is very weak at that point so when we're selecting suppliers, we're looking at a combination of security in terms of their supply their supply to us, their suppliers to them. We're looking at their relevance to us in terms of the product range that we carry so we don't sell cutlery to pick a random example so we're not very bothered

about cutlery suppliers but we do sell insulation so we will look at all insulation suppliers. We'll look for things like innovation and their commitment, their financial strength, their location, market share, ability to serve but also if there is an innovative product we are quite good a championing new products that seem to have an advantage over the current crop. In terms of environmental impact, it would only be because there was a product that came along and had a fantastic environmental credential that could be exploited in a commercial sense, in the nice way of saying exploited, that would be the only environmental issue that would really play on our minds. Similarly from a social point of view there would be no barrier to companies coming in that had a more social attitude to the way they conduct their business but it wouldn't be a primary reason for us to choose them as a supplier where we'd say they must be on this particular score for Social responsibility, that said we have to be careful not to align ourselves with companies that are at the wrong end of that scale because there are one or two out there that have a chequered history and er we try not to associated with those if we can help it so it's weeding out the worst ones rather than seeking the best ones perhaps is a way to put it.

I: Ok that's a very practical answer. Alright, how about in terms of knowledge generation; How you design your process, your business processes and the way you go about carrying out the installation and the way you generate knowledge to actually design these processes. Do these considerations come into them as well?

R: They do, I mean knowledge management is a huge issue, it's a particular favourite of mine as it happens in terms of theoretically, because most companies and corporations and businesses and organisations today have masses of data and information and it's generally stored in an unstructured way so it's hard to access, you know, you'll be an expert in some things, other people will know that they can come and talk to you, where is that information held? It may be on your files on your laptop, in your briefcase, it might be in all sorts of places but how accessible is it? I think this is the problem for all businesses, because we are in distribution mostly we have to respond quite rapidly to market changes so we are, if I say constantly, but we are constantly in a state of flux, changing our processes and looking at new business opportunities. I've already had 4 or 5 forum meetings this year to discuss a new business venture, or new business opportunity and how we might tackle it, or even a challenge that's coming along. There are various new ideas such as business information modelling and management which is out there and as that gathers pace as a means to communicate in construction that means that we have to think about how we are going to operate as a group. So what are the threats and opportunities of that technology and how could we embrace it. The same goes with retrofitting the green deal with er part L20 13 consultation with 2016 zero carbon homes all of these issues play out in the same kind of field which is a changing legislative base about energy efficiency in buildings and we are constantly regrouping our resources to understand what those challenges are to determine whether we need to deploy a team, change our processes, ignore it or embrace it, change everything we do, change nothing and really try to understand what the best place to go is for us. So really it's constant revision.

We aren't ever sort of set up to run our business this way and then leave it for a couple of years and then see how things are then. The pace of change is so rapid these days that we believe we have to keep evolving and keep finding new ways to address these concerns in the market.

I: Ok, I think I'll just as a few more questions along this line. How about in the area of the materials you procure? In this sense, how do these considerations influence the kid of materials you procure?

R: Ok, because we are a distribution business, we generally serve the market that we supply which means that the customers will determine what products they want so as an example there are three brands of plaster board that are available in the UK and we stock all three brands because certain customers have preferences for certain brands – either through commercial arrangements or technical experience so we offer all three of those brands and therefore we aren't in a position to refuse to stock a particular product. When it comes to more innovative materials we might make a decision on the basis that we see greater potential in one product than others and will make an effort to stock it, to promote it and to make our customers aware of it if we think it has advantages for them. So a lot of the innovation in that respect, if this answers your question about materials [unclear], a lot of that comes from our core suppliers who will come to us with a new product that they have developed for market needs or because of a changing market and they'll ask us to help them promote it or ask us to help them sell it. So, part of that is self-selected as in the suppliers that we do a lot of business with will bring us those products to consider. Some of it is self-generated where we'll understand that our customers have a need and we'll go and seek a product, for instance a highly insulated foundation system. Most foundations for domestic and low rise buildings are built of a traditional raft which is a concrete raft which is not, let me rephrase, I was going to say is not well insulated but that's not strictly true, it is insulated but it could be insulated better. So we developed a system that is highly insulated and give incredibly good thermal properties for the building and because this is the base of the building it affords a much better solution for the rest of the construction. We thought that was a great innovation and we marketed that product to our customer base so it was selected on its innovation and its ability to address a market need which was for better insulation in the slab.

I: Right, how about any equipment or infrastructure, for instance your office or your work buildings, vehicles…

R: The warehousing, distribution centres yes?

I: Yes, and vehicles and equipment and things like that…do these considerations come into how you set these up?

R: They do and they're again, as I've been hinting all along, on a fairly commercial basis you know we will insulate our buildings because we know we will save money over the period of the time that we will be using the buildings. We're converting the lights from standard halogen and fluorescent lighting systems to LED lighting systems because we know that there is a payback during our period of ownership of the building or our period of lease. Similarly the vehicles that we use, they are governed by regulation so that we are now Euro 4 compliant in terms of diesel emissions, I'm not up to speed with all of these but it is now required by law that you can only produce a vehicle like this with its low emissions and its higher fuel efficiency, as a consequence those are the vehicles that we buy and therefore we are getting better fuel efficiency.

I: Sorry, I wonder why they can't say the same thing for buildings as well, you know people should build buildings like this. I mean if it was backed by law then, sorry that's just an aside but…

R: No but it's a good point. I've just bought a new house as it happens and the reason I mention it is not to show off but I know the industry, I know the products that I sell and I had zero, no choice at all about how insulated my house was. The builders building it, because I bought from a volume builder, so they're building the house, you either want to buy it or you don't. You can't have any say about what insulation you want, how many air changes you want per hour. You have no say at all about whether it has got any micro generation capacity, what sort of heating system it's got, what sort of windows it has, nothing! This is the house, do you want it or don't you? When you ask questions they don't even know what standard it's been built to because all they are doing is selling you a house, therefore for the 140 – 150 thousand houses that are built every year the person who takes up occupancy of that residence has little or no say, other than the self-builders who can make their own decisions, they have little or no say in how that building is executed. When it comes to commercial property and even non-commercial property so let's say public sector – if it's libraries or schools there's a big disconnection between the capital works and the running costs and it's not clear how the running costs are taken into account. I think I'm fairly safe to say that in the world of hospitals, the big hospitals that were built over the last ten years didn't have energy efficiency at the core of their design so as much as they may be an energy efficient building it wasn't designed to be that, it was designed to promote health care. So the outcome of the building was important and not the intrinsic products that were in it. Now I'm probably doing a disservice to those people who probably did spend a lot of time thinking about the energy efficiency and how they could put in the right size plant but it's my view that those buildings, their primary concern wasn't energy efficiency, it was health care outcome and provision of service. There seems to be a disconnection. Some years ago sustainability was the big word and everybody wanted sustainability on everything and what they wanted was what they called sustainability for free. So it could be as sustainable as you like as long as it doesn't cost me anymore, as soon as you say it costs more they don't want to have it. Now, I have to say sustainability is almost not on the agenda so it's let's check what's been asked for and that's exactly what we're going to do and not a penny less and not a penny

more. So the opportunity to say, "Hey I've got an even better system than that, it'll cost you a little bit more but it is really good" we don't recognise any potential for the market to say yes lets have it then. We think the market would say, no that's what we want, that's what we're going to pay for, so that's what we'll have. So we've kind of lost this momentum on sustainability, if it even ever existed, you know it was a nice to have but I'm not paying for it.

I: Tragic.

R: Yes, I think it is but it depends on whether one believes that those things can be delivered for free. You know it costs money to retrofit a house, it absolutely does, there's no way of changing people's walls and window and doors and making the building more air tight, there's no way of doing that without spending money. So somebody has got to spend the money and even if you were the most efficient business in the world and you could do it for the lowest price in the world it still needs to be paid for and someone has got to cover the cost of that and that's where the $64 billion question is really, is how does the cost get covered then. The schools of thought are extreme – legislate for it so you've got to do it, let's make it a law, you have got to get your house done, not very popular with the politicians that because they always think about the can't pay people which is fair enough you know and this has been said to me "imagine some elderly widow living in her house in the north of England and you've just passed a law that says she's got to insulate her house and put new windows and doors in, which is going to make the house virtually worthless because she can't afford to do it". That's the dive that goes with it. The other extreme of that is that everybody knows that it's important to be efficient with energy because of a lot of issues like energy independence and energy security, damage to the environment, climate change and sustainability and there's a hope that things like EPC's will drive a form of one-upmanship with your neighbour "I've got a C", "Well I've got a B" "Well why? I'm going to do something about that, I'm going to make sure I get an A". I just don't see that, you know we had to get an EPC for our house when we sold it, I don't think the people who bought the house cared at all. They just had and said yeah right, they just had it, and they actually wanted the house because it's on the side of the canal and not because it had a great EPC. So I don't want to sound overly cynical but I think the legislators don't want to pass a law that could disenfranchise voters or pass a law that could force people in to hardship and that's fair enough you could argue. On the other hand they hope people care enough to want to do something about it but as a contact of mine said recently, as a large house builder, he said people buy houses, not causes. So they're not going to buy a house because it's going to have a lesser impact on climate change, they're going to buy a house because they like the house or because they like where it is.

I: Very well put, I should think we're almost done. If there is anything else you want to say about equipment and infrastructure like we said before you can go ahead and say it now.

R: Well I think that overall it's hard to argue against the need for greater energy efficiency in buildings because we are wasteful, it's very hot in here unless it's just me but you know it could be a few degrees cooler but we're not used to doing that. We haven't built buildings with energy efficiency in mind for a long time and it's only in more recent times that we've started to care about it. It's absolutely sensible to deliver energy efficiency and we haven't developed the infrastructures to do that because we don't even know how buildings operate today once they're been built. We design them without any occupants in mind and then say it has a BREEAM excellent score but we have no idea how that building operates in use and there are great stories when you read them about businesses that were cold in the winter and too hot in the summer and they found out that the air conditioning was on a 24hr timer but it was actually the wrong way round so they were actually cooling at night in the summer but not during the day and they were warming at night in the winter but not during the day. So in other words the climate of the building was 12 hours out of sync and they only found it out when they investigated after they'd occupied the building for about 12 months and the stories go on like that. What it really boils down to is once the building has been built, handed over and brought into use, it's difficult to know who takes responsibility for energy efficiency then. The owners, the users – it should be the bill payers but how do you know that? I mean I don't know whether you know who pays the bills for this building or whether it's higher or lower in energy costs than it was intended to be, or who has got to care about that or what they're going to do about it if it isn't. You know…

I: It's not my job description…

R: Well no absolutely and why should it be? And thereby hangs the tail and I have spoken to the property director for Leeds Metropolitan university with a thousand buildings and they're everything from just being finished as in just completed builds to 150 years old. Some are in use and some aren't in use and they have a nightmare about how to work out how to get energy efficiency into all of those buildings but the good news is that everyone is talking about it so everyone is aware that there is an issue about energy use and as energy prices continue to rise more and more people want energy efficient solutions for their existing buildings. That sounds like it's got an opportunity for businesses like mine to develop solutions that will help other businesses achieve that which is great. I think what's difficult to understand is the financing of that and if there's one are that needs attention it's how you make the business case for doing it. How you give people access to funds to do that even the building model, as a final thought, just because I could spend a lot of time going on about this and I'm not sure how much value you'll get out of it.

I: it's up to you, nothing is wasted really.

R: No but there's an awful lot one could say about it, there's a model out there now that says you could deliver an energy efficient building that could generate its own electricity and heating and the model could be that the building pays for itself over the course of 35-40 years. This is something that

is already being developed on the continent. So the cost of the build is 60 thousand pounds and over the course of 35-40 year you receive back enough money to cover the cost of the build and all of the energy costs in between. The building essentially becomes a disposable unit then, at the end of its life it owes you nothing so it's fine if the thing got recycled or reused, it's even better if it carries on into perpetuity but realistically if the building lasts 45 years, that's incredible. There aren't many buildings that we built 45 years ago that we still think are exemplar properties…a good example would be tower blocks, especially round here. I used to live in one but it doesn't exist now it's been torn down, it was only built in 1960 something. So 45 years on the legacy is that it was useless and didn't work. So it would be fascinating to see if 45 years into the future if the buildings we build today are right and if I just wind the final issue in, because this probably comes back to what you said at the beginning. We're busy building houses today especially in Britain, and offices, which are designed to maximise the use of light to minimise the use of artificial light, maximising the use of daylight and also they are thermally efficient to provide a warm surrounding during the winter particularly because most people in the UK use gas for heating and that's the biggest part of their bill each yea. 50% plus of their bill is the winter gas bill. We're building houses that are going to be brighter more sunlight and more airtight, however climate models tell us that temperatures are rising and already the number of overheated or unacceptably hot days for office workers in London is exceeded. In summer time there are more than 30 days a year where working in those offices is considered to be intolerable because of the heat. So if overheating becomes a problem and this is something which DECC is looking at right now, if overheating becomes an issue then we'll look back on our legacy of building airtight glass fronted buildings and decide that we made a big mistake because they will overheat due to solar gain and there will be no way to ventilate them because we've made them airtight. So we could well be storing up a problem today by designing for today's problem but not anticipating tomorrows issues and overheating is the one that is most naturally there.

I: You just described my house to be honest.

R: Is that right?

I: Yeah it has a terrible design floor in it. They did the whole approach, it's not like it's especially energy efficient but then in terms of the whole glass proofing and airtightness in summer it was not nice to be in at all and the garden door is jammed.

R: But that's typical of what goes on. There's an old saying that the Army always prepares itself to fight the last war. So the army invests in all the technology it wishes it could have had the last time it was in battle but the next battle will be a different battle and then it will change again so you know we're always preparing to fight the last war and this is the same with buildings. I think it's profoundly misguided to think that we today in 2012 think we know what buildings we need to have for 2040 because we don't any more than if you wind the clock back the same amount and go back to 1982 and

say did we know in 1982 what buildings we thought we wanted in 2012 and the answer would be no. You don't have to go much further beyond that, I did a little presentation about the number of commercial buildings built before the first oil crisis in 1970 odd and it's about 1 million buildings in the UK. Commercial buildings that were built before the first energy crisis, at a time when gas and electricity and coal were in free supply and nuclear was going to be so cheap they wouldn't bother to meter it, so everything was going to be made out of concrete and electric because it was going to be brilliant and guess what, it wasn't. So I think it's challenging, challenging is the least of the words for architects or designers or planners in particular to say we now know today what we need to build for 2050. One of the issues, and it's another thing I sit on, is the Low Impact Building Committee for the *(name withheld)*, trying to think about what is a low impact building or a high impact in terms of innovation but low impact on the environment, sustainability and embodied energy, adaptability for future living you know, will we want to live in a house that we can change over our lifetime, so once we've got our lovely house we can adapt it for aged living or resilience to floods. You know what are we going to build into these houses to make them better? That kind of tackles new build but it doesn't tackle the retrofit. I think going right the way back to your first question – even the solutions we think are right today are right for today's issues but they probably won't be right for the issues in maybe 10 years, almost certainly 20 years and I think this is one of the major floors of the green deal. I am a big fan of it but one of the big floors is that it assumes over the period of the technology which is 20 years for mechanical and electrical products that this is somehow this is a solution that will be fine for 20 years. I don't see much technology in this room or that you're using today that was around 20 years ago or that you'd wheel out something from 20 years ago and say this is what I'm going to use today. So the idea that our boilers or PV systems or solar cells or our solar heating systems are going to be fine that we put in today again I think is floored. So I think there will be a lot of legacy systems. I think that if this Green Deal takes off there will be watch dog stories about somebody that put all of this technology in and it's all broken down and nobody can fix it and there aren't any spare parts and it's now been made redundant and yet they've still got to pay the loan on it.

I: Ok, that's quite a lot to chew on. I'm just going to ask one last question but in reference to what you just mentioned, that we do think that seeing as technology is [unclear]. If this trend carries on into the future then that means even though we don't know the future we could assume that it's going to be better, not worse, because even if we don't know what the future home appliances are we can assume that it's going to be more efficient than now so we can go ahead and focus on energy efficiency.

R: There are a couple of bits in there, you know I heard a guy on the radio today, a futurologist, Iain Pearson who used to work for *(name withheld)*. His theory is all technology as soon as you've got you've got the latest version, throw away the product you've got and buy the latest version, always future proof your technology, get rid of your old gear now, I'm trying to think of how he phrased it. It's make redundant your products as soon as possible, make them as obsolete as you can and his logic is

because the new technology is always better. Even if you have to go off a few branches and come back to the core but what you said this mobile phone today uses far less power and uses less energy than the one I was given about 15 years ago and the one I had 20 years ago was incredible, you know I had a brick for a battery and you had to leave it permanently plugged in because you had about 15 minutes of talk time and that was it and they still called it a mobile phone although I had to plug it into the cigarette lighter in the car and leave it permanently plugged in there, so there is an argument that you can see, 20 years ago, I was reading something the other day now, maybe 50 years ago we're using the same amount of electricity we used 50 years ago but in those days we only had one television, we had no mobile phones, we had one fridge with a small freezer maybe. We didn't have anything like the equipment we've got today but that equipment is so efficient that we're not using any more electricity than we used to all those years ago. I think that's about right, I might have misquoted it ever so slightly but there is an argument about, another impact about the 24 low voltage DC grid in the house because at the moment you plug in your charger for your phone to convert 240volts to 12volts or 14volts DC in order to charge your phone but if you have a 24 volt or 14 volt circuit in the house which could be run from a PV system on the roof directly no invertor – you could charge all of your DC equipment. Now it's not so easy to switch DC on and off that's one of the arguments for using AC but it's technology that's being researched now. There's a competition being run now looking at the DC house and I think the only item of equipment that can't run on low voltage is the washing machine if I've got that right. I think all the other technology in the house can run on low voltage. Everything from the television, mobile phones, CD, DVD players, lighting, every appliance you can think of has a low voltage equivalent so there could be a change where the house becomes the energy unit and generates its own electricity and the grid stops being an issue. I think in terms of future proofing technology or technologies the quicker everything becomes obsolete it sounds to me the better. I have optimism that mankind is quite inventive and we're quite able to adapt I also not that we live in the polar ice caps and also in the Sahara desert so we're quite able to cope with our environment by finding a different range of strategies, the issue is about not trying to lock in a technology that we can't be sure is going to be right into the future. If the climate is warming up then we've got a different strategy for if we think it isn't. Energy efficiency in my mind is about Economic certainty on an individual level on a business level and also on a Governmental Level. To that extent it makes sense so long as it can be successfully made a commercial argument.

I: Ok, so in conclusion, just the last one – if we were to view companies finance [unclear] could you say how paying attention to these extra environmental and social issues, other than the core economic impacts on your financial capacity?

R: I think it's a reality of modern life, modern business in the modern world that we have to pay attention to environmental considerations and consider our social impacts because we have to be a good corporate citizen wherever we're domiciles and clearly that's a core attribute of the business to be

recognised as a leader in certainly the areas of environmental sustainability, you know with insulation being at the heart of our business we should be leading the charge and we are for energy efficiency and for promoting the good that comes out of maintaining a strong position. I think as far as financing is concerned it helps us with our business platform and also with our investor confidence if they can see that we are a credible, and I'll use the word honourable again, business that can be seen as a very not just safe but also considerate investment. So, I think it does have a slightly intangible benefit, I say slightly intangible because I'm not sure how you could scale the value of it but there's no doubt that being a company in that space has a positive impact on our ability to raise finances and be seen as a worthy investment.

I: Ok, alright then, I think you've really talked at length and thoroughly. I think I'll call it a wrap now.

A1.3 Scenario Planning Transcripts

The scenario planning transcripts were structured similarly to those of the interviews. The only difference is that since there was more than one respondent during a scenario planning session, 'R1', 'R2' and 'R3' were used to distinguish between them. All five scenario planning case studies featured 3 respondents.

Table A3 provides details of the scenario planning exercises, with the sample highlighted.

Organisation	**Services offered**	**Management team members**	**Identity codes**
Inex Ltd	**Installation of various renewable energy technologies**	**New Business Director** **Production Manager** **Projects Manager**	**IR1** **IR2** **IR3**
Homeworks Intelligent Energy	Supply and installation of solar PV	Business Development Manager Finance Manager Operations Manager	HR1 HR2 HR3
Coen Building Solutions	Installation of insulation products; energy consultancy	Managing Director Commercial Manager Business Development Manager	CR1 CR2 CR3

Alsecco	Manufacture, supply and installation of insulation products; service training	Business Development Manager Product Development Manager Finance Director	AR1 AR2 AR3
BNK	Installation of various renewable energy technologies; energy consultancy	Commercial Manager Operations Manager Business Development Manager	BR1 BR2 BR3

Table A3: Table of Scenario Planning Exercises

The following is the transcript of the scenario planning exercise conducted with Inex Ltd's management team.

Inex Ltd

CSCS refers to Construction Skills Certification Card

FENSA refers to the Fenestration Self-Assessment Scheme

PPC refers to Project Planning Contract

I: Before we get on to the scenario exercise ok, ok that's your opportunity.

R1: My name's *(name withheld).* I'm New Business Director for Inex, and it's my job to search and find and win new work for the company and support the business overall with systems and procedures going forward

I: Brilliant

R2: I'm *(name withheld)*, Production Manager for Inex. I look at all schemes, we're involved with all the schemes from the start, I get involved with the health and safety, environmental management and the programmes

R3: *(Name withheld)*, Projects Manager for new build and traditional build projects.

I: Brilliant yes, I can see you all do multiple tasks, right ok. You know, I've certainly gone over why we're doing this anyway and you know we've got three scenario's today, um I can sort of, I'll read out the bits because I think it'll help enable us and you to ask any questions about it. The how to play bit it a sort of a game in some way although it's got a serious output. Really it's about us introducing

this and then we're going to leave you to talk about it and what you'd come out with as a decision. So the first one is scenario one; it's about strong demand now and uncertain future demand and as we go through background our next management team is expecting new economic opportunities for the company. Their expectations are based on the green deal and eco programmes and the £161billion market for building energy efficiency projected to deliver from 2013. The company's research also indicates that social attitudes towards environmental sustainability and by extension sustainable energy services and products for the built environment are becoming increasingly positive, however; there is no guarantee that these trends will actually translate to strong consistent market demand for our sustainable energy services. There might be some real bit in this. The company's research found that despite the apparent public support for sustainable energy products they are viewed as just another building option and can be over looked in favour of cheaper, less sustainable alternatives – especially since there have been cases of the product failing to achieve expected levels of energy efficiency improvements in buildings. Likewise the delivery mechanism for the green deal and eco programmes are not completely clear and there are some unanswered questions about the programme's funding and gov't regulation.

So that's the context, then the specific situation in the midst of this business situation that could go either way, Inex receives a sudden bulk order for its products and services. Since the market is inconsistent and unpredictable Inex is unsure if it will get another order as big as this for the rest of the business year. So this is your task as Inex's management team you'll have to decide how they will organise their work force, inventory, facilities, finance, processes and supply chain and other relationships, to meet the bulk order in a profitable way.

R2: Right ok

I: There's a degree of reality in this, you could be more specific, you might like to be more specific and say, it could be this, you know in order to give it more reality. And really it's just for us to sit back and let you talk.

R1: Ok, I think we've got jist of it.

R3: Yes, I think so. It's quite a reactive scenario in many respects

I: Yeah, yeah

R1: Um, yes it is quite real business, isn't it really? Um, I think the first thing we'd probably look at is erm where this order has originated from, so where's it come from, what is it, so we need to sort of peel all the layers off, find out what it is, what the contractual arrangements are with it so that we understand then how flexibly we can look at the contract overall so can we spread this contract over a longer period. So looking at it from a strategic point of view is there another way of delivering it to help

the business instead of having this from end explosion, can we look at the programme and deliver it over a longer period which will help us in terms of resource, the financial impact, cash flow and how we're going to manage the finance to deliver it. And also how we can work with suppliers, manufacturers and other supply chains to deliver the project in terms of spreading it over the period, making special payment arrangements, whatever, to accommodate that. So from my point of view I'd probably look at it strategically. *(Referring to R2)* probably from a programme perspective.

R2: Yes, and health and safety and obviously the supply chain, because you wouldn't have all the skills at hand to do this, you've got to draw on the supply chain to get this delivered.

R3: So probably what we'd do there then is we'd look at our current supply chain, we would utilise the best resources from that, those that are qualified and capabilities, and we'd use those organisations then to um come on board with us, so again do the same thing, once we've peeled the onion back we then know what the different component parts are and one them is getting the resource sorted out.

R2: You'll need to the quantities, property quantities that we're going to be working on, obviously divided by the timescale for example if you've got 52 weeks in the weeks divide it by 50 weeks and work out what supply chain you'll need and how you're going to get it fitted in for the year.

R1: So we assume that the contract is coming from one route, or one point of contact within the business so I think the first thing that we'd probably do in order to spread that communication normally at the front end there's a very micro team that have been involved with getting the project to the table for the business. That team then will have to open up to the rest of the business in terms of the senior manager to actually talk about the project and give everybody the opportunity, so the key members that will deliver the project (the hand on people) will then be engaged, go through the tender process, go through the clients, contract relations, that sort of thing and we develop a plan then of everybody going away with actions to actually develop and produce their part of the plan up to set up on site. So from your point of view *(referring to R3)*, looking at what you've done with the housing projects, do you want to go through how you'd sort of set that up?

R3: from site set up or from management basis I mean forming a team, looking at logistics, looking at the areas that the project is in, that'd be a concern. Whether need to setup smaller satellite offices to run from or whether we'd be based on site. Look at the clients representatives, and mainly I know there's been an issue recently with mine, so if there's any changes to made to the er houses or whatever, we'd need to consult the client and local authority about doing that.

R1: So what we would probably see is er not just the internal meeting regime, we'd see an external stakeholder meeting regime up here. Like *(referring to R3)* said in the first instance that would be with the client again to get a better understanding of the project and to understand how they want it delivered

and how the customers expect it to be delivered. But then there's also the third party people behind that, such as the planners, building control, perhaps, or any bodies like that so we need to get them into the team so that we can get the most complete picture that we can of what the delivery model is going to look like. After that then I would suggest coming back to the internal context, that's where we look at how our service model is going to be shaped up, so what procedures, correspondence, communications, programme's all the sort of documentation that sort of goes with the project, all the health and safety documentation can then be formulated and be quite specific to the project.

R1: You've got to erm, let the customers know what they're expecting as well, awareness, because you've got to win them over, sometimes they probably won't know what's happening so you've got to let them know what's happening get them on board so that you won't have a problem getting access to the property's as well. Because it'll slow you'll programme down and then you'll lose profit because you're not getting in and turning work over. Forming a team of back room staff as well, I mean we've got people who need to be aware and given a certain amount of training so they know what they're talking about.

I: If I may, I'm going to intervene because maybe it does need a little more realism. If it was a housing association, saying it's got an estate of 200 houses that it's going to um upgrade and let's put some value on it, maybe it's got to increase your overall business by 30, maybe 40% so it's a substantive opportunity, you know. How would the company respond, you know? You've addressed it as a project, now address it as a company taking on this exciting opportunity with terror.

R2: Yeah, it is a little bit like looking down two barrels really. In one way it's exciting for the business because anybody that can bring a project back successfully we know how much hard work goes into that. Probably the second thing is, (this is where we're going on a scary journey now, this is where reality turns in) where we need to look at, not so much the commerciality of the project but the commerciality of the business. So this is where…how can we afford to plug this project in at that sort of volume in that it has a significant difference to the cash flow of the business. So probably with everything we 'eve suggested to date yes there would be somebody sitting in there from a commercial point of view. But taking it one step back to day we've won the project we would have had some discussion in the tender stage about how this project could be plugged into the business from a financial point of view. What we have done, because in real terms we have come across this situation, is that we've worked with the bank to help support er, we've explained to them, we've done presentations where we've shown them the strategic outlook of the business, the expectations of the new work load and how that they can support us because at the end of the day we are a company that pay on 30 day payments so we have a very good relationship with our supply chain and suppliers, however; we have worked with organisations, like *(name witheld)* that could pay at 60 and 90 days. Well you plug that into the plan and it's completely offset on every single corner. So therefore, what we have to do is make

sure that we've got the support from the bank to be able to do that to pick up the peaks and troughs during any 12 month period to see where other work, current workload is in and when monies are coming in from that. But mainly anything new coming in we do have to look at that quite carefully on the impacts financially it has on the business.

R1: So even at that stage we would set a threshold of what our capabilities are so that there's a clear understanding all the way through so that even at tender stage we know what our ability and our capability is. Probably, I would say that when we've won a new project it's about supporting that commerciality, but it's also about the work that you do with the supply chain to help you with that. One of the main strategic features of the business over the last 18 months has been to swap over from working for main contractors (80% of the business was with main contractors) so we were delivering the work on their financial terms, now we've turned that round to the same, we've reversed the ratios completely where we're doing 80% of our own work, so we're getting finance direct from the client. That's had a big impact and that's opened our view of the business going forward and what we are capable of delivering from a financial aspect as well. So I suppose really, what we're saying there is can we afford to do the work. As many opportunities cam bring in…

I: So you've set up the bank. What about the internal organisation? Would it require another premises?

R: Yes.

I: So these are all investments?

R1, R2 and R3: Yes

R: I think you've got to recruit and you've got to look at your site, whether you need a satellite depot and increase it by 40% in the business and there's cash flow that's the big one because you can be looking at £50K a week in materials only and then there's your labour on top. You won't be able to run up credit with some suppliers because you've far stretched it within your first week, and you could be doing it for months, that's why you need to build a team partnering…

I: With the supply chain? Yes, so they're in right at the beginning. So one of your business strategies would be to bring in your supply chain and try and get them to engage with it.

R3: I'd look at setting it up slowly, start off a five, probably ten a week and then build it gradually up to 30 a week.

I: As the supply chain becomes more…

R2: And the learning curve for the customer. You can go out and do hundreds all in the first day well if you start off wrong, you're going to be wrong in a lot of areas. Start off small, learn all your little mistakes, iron all of those creases out and then as you grow, you're growing a really good model for delivery then. But strategic partnering for the business has again been another strong feature we don't sit down and nail people to documentation and say this is how you'll perform on behalf of X what we do is we bring in strategic partners and it's people working with people and what we've been able to negotiate are some really good payment terms especially with the suppliers and extended arrangements where we need them purely on a basis that we've been honest and open and said, we're looking to expand the business in this way, we're expecting something like this type of project to come through how will you support us. And erm by doing that and testing the supply chain in a different way what we've got back is added value to the business in respect of yes we can accommodate that, we can extend your payment terms and we can accommodate holding the materials, etc., etc., and they given the opportunity they come to the table and offer us some great opportunities really.

I: what about the work first that might be within your supply chain. There may be some doubt that you can get enough people?

R: our work force?

I: Yes, or the supply chain in both cases.

R2: The supply chain would have to commit themselves to meeting our needs otherwise we'd have to look elsewhere. As far as our own workforce we'd be concerned about a certain amount of retraining for us, bringing new people on and bringing apprentices / young people through to learn the trade.

R1: I think what we would have to do is sort of make sure, I believe we've done enough work with our supply chain to feel that we've got enough, we've got the eleven players we need to deliver the project and I think after our own resources is utilised then we've got different organisations and different ranges of capacity that we could chop the work up and get them to deliver it for us, so I'm comfortable that we wouldn't have a project that is too big for this business. It's a big opportunity but I'd be happy that we've got the people.

I: So a 40% expansion could be done just with your current supply chain?

R1: No you need to add to that supply chain

R2: But if you go with the steady growth that we've talked about you could build your supply chain up

R3: Start off slow and they keep adding to their work force to help you out.

R1: I think one of the things, one of the important things to remember is if these are new build properties that have been developed, designed by architects. It's convincing the clients that the architects got it right, if they're not, if they're tenanted properties then it's convincing the tenants that the work needs doing. I mean that's something that that office is involved in daily. Educating the tenants er making sure they're aware that it's beneficial to them. Because they often don't understand so you need to get in there, get them on board and then obviously…

I: SO there's a lot of work just involved in that. Well one of the things we're interested in is the training of skills in the supply chain you know, would you have sufficient skills? We're thinking of a refurbishment project, complex, you know, all the various things that I'm sure we all know happen on these and you need quite a strong aware work force.

R2: I think what you've got to be aware of is that they're all new products.

R1: Are there going to be enough people out there trained up to do the job in the first place. to get them on board…

I: How would you either do that training or help the supply chain to do it better?

R1: I think going back to a model that we've just put in place now is to create again from strategic partnering approach, is to engage with local training providers not just one,. Don't put all your eggs in one basket but spread it out, so if you know depending on what the geographical spread is of the project then we'd be looking at training partners within those areas. So we'd be looking for someone that can provide the training we'd be looking for organisations that can deliver the work that would buy into the training and they would see the business opportunity there as well. So again, using this ramp up model, this doing it steady and building the team up that's how again bringing the training aspect…

R3: You've got the supply chain training as well haven't you?

R2: yes, yes and I think the training strategy here is quite short and specific as well so if it's a particular product then erm product training is quicker than long term skills training so that's an advantage, so can be an advantage provided you've got the basic skills of individuals. So I think that is quite a quick win situation, if we're talking about a product that we can get specific skills identified with erm and I think again having that local supply chain will buy in to.

R3: If they want us to use their product they should provide the training to install that product

R1: What we couldn't commit to is you know what we like to in business is create apprenticeship opportunities and I think this sort of project coming in like this erm although it's a great opportunity would only sustain short term work experience opportunities so you could do small training blocks for people to come in and utilise but long term apprenticeships if this project completed and we had no

more work, then those apprenticeships would have to be extinguished. Same with all resources really, I'd be looking at a team to come in if we're, if there's new employment we'd be looking at short term contracts for those people because we've got to find a way, and it sounds a bit cold and callous but unfortunately that's from the weather that we've just come from, you know the recession that we have to switch off the resource as quickly as possible and prolonged redundancy arrangements would make it difficult and that's what we all want, long term sustained workload.

R2: What would be beneficial to (unclear) is that they've gained certain amount of training whether it be short term or long term (phone vibrating).

I: Yes, yes brilliant.

R3: A skill for life

I: I'm going to mention it now but it will come up in the next scenario. What about the fact that there'll be other people wanting your supply chain? You know, if it's happening to you, some other housing association has gone to another company and you know what tends to happen is it's all or nothing.

R1: I think probably the way I'd answer that is that the people we use within the business, our own people, we do look after and we do train and I think there is a return on that for people being loyal…even bad payers, if they know it's 50p a month but they've got to work a month in hand ? it's convincing the work force that you've got their best interests at heart but you know you've got to convince them obviously

I: (Laughs)

R2: That's a good answer that is…

I: Yeah, it is yeah. Hmm, um, most of your decisions have been based on economic considerations obviously, it's a business but apart from economic considerations were there any other considerations that went into shaping these decisions?

R1: The client, you've got to consider that as well. You've got to make sure that the client is suitable, [unable to hear sentence]

R2: I think if you look at all the accreditations that we've got in the business, without putting them up just as badges, I think all those have a part to play in what we're talking about in terms of the quality aspects, you know, the procedures I will put in place. There'll be specific environment for 9001 there'll be specific environment for 14001 er specific accreditation for glazing like FENSA, so there'll be whole heap of things that need be incorporated… Safety particularly.

R3: That would definitely be paramount if we're going to work with the general public on a day to day basis, then safety, we can't take that light at all.

R1: We haven't got the benefit of the hoarding round our site, we can actually go in there and bump shoulders with the customers. It can be a bit scary at sometimes

I: Lovely people

R2: And there are a lot of lovely people out there

R3: That apple pie people are nice, but there's are lot of people that are not but that's not for us to judge

I: Ok, shall we move on?

R1: yes,

I: Do you guys want to take a phone call or anything, or

R2: I think I'm alright

I: yeah, no, can I say it's really good and really interesting

R3: I mean, area we answering

I: As I say, I don't think there's a right answer, what we're interested in is what you're doing and in sense what, I suppose what we're interested in is barriers. What are the things that stop you being able to do these things, that maybe we could help you with. Erm therefor that's always at the back of our minds. So whether it's the bank.

R1: cash flow is the biggest one

R2: Yeah, and the current market, definitely.

I: And, how responsive are they?

R3: um…

I: You've at least got them here.

R1: Yeah, we have good attention with the bank

R3: I think what we've learned is that most people don't test, you're the customer you don't test the relationship with the people that are providing it. You're paying them for their service and like most people, you never go to your energy company, you never go to your bank, you never go to your insurers

and say ‘are you doing the best deal for me’. Every year the renewal come through, it’s ten pounds cheaper than the year before, oh that must be a good deal, I ain’t paying any more so you pay it, and we just let it go through but there might be a company down the road that’s doing it a lot cheaper than that so what we’ve tried to do is bring in those people, like the insurers, did you know that we’ve got green vehicles, did you know that they’re no more than 3 years old. It has an effect on your premium, it has an effect. You’ve got procedures in place that they didn’t know about that has an effect on your premium, so your premium can come down. So if we’re 14001 that might mean 3% comes off our premium because it’s on their check list, but nobody ever goes out to test it. With the bank we said look, we’re expecting this work load this is the strategy for the business, we’re looking forward, we’re looking up, we’ve got a bright future, we’ve got a cracking team and we’ve got them here and we reversed the tables. They didn’t sit in the bank and we went to see them they came here, and since then we’ve got a more flexible arrangement with them. They can understand how their products can dovetail into the business needs of what we want. That’s why I think we‘ve got access to these workloads going forward from a financial point of view.

I: Brilliant. Yeah, yeah. Ok. We’re going to move and change scenario…

R2: I’m just waiting for the crane that’s fell over.

I: It’s not going to be quite like that, this one is bad news though. Ok, this also may happen. The transition from the Governments Carbon emissions reduction target scheme to the green deal and eco programmes is taking more time than expected. Consequently the initial expectation that energy companies will provide 1.3billion a year towards green deal and eco does not materialise as the programmes fail to pick up steam and time. Inex’s research reveals that this situation is caused by the inconsistent government policies and complex stakeholder network and market structure, due to the delay in the government driven energy programmes. A short fall in funding for energy efficiency in energy efficiency installations in public sector housing occurs, so you know where we’re going, so specific situation… Local Authority housing, now that public housing orders for energy services which constitute the bulk of annex’s orders, so in a sense we’ve changed the scenario therefore you know 60% of your work has been doing this begin to be cancelled. So you’ve moved over, you’ve transitioned and put on hold. Inex’s management doesn’t expect the situation to get better any time soon. Annex is faced with exploring ways in which the company supply chain processes workforce, inventory, finance and facilities could possibly be reorganised to reflect the economic downturn. It’s all happened…and then

R3: It’s all slowed up, sounds like solar PV.

R1: Do you want to start on that? Have you got any thoughts on that *(referring to R3)*, or shall I?

R3: Yeah carry on whilst I get my head round it…

R2: I think what we'd have to do there is have a look at what the programme impact is, so you, again, to look at the flexibility in the programme to see if it can be delivered in a different way to suit not having to reduce the workforce, although that's probably very likely. Er it doesn't have a significant impact on the supply chain although that's very likely really, but try and consider as many risks at that stage and what that down turn, how that's going to affect everybody. We'd probably prioritise our own work force and keep them more occupied than the supply chain.

R3: We could try and move them to other areas of the business erm, the biggest problem is if you lay them off is getting them back.

R2: You've broke that bond that *(referring to R3)* was on about there

R3: Yeah so it's getting them back after you've let them go and that would probably be the biggest one

R1: I think, I think the main thing on there would be to er discuss the contract at the beginning, because obviously there'll be a contract in place that's er come to a halt or slowing down then the client would be obliged to honour the contract anyway. If we're set up as a business working contract to contract then the effect is not going to be as great as if we're running ahead with it going on and giving [unclear] by the client if you like. So it would need managing contract to contract and then hopefully it wouldn't then be such a blow and we'd have prior warning of it obviously so [unclear] phase of the contract [unclear]

I: So let's go through all the er, what about the banks?

R1: Right, I think if you've got that relationship that we talked about I think the best thing that we can do is go to the bank and speak to them and be honest and open about what the down turn is. Again, there may be products or something that they can offer in to the mix that helps us regarding payments to supply chain erm to alleviate that. It's suddenly going to drop off. There will be a demand financially on the business quite quickly for people to be paid, that loyalty towards the business will go quite quickly and they'll look at that work load dropping off, they'll see a risk within that, will we get paid? When are we going to get paid? So I think getting the bank on board to see how, and again this is about sharing the problem really, not just taking it all on board and not sleeping of a night. This is about sharing it with other parties. Everybody was happy to come when it was good so what are we going to do guys when it's not so good and how can you help us then and I think maybe there's another way that the bank could help us in terms of the cash flow with what we need to do to come down off the back of the spike. So there's that sort of thing there.

R3: Yeah there's obviously a er a tax scam in there [unclear] exploring ways how the company supply chain process can look to reorganise obviously the idea and concept is there and they're good,

but the finances aren't so there may be an option somewhere else. Maybe with the bank er to finance it on a [unclear] basis.

I2: Interesting, yes, yes.

R1: There might be other options to deal with it that way, might there.

R3: [Unclear]

R2: And I think that could set a bit of a pattern for the resources as well. If we got the operatives and the team, then probably what we would do is investigate where there are already current opportunities that might be under resourced or other organisations that we can subcontract work or whatever and give us a further option to utilise that resource. The benefit for us as a business is that we do have a very good diverse background of work load, so if one market drops off particularly we have probably got two or three other markets that we can rely on but at that sort of level 30 to 40% difference in the work force you just wouldn't be able to smooth that out across 60% of the rest of your business really, it would be too much but you would be able to look after your best resources so that when it does pick up you can bring them back out and reutilise those skills.

R1: [unclear]

R3: I think again you know talking to suppliers er people providing us with the material again as soon as we can to communicate with them and tell them what's happened, why it's happened and so on, because what they might be doing is they might be ordering large quantities of stock on our behalf. If they're doing that strategically they could have lorry loads of stuff coming in. well they need to switch that off an we need to within the business to stop ordering materials, because, what have we got in store, how does is that going to be utilised, are we going to end up with material in excess of the contract value at the current time. So we could end up with 300 solar PV panels out there that have got nowhere to go so it's about utilising the relationship with the supply chain and saying "right we need you to take them back and we need to stop" and you know if you've got that relationship and I think we have pretty much with people we work with we would be able to do that, although if it's sold then let's say it's sold, then what we've got to do is let's say create another strategy to sell those units, and that's a bit more street walking than disruption.

R2: Perhaps this is something that we'd need to sit down and discuss at [unclear]

R3: Obviously with me it's very similar to materials on site and you need to be paid [unclear] If you've got materials on site you need to be [unclear]

R1: Some of the things that we've learned from the recession is that we have literally hundreds of kitchens in there and you think about 20 or 30 cabinets per kitchen then we times that by hundreds of

kitchens going through that unit next door you know, we can have two or three artic lorry loads coming in every week with all that in. Now what we've learned is that we operate just in time so if suddenly that got switched off that unit would become empty but we wouldn't be left with any stock really, it would all be delivered on site, same with the way Kev works on the materials side, we don't get involved with ordering thousands of packs of bricks, we supply the labour, we leave that with the main contractor. So probably going back to planning and the tricks that we've learned of how to put cost as no benefit to us out of our remit, putting it back with somebody like [unclear] who might be able to organise better rates anyway on their volume, then we're not interested in making a quid on a pack of bricks, we're happy to make a quid an hour on a bricklayer and be more proportional, so again we wouldn't have much risk on material in that sense there. So, as Dave said really, from a lead time perspective, I think we would probably have something [unclear] it wouldn't be far off just in time delivery anyway so that would help us significantly.

I: What about the apprenticeships that's always a difficult one at this time isn't it?

R1: Yeah um, well. I think it's how strong your management is really. Being honest you can have a management principle that if you've not got a job that's productive, it doesn't matter what you are whether you're an apprentice, an admin person or a brick layer, if you're surplus to requirements that's it. There's no work, therefore you know…

R2: It's the nature of the industry

R3: It is unfortunately.

R1: A lot of it would depend on where they're at and what stage they're at within their training and if they're due to finish any time now you'd probably be more sympathetic to them than if they'd just started and they're a couple of weeks into it.

R3: What we wouldn't do is just tell them by text or something really informal and say, 'Don't bother coming in on Monday Johnnie, coz there ain't no work for you'. I think what we would be duty bound to do is perhaps the organisation body that's dealing with their apprenticeship to see if their apprenticeship could be taken up by someone else. That somebody else might have the benefit of that person already having done 18 months, so they're not green they're very well skilled and there's an opportunity to place, if not then how can we make sure their apprenticeship if completed at least from the academic point of view. Um well apprentices, they're quite cost effective in many respects aren't they? And I think the diversity of the business lends again to the opportunity of as long as you don't take on too many and as long as you make that number realistic, the chances are if you've got sort of half a dozen apprentices you could probably relocate most of them. You know from our own experience, apprentices completing actually turn into good workmen, if they're mentored properly.

R2: Apprenticeships aren't like they used to be. [unclear] you can probably go through certainly in my side of the business I can go through 10/11 apprentices before I find one decent one. And as soon as you realise you've got a decent one, you work a little bit harder to make sure… The other thing the client doesn't like is that as a business we're encouraged to bring apprentices into the industry but the client will actually say you've got too many apprentices here we don't want that many, because obviously they're not tradesmen and we're using them as tradesmen. So that's you know certainly in my experience any way.

R1: And probably the other thing from a positive strategic outlook is erm depending on the speed of how this is switched off there's always the opportunity in the peaks and troughs of any one year of being able to use the diversification of the business to pick up work elsewhere. So if we've suddenly got that capacity we could either utilise it through the supply chain if they've got work we could subcontract that work on an arrangement there. Or we could go to existing clients and say we've got the capacity to erm take on more work, if there any opportunities, our performance is good, our service is good would there be the opportunity of taking on any more work. I think we'd all sort of go out as hunters and start using our respective networks to try and replace that capacity before option one is let's make everyone redundant let's see if we can replace that because the turn over and if we're making decent profit, is good for business. So why not try and keep it at that level and put the effort in to keep it at that level? Not give up and just let it drop and I think it's about working that way. Opportunities for us, I would say, come the spring, people like to build things because the weather gets better and you end up with a bit, it goes up a little bit there, there's a small spike that goes on in the spring and you can't get enough brick layers, blah blah blah, it gets better. The one for us in this sort of market in social housing, local authority and social housing clients, is the quarter fall is the period January, February and March where they suddenly before Christmas sitting there thinking about Christmas dinner they think, well let's put a few numbers in how much have we spent how much have we completed and they think "Oh my god, we've got half a million pounds of roofing to do here and three months to do it in!" Then they suddenly come and often do that with *(referring to R2)*, they'll pick the phone up and increase his budget which is absolutely wonderful but erm that again there's opportunities in that so we would normally then all being well, have to bring in extra resources but if we were on a down turn with another opportunity we could then smooth the resources across.

I: How bad would it have to be before you got worried about the business? You've been in situations where I know businesses have gone under, ok…

R1: Absolutely, It's a terror. 18 months of it where I ended up managing the finance and you've got 400 grand coming in and there's 600grands worth of bills and it doesn't equate, it's terrible to spend your Sunday afternoon thinking about that and that's what happens to all of us if the business is not good, we're not sleeping and it's affecting our lifestyle, it's affecting lots of things on a personal basis.

R2: It affects senior management before it affects anybody else doesn't it?

R3: Yes

R1: Financial controls have been set up tightly now so they're monitored daily, so erm…

I: So you know what's happening

R2: Yeah, and each job we run there's a separate budget for each job and that's monitored daily by our commercial guy and he er he highlights where [unclear] and what we're spending on the job so it's picked up quite early. So you could prevent a catastrophe there really.

R3: And again you know, what we've done is we've got the relationship with the bank so we've got a facility there that if we do need to bring that in it just gives us the capacity or some time to replenish that work load. So we might have a low month where the overheads go a little bit about the profit level but then as long as we get more work in we can bring that back down. We know what our overhead threshold is now as well so we know on a daily basis the difference between our gross profit and our net profit which is absolutely the key to everything but it's took a lot of pain and heartache to get to that point because you need that transparency [unclear]

1R: You know when you think to yourself there's 20 grand coming in next week, 15grand going out, [unclear] you've forgot about the 10 grand extra that you've got to pay out so you've got, all the guess work is taken out of it.

R2: What we've done now is we've shared the responsibility across the business. We don't blame the estimator for getting it wrong, we don't blame the surveyor, although we probably do… What we do now, on a project when we're tendering, we adjudicate it amongst a team of people who know what they're doing. Basically what we do is walk through the project really and build it and say is that the right price for that, have you got enough money for that, is that the right value for that? And because we're doping the guys are coming back and saying well, you aint going to get an electrician going in and doing that for 15 quid, what about his car to get there, and we're picking up all those little bits and pieces like that. If it goes in and if we win that job and deliver it its lost or losing money because we can see early on, then we've got to find out why. You know what's happened here, when we've analysed it there, or is there something happening on site currently. It helps us get to the problem much quicker than it would normally. When you get to the end of the job you tot it all up, we've have that, we've been paid regularly, add it all up we've made nothing, we've lost £5000 on that job. For 18 months work with 20 blokes on it, and that's been the problem where we've not known in the past that we've been losing money and it might only be a quid a week but at the end of the project it's a lot of money. So like anything else we've learned lessons, like any tradesman would when he cuts the wood too sort and he gets in a lot of trouble or lays the brick upside down or whatever, that's how you learn the

business but you can't afford to make mistakes on finance. So I think from that point of view we sleep a little bit better than we have perhaps done 12 months ago.

R3: [unclear] laughter

R1: Has that sort of answered the question?

I2: Yeah absolutely, yes. Um so in economic downturn, does quality suffer as well [unclear]?

R2: Does quality suffer on the downturn?

R3: I don't think so, because obviously you're committed to quality at the outset. Every client now will say have you got quality assurance guarantees. You've got to issue them. As far as the tradesmen themselves go the management need to keep on top of them. The site managers have got to manage them and the senior managers have got to manage. If there's any argument at the end of the job you've then got a written confirmation that it's all been done…KPIs and stuff like that.

R1: In process inspections throughout the job.

I: There's obviously difficulty in a depressed demotivated situation to keep that quality level up.

R2: That starts at our level. If the management is depressed and couldn't give a damn any more then it's going to translate down to the work force isn't it. So at the end of the day we've got to keep motivated. Our senior managers have got to keep us motivated.

R1: I'll make a note of that…

R3: As far as quality goes you've got no excuses nowadays for doing work lacking in quality

R1: I think with your managers. Your managers are you're tried and tested team players really. They're the ones that I don't believe will let you down, because there's a certain pride that comes with a manager. He doesn't want to go away with a poor reference if he does leave the company and if he's been with you for a while, he's going to rely on your reference as well so it works in that way. There's a pride in finishing a particular job, if he's got a good relationship. Er from a trade point of view, if there is a month left on *(referring to R3's)* job and somebody is offering him 6 months' work somewhere else, I'll say I wouldn't want to miss that so *(referring to R3)*, you'll have to find someone else for your last month, thanks ever so much, I really appreciate it but I need to think about the Mrs, my kids and that so you'll always get people that will have to make that judgement call on the balance of how much work he's got as opposed to that chap over here and it might not be better payment terms however it's 6 months' work and that'll get me through Christmas and through the winter.

R3: [unclear]

R1: I think the key is motivation and keeping people motivated. You can be at the bottom of the premiership you can still battle every Saturday for 90 minutes, I know that.

I: Which team are we referring to?

R1, R2 & R3: Unclear

I: They're going down.

All: Laughter

R1: Could be worse, I could be a wolves fan.

R2: Ok enough said.

I: Ok, ok, again an opportunity if you want to take a phone call. So having got that depression through, too much of a good thing?

Changes to government legislation have led to all people in organisation being compelled by law to minimise their buildings carbon emissions. This development, coupled with already positive societal attitudes towards environmental sustainability results in a strong and stable increase in private and public sector demand for sustainable energy products and services. Confidence on investors and finding providers in the sustainable building industry increases tremendously. Due to the favourable business environment Inex find that order for its sustainable energy services have increased with a further steady growth in demand expected in the future. The company's capacity utilisation rate rises over 100%. The company comes under greater pressure to respond to company orders on time whilst also focusing on product services and process improvement. So, everything is going well, you to some extent can't cope because it's so good. Inex finds itself needing to make changes to its workforce, inventory, finance, facilities and supply chain and other relationships in order to expand its operations in order to meet increased demand. You're going for it!

R2: Yes, first thing there is confidence. The investors and funding providers is not a bad thing so you go straight to them don't you. Have a chat with them and find out, test the water if you like. See what they've got to offer and what we've got to offer them.

R3: in terms of the market share you mean?

R1: yes, well you've got the funding providers – they're obviously the banks aren't they, normally.

I: Yes, yes.

R2: The bank has got to be on side straight away, if they've got confidence already [unclear]

I: What we're talking about is probably doubling your business. In a year. What do you do? Buy yourself a new car…

R3: I think what we'd have to do, I mean there is an expectation this year to do, I wouldn't say to double our workload but we probably might increase it by 40-50% if we can realise our potential. If we had to increase it by 100%, are we saying we need to do that? I don't think we would say we would?

I: It's your call

R3: Ok, I'd say we'd look at whether we could deliver the project and take home what we're happy to achieve, because depending on the cost of the erm the work, we wouldn't get the credit limits [unclear] so I think you've got to take that into account in terms of taking on what work you're saying you're going to take on.

R1: I think if this came through as one single contract and it's an either take all or take nothing, there's a little clever answer to this, and that is we look at what the programme is, we look at the value we can achieve, and we say we can do 60% of that contract [unclear]. I would like to think that we've got sufficient relationships with our supply chain that we could then cut and carve that contract up and share that under a [unclear] arrangement with other partners. So we wouldn't say no but what we would do is deliver to our capacity so we take that out and what we do is take that out is sit down and come up with a JV Arrangement with other organisations of similar kilter to us and say look you know, and what we could do out of that is take a small percentage of a finder's fee or whatever you want and we could then pass a section of that work to that particular supply chain member, knowing they've been vetted and their capability and capacity and offer them the opportunity to work with us / alongside us with their own arrangement maybe with the client or with a model where the finance comes to us and back to back arrangement where it goes straight back to them so that there's not real constraint on payment. I think we could probably deliver 100% on something like that.

I: That's a really interesting answer, can you explore it more, who would you go to, who do you know. Maybe unfortunately you could name, have you got enough to do that?

R1: I think our supply chain is quite diverse in its capacity. I think we've got people we like working with that [unclear] to an organisation that might have 40-50 people working for them who have a nice little industrial unit or something they've invested in as part of their pension fund and they've got some nice little offices somewhere who are a true SME, a professional SME so you've got everything in between the little man with a couple of people to the more sophisticated. I've been looking at organisations that comes in and works under us in terms of delivering the project to our ethos, so I'd like them to be partners but not 100% equal, just slightly below so that we the final say on the strategy and the ethos, we want the whole 100% completed in the Inex way. Our service is 100% and it's reliable

and it gets us 70% of the business. So I'd want them to come in on there but I think that's just setting out the arrangements to do that but we could choose any amount of supply chain people to come in and do that.

R2: Systems suppliers have their own preferred contractors as well so you could draw off their supply chain as well

R3: Yes

R1: And we could again, we could look at erm the materials supply. We could say is there a better way that the client could er utilise the supply chain from the manufacturing the materials side in a different way where they could use it within their own volume potential. So if they're buying similar material elsewhere in their organisation how can that come in where they actually have the relationship direct with the supplier and they supply the material. That would take a massive pressure out of the cash flow scenario. So not only with the resources supply chain…

R3: You've got, potentially you're going to double your business, you've got [unclear] suppliers such as *(name withheld)* [unclear] these people would be very interested in forming relationships with you. I'm sure as long as you've got it on paper that you know [unclear]

R2: If you went back to the client and said, 'Look, 30% of the contract value is material, why don't you have a joint arrangement with ourselves, you supply the material people?', and what we'll do is create a profit level within that so we'll get best value, we'll get a little profit level and we'll split the value of that profit level between the 2 organisations. That gets the extra 30% of the financial impact on the business out of the equation. Nobody is unhappy because they'll all get paid on time, they're going to get paid from a bigger organisation than we are, so there's going to be a lot of reliability within that and therefore we could use the supply chain now in a slightly different way where they're actually just working for us to top up the resource side of things.

I: And the ethos you mean not just quality like environmental [unclear] systems

R1: Yeah so if you look at the way um I like to think the boys and girls that deliver out there. Being honest not normal cases but the majority of cases they do it with a lot of passion, certainly the managers and the team that are directly involved. They're passionate about it. It's not the sexiest part of the industry but they're very passionate about it and the give it 100% every day. That's what I'm looking for, for people just to give 100% and they do, the guys at [unclear] do that, and that's why we do well. It's good customer service, proper old fashioned customer service. It works every single time. So that, I think that Ben to answer your question that's what I'd be looking for. I don't want fancy [unclear] manuals and software I want you know people to turn up and be passionate about doing the boxing in

in the corner of whatever it is. Doing it on you know, I'm working on a very poor property and that boxing is the best thing in here, and that's how it should be.

I: And I suppose we have to ask about the training issue, you know. Are we then in a situation where the industry as a whole is going to have difficulty in supplying, probably on the materials side but certainly on the labour and workforce side. So what do you do about that?

R2: [unclear]

R3: I suppose what we'd look at and again going back to the programme the outputs overall. I mean we're quite clever at understanding what opportunities can arise. There's work experience for one, and that's short term bits, coming to work and interacting with other people and so on and so on.

R1: There's the back to work scheme as well…

R2: training schemes where you get someone for 6-12months, so short term opportunities. And then with a project like this I'd suggest that we look quite carefully at apprenticeships so that we can bring in long term training opportunities

I: And build it around your joint venture?

R2: Yeah

I: So it made it more substantive, the experience

R1: And also from a company point of view, it needs to also engage external to the business in other organisations that actually show these markets are coming from and what skills are required to do it. I think that gives us a slight advantage that we are actively involved outside the business and we're involved with the parties that are actually setting the strategy for how these projects are going to be delivered. I think that helps us a little bit, that gives us a slight advantage I think on what markets are coming down specifically.

R3: There are a lot of [unclear] developers out there as well aren't there? That bring their work force to work for you. [unclear] Drop all their trainees off which again takes the pressure off you.

I: You could make that part of your joint venture

R2: Yeah

I: Then because you know that will be a problem.

R3: I think, you know, again, on a specific project that was going to raise your capacity or your opportunity by a present of that level I would expect that the client would have expectations of the

business to sort of erm come in line with some sort of corporate social responsibility outputs within that. I think we've got a good handle on how we would deliver that in terms of work experience, trainees and apprenticeships. So if you look at one thing then you always buy one thing, so you've got to look at the different ways, even on the short term you can still offer work experience to somebody, and individual benefits…

R1: It might be an idea to set up a separate side of the business looking after that sort of area of training, providing training programmes for people and you know obviously we don't want to neglect people that are showing promise as managers. We want to provide them with training as well as apprentices or day release and it might be [unclear] to identify talents [unclear]

R2: So you can go to one and say how much is that going to cost for that CSCS card and its 70quid there, 65 there, 50 quid there. But you're going to get exactly the same so, well Jim's doing it for £50, oh well we'll do it for 50 quid and you know you got to have that sort of business prowess about how much training costs as well and who is going to get you the best deal towards training. That has an impact on how many people you can take on as well, so if you can get funding for an apprentice that keeps the costs minimal and what we get then is the benefit of another pair of hands that can be productive on a construction site. If we do all the things around safety and mentoring and things that you should do within an apprenticeship, you'll end up with a person that is fit for purpose eventually.

I: What about at the other side about materials, um, when things expand like this the um manufacturers can't deliver? Um, how would you manage that, you know, you've said you're going to finish this contract but you can't get the materials.

R3: I think that comes down to, as *(referring to R2)* said earlier on, programming. You're programming in your work load.

R1: To the lead times of what the supplier can supply to

R3: Yeah your supplier has to agree to that you know, if not you could use two suppliers for the same material if you like.

I: What could happen are things like you know you're being obliged to use some environmentally secure supply route that is all recorded, I forget what British standard number it is, which one is the environmental supply chain British standard? Don't know! Anyway, you've got to deliver, you can't get it through that, temptation to go and get it somewhere else?

R2: Well, there are different methods aren't there, the provider is saying you're looking at carbon emissions, you've got different systems from different companies that will achieve the same values. So as long as…

R1: You've got to have it approved by the client though.

R2: [Unclear] both different systems but both providing the same outcome.

I: I've got ten container loads, just out there, [unclear]

R3: It'd be worth looking at in respect of is the material the right specification, is it BAA accredited or if it's there and you just come by it in terms of an accident where it's over from another job or something or if it's coming from china or something like that and it's got not badges on it say steel on the side of it but steel is spelt wrong or something like that you know then [unclear, phone vibrating]. I suppose an example of that is the amount of kitchens, the units, you could get another kitchen range from any amount of kitchen manufacturers that are out there.

R2: I wouldn't do it

R3: Not without the client agreeing to it

R1: Honesty is 100% the best policy

R2: The cost to the business would be far greater that all that you've saved

R3: And if it failed, not only have you lost the face with the client

R1: You've lost your reputation

R2: 2 minutes to lose your reputation, 2 years to rebuild it.

I: So even though you would lose your reputation for not delivering you would prefer to do that than deliver with a

R3: Substandard?

R1: I would rather….

R2: I think the controls there are out of your hands there really you've got to bring that to the client's attention and er you know, come clean and say we can't do it because we can't get the materials

R3: Yeah,

R1: And these are the alternatives

R3: I think this is where…

R2: Twist it back on them, let them make the decisions,

R1: Yeah, it's where your relationships come in. If you build up good relationships from day one with your client you can have an honest conversation with them, that's worth gold that is. It really is because sometimes they'll have problems and they'll unload them to you and we'll sort them out and get them over it and recover it for them but there's other times when we'll have problems like that and you need to have that honest conversation and you know through various contract arrangements that I've worked with like PPC 2000 where partnering is encouraged, everybody has a problem at some point during a construction, the lift is not coming until ten weeks after the PC, the escalators are not coming until next year because of whatever. You find ways of [unclear] goes out to the factory in china and get a night shift put on so that your escalators are made and put on the next boat or whatever. It's things like, it's about how much effort you're prepared to put in to resolve the problem.

R3: if you're standing there debating 20p in a £20000 valuation, you're not going to foster very good relations are you. When you come and you've dropped a bit of a 'tater [potato] and you've not allowed enough for the mixer or something like that at the end of the job and actually you owe the plant hire company 200quid but any chance you can help me out…I don't think so. It does work. I've seen it work quite well in the past to be honest. Everybody has problems on construction and you need your friends.

I: So even in times of economic [unclear], in terms of a process, you wouldn't consider maybe er now extending your lead times? After all you can literally afford to [unclear]

R2: Er, yeah, yeah. That's a good point actually, that's a good point. I actually, after what we've just come through Ben. I would always work as if you're working on recession. I think that's the lesson for the future. If you want a business that's going to sustain itself, always believe that you're in some sort of recession and you need to be very careful about it. You're right you could extend things out, but I'd rather keep it as a tight model. If nothing, we've learned some very hard lessons through the recession and I think as soon as boom, I don't think boom will come back, I think it'll get better over ten years maybe, and it'll steadily grown. You won't necessarily feel an immediate impact, I think it'll just grow steadily and in ten years' time it might feel a lot better. Whether it's a boom or not I'm not sure but it'll feel a lot better and things will feel more settled. But I think businesses as a whole, certainly your banking, they're doing it now, they'll be looking at what their business model is for the future in terms of how do we stop that from happening again. What mechanisms, because we all went along thinking the world would never end, and it did didn't it? Very, very quickly. I think you've got to have that in your mind, I think we just got lazy, everyone made so much money It didn't matter. The window was open and the heating went out.

R3: There was an element of greed there as well wasn't there? You've got to be aware of that in the future.

R1: Yeah, what we need in business is every person in the business to think that it's their own money that they're spending. If everybody did that, there wouldn't be much waste about

R1, R2 & R3: No.

I: what we know though is that there will always be a company that when there's an expanding market somebody will come in and offer what you're offering cheaper.

R1, R2 & R3: Yes

R3: but they're twice as likely to fail and…

R2: That's happening right now, we're competing against erm…

R1: We've had it haven't we?

R3: Yeah, there's a lot of um people coming in from all over Europe that are coming in as skilled tradesman, even from Ireland as well coming in because their own economy is absolutely on the floor, they're coming in and they're coming in at 30% less the rates. So that is very enticing for clients, but what clients need to be fully aware of if that they're not necessarily going to get the competence or the warranties, or cause these guys will come and they'll do it, 'well where's Jim who was here last year that did this because it's coming off now', 'well I dunno he's gone hasn't he'. It's up to a client. The client needs to be astute about what they're buying

R2: This is where your reputation and relationships

R1: You get what you pay for…

R3: Your relationships on previous jobs projects, they stand for a lot you know

R1: We can't stand here and say "That's the rate governor" we have to say this is a fair rate for a fair days work and it's based on these efficiencies that we've created within the business. You know, I like our business because there ain't nobody that stands around doing nothing. You know and yeah, we wear several hats each of us every day but we work bloody hard but the point is everybody is committed to the business. We've created that team that everybody is committed, everybody wants to do that.

R2: [unclear, laughs]

R3: I think that comes across to clients and that's an intangible for clients. It's not just the price, it's about that passion and I think when we go out and interview for projects I think we do fairly well because I think they can see that we're passionate and committed to what we do

I: I think it's an interesting thing to maintain your values, both when things get bad and also when things get good.

R3: I think what we've also created through the [unclear], we've created these Rolls Royce models of delivery. Say you've got all of these corporate organisations that when you go and buy something for a thousand pound, most of that money goes in to all these people who are in offices, the health and safety support, the erm bin manager, HR manager. You're buying all this, the contracts manager who has got a fancy car, the site manager who has a fancy car, and a pension and a medical [unclear]. And you've got this big fat layer and you're not actually getting value. You come back down to us guys…you get none of that…but you get the best people

R1: [unclear]

R2: I these guys, the corporate side of things, have got too fat. Where I think the smaller end of the business of the construction industry has actually learned to survive and lived off the allotment if you like. Rather than…

R1: I think most people have been through …had a bad experience, haven't they, and they want to do their best to stay out of that situation.

I: Ok, as your last little task we've got a feedback form. I'm sure you've all through the [unclear] before. But what we'd like you to do is just sort of, and if you can do it individually, we're partly interested in doing this as research but we also think that these sort of activities actually could be useful for your company so maybe the first one is maybe is there anything that you've discussed together that, well, that's interesting! I think that's of value to the company and secondly you know, can we do this exercise better, you know tell us what wasn't good, what would be better, you know that sort of thing and that's the second question so there's no marks for this.

R1: We don't pass or fail on this?

I: No

A2 AUTHOR PUBLICATIONS

A2.1: Onyido, T., Boyd, D., Thurairajah, N. (2014); The Implications of Supply Chain Localisation for the Evolving Sustainable Energy Products Markets in the UK Built Environment; Paper presented at the CIB 2014 International Conference on Construction in a Changing World*;* Henritance Kandalama; Sri Lanka; 4-7 May 2014

Abstract

This paper was written to explore the viability of supply chain localisation as a strategy for minimising possible adverse environmental and social impacts of large-scale economic activity surrounding the production of sustainable energy goods and services. Supply chain localisation here refers to the situation of production activities close to the geographical areas in which the sustainable energy products would eventually be installed. Sustainable energy products refer to technologies and other goods and services that minimize negative environmental effects of energy use in buildings throughout their construction and habitation. The paper dwells on the outputs of a major energy-efficiency project that focuses on preparing for the Green Deal – a UK-wide housing retrofit initiative – and the attendant increase in economic and industrial activities that it is expected to generate. As part of measures to ensure that these activities yield minimal negative environmental and social effects while optimising economic benefits, project participants recommended the localisation of the supply chain for the production, installation and maintenance of sustainable energy products. Based on the primary research conducted on the project as well as secondary research sources, the paper discusses the economic, social and environmental benefits and detriments of the supply chain localisation agenda. It also looks at the overall practicality of the implementation of supply chain localism within the context of mainstream business practices in the property, construction and energy sectors.

Keywords: Supply Chain, Localisation, Green Deal, Sustainable Energy Products, United Kingdom

Introduction

Environmental concerns over negative impacts of energy generation and usage on the ecology, coupled with economic/political concerns over the volatility of fossil energy prices and unstable relationships with some crude oil-producing nations, have long since been increasing the UK government's emphasis on energy conservation, carbon emissions reduction, and a shift towards renewable energy sources (Brown, 1996). Within the UK built environment, a recent reflection of this trend is the commencement of the Green Deal programme, a government initiative aimed at retrofitting the country's residential building stock with a range of sustainable energy products that includes insulation, window-glazing, low-energy lighting and heating, 'smart' and automated energy control systems, and renewable energy technologies such as solar photovoltaics, wind turbines, biomass boilers, and geothermal systems. In addition to its intended socio-environmental goals of fuel poverty reduction and energy conservation, the Green Deal is being actively promoted by the government as a major opportunity for the creation of new businesses and the stimulation of economic and industrial growth (DECC, 2010).

Due to their role in reducing adverse environmental impacts of energy use, organisations that are involved in the provision of sustainable energy products for buildings are commonly associated with the 'green economy' and its attendant focus on ecosystem preservation and social development (Placet et al, 2005; Brand, 2012). However, previous research suggests that the application of traditional business practices to green building initiatives could give rise to the following risks: one, new environmental and social problems could arise in the process of solving existing ones; and two, the sustainable energy products could fail to achieve the expected level of technical performance if not installed in the right manner (Schmidt, 2003; De Simone and Popoff, 2000). This is mainly because traditional, mainstream business practices are based largely on economic considerations, with environmental performance and social success having only secondary relevance (Isaksson et al, 2010). It is conceivable that a combination of the aforementioned risks could lead to a worsening of socio-environmental problems associated with the use of energy for the construction and operation of buildings, damaging investor and consumer confidence within the still-evolving UK market, and thus discouraging further uptake of sustainable energy solutions.

Perhaps in awareness of this situation, a number of organisational networks, research institutes and think-tank groups have planned and are planning the development of a major industry around the Green Deal which will be economically, environmentally and socially viable all at once. One such initiative is a major energy-efficiency project based in the West Midlands and made up of members of several organisations from the construction, energy, housing, local/regional authority, and education sectors. The project focuses on the challenge of developing the supply chain, skills,

resources and market demand for the Green Deal, and of optimizing economic, environmental and social returns from this activity. One of the outcomes of deliberations within the project was that the supply chain for the manufacture, installation and maintenance of sustainable energy products for buildings should be localised. Based on the project case study as well as literature sources, this paper attempts to explore the supply chain localisation concept and analyse its economic and socio-environmental implications.

Supply Chain Localisation as a Resurgent Practice

Alaane and Saari (2006) present the concept of localisation of the manufacture and distribution of energy products as one that has come round full circle, a resurgent phenomenon that is a reasonable alternative to the practice of globalisation and its attendant environmental and social detriments. However, the existing body of literature that offers an exposition on this perspective is quite limited. Practical applications of supply chain localisation to the commercial provision of sustainable energy products appear to vary depending on the nature of the energy product, technology or service in question. Nor does there seem to be an established, quantitative definition of localisation in terms of distance or other geographical terms, e.g. how far away from its eventual point of use can a sustainable energy technology be produced before its production can no longer be described as 'localised'?

In general though, localisation refers to the improved utilisation of local resources in energy systems, and it could take the form of local fuel harvesting and storage, the promotion of local business opportunities, and the development of products and services based on local raw materials and labour (Alaane and Saari, 2006). Within the renewable energy sector and indeed other economic sectors, a prevalent trend has been western firms' location of their manufacturing – and ever increasingly, research and development – infrastructure in countries like India and China (Cusmano et al, 2010; Christopher, 2005). Lewis and Wiser (2007) report that notable wind turbine manufacturers from major western markets such as USA, Germany, Denmark and Spain first grew and developed a stable base within their home countries before eventually relocating their facilities to China, India and other developing economies. If the home countries provided a conducive business climate for these companies to grow and stabilise to begin with, then why did the firms choose to relocate their production activities?

Within the late 20th century, a tendency grew among manufacturing and service companies to achieve greater specialisation of their functions (Kim, 1995). Outsourcing of tasks that fell outside their core competencies became a way of realising this (Humphrey, 2003; Nassimbeni, 2003). According to Perrot and Filippov (2011), within the renewable energy sector there was also the issue of high operational costs that characterise markets like wind and solar, and which make the

markets dependent on production incentives, local subsidies and tax benefits. Thus, sustainable energy companies became attracted to the low-cost advantages and large market size in emerging Asian economies, the relatively adequate level of existing skills and facilities there, and the previous success of destination countries like Taiwan and China in the manufacture of semiconductors and microchips; the stagnation of western markets at intervals between the 1980s and the current decade further catalysed this trend (Perrot and Filippov, 2011).

All through this period of off-shoring, however, locally manufactured products retained their reputation for offering shorter lead times and higher quality assurance, and in more recent times, there appears to be an increasing interest among governments and businesses in parts of the developed world in encouraging localised production (Melani, 2006). Straka (2002) offers a political perspective on the reason behind the re-emergence of localisation in the energy sector in particular, stating that concerns over political conflicts in some of the major crude oil-producing nations and their attendant risk to supply chain security heighten the need for other countries to focus on the development of local energy options. Another common social argument against the 'internationalisation' of companies' operations is that it results in the loss of jobs in the companies' home countries (Li, 2005; Hamilton & Summy, 2011; Alaane & Saari, 2006). However, Perrot and Filippov (2011) suggest that the transfer of functions such as research and development to overseas locations is not always a 'zero-sum game', as it does not by default lead to the closure of corresponding jobs in the home country. Other reasons that are attributed towards the support for localisation include rising labour costs in developing countries, rising energy costs, the export-import balance, currency depreciation, and the leaning of public attitudes towards environmental protection and social responsibility (Ristola & Mirata, 2007; Longo et al, 2008; Sheffi, 2001; Walker, 1995). The Economist (2012) reports that with a 5% p.a. inflation rate in shipping costs and a wage inflation rate estimated at 30% p.a., by 2015 it will be just as cheap to manufacture in North America for the domestic market as it would be to manufacture in China.

Case Study of an Energy-efficiency Project

The Green Deal and ECO are UK governmental policies aimed at encouraging the widespread implementation of a diverse range of sustainable energy products across the country, from insulation to window glazing to low-energy lighting and heating systems to renewable energy technologies, and it went 'fully live' in January 2013 (Richards, 2013). In order to investigate how the production and installation of sustainable energy products for buildings can be expanded to become a significant UK industry through the Green Deal, while minimising possible adverse environmental and social impacts of such a large-scale economic action, this author became involved in a major energy-efficiency project in the West Midlands County. The project focuses on developing supply chain, skills, and finance and other resources in preparation for the Green Deal

and Energy Company Obligation (ECO) programmes, and on optimizing the economic, environmental and social returns from this activity. In this regard, the project represents a situation in which the economic activities involved in the provision of sustainable energy solutions for buildings are actively considered within social and ecological contexts. The project is made up of representatives of 30 organizations from the construction, energy, and property sectors, most of which are involved in the procurement, supply, installation and/or maintenance of sustainable energy products in buildings. The project also includes the contribution of big UK utility companies such as Eon.

The study of the project for the purpose of this research began in February 2012 and concluded in August 2013. The study involved not only listening to, watching and recording the verbal and written interactions that took place among participants, but also the participation the researcher in these interactions. This was in order to gain first-hand knowledge and experience about the planning and decision-making processes involved, and also to gain the confidence of the other participants and ensure that the researcher's presence would not alter how they responded to issues. This field research technique of participating in a culture or context while at the same time recording what is being observed is identified as participant-observation in several research literatures (Iacono et al, 2009; Trochim, 1999). To ensure that the researcher's presence in the project would not compromise the reliability of the data obtained, the researcher's participation was limited to a relatively minor role. This involved carrying out instructions given by complete participants, i.e. staff from member organisations of the project, rather than contributing an independent perspective. Thus, the outputs of each session were based on the contributions of the other participants and did not reflect the researcher's own views. To establish consistency, care was taken to maintain this approach at a constant level for the project's duration, without the researcher becoming more active. Empirical qualitative data was obtained during participant observation via the recording of field notes. Also, other important documentation created by the participants during the course of the project – such as formal reports about the outcome of each project task – were obtained as additional evidence.

In addition to participant observation, interviews were also conducted to determine the effects that a company's implementation of environmentally and socially responsible practices could have on its business capacity. The interview respondents were the management-level company representatives involved in the energy-efficiency project. This ensured that the respondents had expert perceptions of business development and its relationship with environmental and social responsibility. The interviews were semi-structured, as this provides consistency while also allowing a sufficient degree of freedom and adaptability in getting information from respondents (Haigh, 2008). In all, 20 interviews were conducted, at which point 'saturation' – new data fitting

into categories already devised from old ones without introducing any new category (Charmaz, 2003) – was considered to have been achieved.

Research Findings: Supply Chain Localisation as Part of a Socio-environmental Business Strategy

The observation of the energy-efficiency project indicates that supply chain localisation is viewed as a useful measure that could be taken to ensure that the expansion of commercial provision of sustainable energy solutions for UK buildings does not create new environmental and social problems. Possible new environmental and social problems that could arise as a result of the expansion were identified in the programme as the following: the production of sustainable energy technologies and other products could result in new emissions releases, energy losses, and waste generation across the products' supply chain; the wholesale installation of sustainable energy solutions could have a disruptive and invasive effect on existing housing structures, fittings and occupants; and energy costs could be increased rather than reduced.

While the invasive and disruptive nature of the installation of sustainable energy products in buildings appears to be temporary in scope, lasting only for the duration of the installation process, project participants felt that it could nevertheless serve as a disincentive for building occupants to view sustainable energy solutions favourably. The prospect of an increase in energy costs was attributed by participants to the inability of the current electricity grid network to absorb additional power from solar PV and other micro-generation technologies. This presents a significant case of sustainable energy solutions creating a social effect opposite to that which was intended, i.e. the alleviation of fuel poverty. The risk of an increase in emissions, energy loss, and waste as a result of the intensification of production activity was also acknowledged by the participants, as was the underperformance of sustainable energy products in buildings due to the inadequate integration of the products with the existing building facilities and the behaviour of building users.

In order to prevent the occurrence of these environmental and social risks, participants endorsed the localisation of the supply chain for sustainable energy products. They also recognised other measures such as whole-life costing; the reorientation of skills; a 'whole-house' approach; and the inclusion of building users in the capacity development process. All five measures are further highlighted in the paragraph below.

The participants appeared to share the view that the adoption of supply chain localism for the implementation of the Green Deal has the potential to stimulate UK economic growth to a significant extent. The creation of new businesses and employment and poverty reduction opportunities in Local Authority Areas throughout the United Kingdom was identified as a major

potential benefit of supply chain localism. For instance, participants were observed to target the Not in Education, Employment or Training (NEET) section of the populace as a source of new members of a multi-skilled workforce for the Green Deal. The NEET category's current lack of work experience, as well as the need for sustainable energy products to be installed and maintained with minimum social disruption and optimum technical performance, led the participants to propose the reskilling and multiskilling of the workforce. They also proposed that building occupants and other building users should be engaged in the capacity development process in order for their perspectives to be obtained on how sustainable energy solutions can be installed with minimum disruption to their lives. However, the skills training and setting of up of local supply chain activities require a high level of financial investment, and so the participants recommended a 'whole-life costing' standard that particularly highlighted the economic benefits that might accrue to the companies in the future to offset the initial investment costs. The aim was to encourage companies to take a longer-term view of the business rather than seek quick economic wins. In addition, the participants supported the adoption of a 'whole-house' approach that focuses on the integration of different sustainable energy solutions within buildings (rather than on the efficiency of any single solution in itself), in order to ensure that different solutions fully complement each other.

Beyond the social and economic rationale behind the participants' support for supply chain localism, there also appeared to be environmental reasons as well, in terms of the need to minimise the energy, emissions and waste issues associated with procuring, transporting, installing and maintaining both production materials and finished sustainable energy products. The participants were of the view that the localism approach would allow for a closer monitoring of the production and delivery of sustainable energy solutions to guarantee that only minimal or zero harmful environmental impacts are yielded.

The interview data suggests that companies acknowledge local sourcing and procurement as a major way by which they can implement socio-environmental responsibility. The interviewees acknowledged the role of localisation in reducing the embodied energy of sustainable energy solutions (the energy consumed in the process of sourcing, producing and distributing them), carbon emissions, and negative social impacts. As one interviewee put it: *"If you are sourcing locally, you've got a little bit of comfort that …the product itself is being manufactured in the right kinds of ways"*. Another questioned: *"What's the carbon emissions to bring that piece of material from China? ... That could be a substandard material and it's not got the lifespan that you think it's got and then you've got to dump it anyway"*. However, interviewees emphasized that finance is a significant barrier to the development of business capacity for the implementation of supply chain localisation and other measures recommended during the project. One interviewee mentioned that *'There's a lot of investment required for new manufacturing facilities'*, while another states that

'The costs are more upfront as well …which is what the stumbling block, I think, is'. Environmental and social criteria were also found to increase the intensiveness of materials specification and add to the overall complexity of the procurement process. Local partners may not always offer the financial quotes, however, and this means that the company may have to forego cheaper partnership options. Apart from this, a conflict is set up between the environmental business value of localism and the mainstream business practice of globalisation. The emphasis on localisation may also require a company to forego expansion opportunities. For example, an interviewee states: '*We could have had the model of being the biggest nationwide installation company covering the whole country, but I decided …that wasn't the best model. The better model is for there to be an installation company in every town or village or wherever …it creates local employment'*.

Supply Chain Localisation and Its Consequences

The data obtained from the project case study indicate that the localisation of the sustainable energy products' supply chains has the social benefit of creating new jobs, and it also provides extra income for building occupants through their sale of surplus electricity, which in turn serves as an incentive for the public to use energy more efficiently. Environmentally, it allows for greater monitoring of production activities to ensure that they yield only minimum adverse ecological effects, and it reduces the distance across which products can be distributed, thus reducing the release of carbon emissions in the case of fossil fuel-based transportation. These findings are supported by literature sources (for example, Hamilton & Summy, 2011, and Ristola & Mirata, 2007). Rio and Burguillo (2009) mention that the social benefits of the localisation of renewable energy production activities extend beyond employment creation to impact on social cohesion, education, income distribution. Localisation also acts as a disincentive for emigration, and in so doing it indirectly alleviates environmental problems that are connected with the depopulation of rural areas, such as desertification and erosion (Rio & Burguillo, 2009).

Despite these benefits, there are wider concerns surrounding the feasibility of localisation. From an economic angle, the infrastructure required for the setting up of a completely local manufacturing base involves a high level of initial investment, as identified by participants in the project case study. The situation is further compounded by the ambiguity that still surrounds the funding mechanism for the Green Deal, as well as by the insufficient security of market demand which makes such a high volume of investment harder to justify (Laughlin et al, 2012; Wustenhagen & Bilharz, 2006). There are also lingering issues concerning the disruption that a wholesale transition to localisation could cause the industry, which currently operates on a more globalised, neo-liberal market system and relies significantly on the procurement of sustainable energy technologies from China and other external markets, as noted by project participants. These viewpoints on the economics of localisation are echoed in literature as well (e.g. Omer, 2008; Sawin, 2006). Even in

the case of biomass energy systems, which benefit from the local availability of feedstock, Lam et al (2010) state that extensive infrastructure networks are required for harvesting, transportation, storage, and processing activities, and the relatively low energy output produced per unit volume of resource increases the cost, emissions and complexity of supply chains (Lam et al, 2010). Richard (2010) indicates that independent local suppliers may only be adequate for small-scale energy generation activity; a more practical alternative to regional or global market arrangements is the operation of single companies on large contiguous land areas in order to achieve a less fragmented but distributed approach. However, this system comes with problems associated with land access and appropriation and employee rights; and there is also the issue of setting up contingency plans for backup suppliers (Richard, 2010).

The limitations of the supply chain localisation concept aren't just confined to the social and economic fronts either. Environmentally, there is counter-evidence to the view that localisation is truly beneficial in an ecological sense. If global energy consumption remains unchanged and traditional fuels and technologies are still used, the volume of emissions reduced by decentralised renewable power plants in particular would remain constant rather than rise (Alaane & Saari, 2006). In other words, the localisation of energy generation may redistribute global emissions but not reduce it. In regard to this, the intensification of local manufacturing and other production activities within the UK could cause a setback to the country's achievement of its energy and carbon emissions reduction targets (Anderson & Fergusson, 2006; Tsoutsos et al, 2005). Furthermore, the potential benefits of localisation with regard to resource conservation are also liable to be exaggerated because assessment studies do not always fully take into account supply chain-related processes that take place outside a given location (Albino et al, 2002). Putting the whole picture together, while localisation can yield significant environmental and social benefits, there is also an active risk that the localisation agenda could well disrupt supply beyond the short-to-medium-term and have major negative economic repercussions for the industry, thus jeopardising its socio-economic potential without guaranteeing significant positive net energy and carbon impacts.

Conclusion

This paper has looked at the potential of supply chain localisation to minimise adverse environmental and social impacts of the provision of sustainable energy goods and services on a major scale. The paper relied on a case study of a major energy-efficiency project within the West Midlands, United Kingdom, as well as on a study of literature. While supply chain localisation was found to represent a sustainable business option in principle, the scope for its application remains limited and reliant on standard policy tools such as subsidies, tax reliefs and other regulatory measures that could significantly lower the cost of doing business in Britain. Future studies could

focus on how to resolve the barriers to supply chain localisation rather than simply promoting its benefits.

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Abstract

This paper was written to explore the viability of supply chain localisation as a strategy for minimising possible adverse environmental and social impacts of large-scale economic activity surrounding the production of sustainable energy products. Supply chain localisation here refers to the situation of production activities close to the geographical areas in which the sustainable energy products would eventually be installed. Sustainable energy products refer to technologies and other goods and services that minimize negative environmental effects of energy use in buildings throughout their construction and habitation. The paper dwells on the operations of a major energy-efficiency programme based in the West Midlands, UK, which focused on preparing providers of sustainable energy products for the Green Deal—a UK-wide housing retrofit initiative—and the attendant increase in economic and industrial activities that the Green Deal is expected to generate. Participant observation and interviews were used to conduct a study of the programme. As part of measures to ensure that Green Deal-related activities yield minimal negative environmental and social effects while optimising economic benefits, programme participants recommended the localisation of the supply chain for the production, installation, and maintenance of sustainable energy products. The paper examines the programme outputs and focuses particularly on the concept of supply chain localisation. Based on the primary research conducted, as well as secondary research sources, the paper discusses the economic, social, and environmental benefits and detriments of the supply chain localisation agenda. It also looks at the overall practicality of the implementation of supply chain localism within the context of mainstream business practices.

Keywords: localisation, supply chain, Green Deal, sustainable energy products, United Kingdom

Introduction

Environmental concerns over negative impacts of energy generation and usage on the ecology, coupled with economic/political concerns over the volatility of fossil energy prices and unstable relationships with some crude oil-producing nations, have long since been increasing the UK government’s emphasis on energy conservation, carbon emissions reduction, and a shift towards renewable energy sources (Brown, 1996). Within the UK built environment, a recent reflection of this trend is the commencement of the Green Deal programme, a government initiative aimed at retrofitting the country’s residential

building stock with a range of sustainable energy products that includes insulation, window-glazing, low-energy lighting, and heating, "smart" and automated energy control systems, and renewable energy technologies such as solar photovoltaics, wind turbines, biomass boilers, and geothermal systems. In addition to its intended socio-environmental goals of fuel poverty reduction and energy conservation, the Green Deal is being actively promoted by the government as a major opportunity for the creation of new businesses and the stimulation of economic and industrial growth (DECC, 2010).

Due to their roles in reducing adverse environmental impacts of energy use, organisations that are involved in the provision of sustainable energy products for buildings which are commonly associated with the "green economy" and its attendant focus on ecosystem preservation and social development (Placet, Anderson, & Fowler, 2005; Brand, 2012). However, previous researches suggest that the application of traditional business practices to green building initiatives could give rise to the following risks: (1) new environmental and social problems could arise in the process of solving existing ones; and (2) the sustainable energy products could fail to achieve the expected level of technical performance if not installed in the right manner (Schmidt, 2003; De Simone & Popoff, 2000). This is mainly because traditional mainstream business practices are based largely on economic considerations, with environmental performance and social success having only secondary relevance (Isaksson, Johansson, & Fischer, 2010). It is conceivable that a combination of the aforementioned risks could lead to a worsening of socio-environmental problems associated with the use of energy for the construction and operation of buildings, damaging investor, and consumer confidence within the still-evolving UK market, and thus discouraging further uptake of sustainable energy solutions.

Perhaps in awareness of this situation, a number of organisational networks, research institutes, and think-tank groups have planned and are planning the development of a major industry around the Green Deal which will be economically, environmentally, and socially viable all at once. One of such initiative is a major energy-efficiency programme based on the West Midlands and made up of members of several organisations from the construction, energy, housing, local/regional authority, and education sectors. The programme has so far focused on the challenge of developing the supply chain, skills, resources, and market demands ahead of the commencement of the Green Deal, and of optimizing economic, environmental, and social returns from this activity. One of the outcomes of deliberations within the programme was that the supply chain for the manufacture, installation, and maintenance of sustainable energy products for buildings should be localised. The localisation of the supply chain was presented as having the multiple functions of facilitating domestic economic growth, generating new employment, and allowing for a closer environmental monitoring of the production and delivery of sustainable energy solutions.

With all these benefits attached to it, supply chain localisation appears on the surface to be worth considering as a possible route for the sustainable energy solutions industry to expand economically

whilst minimising negative environmental and social impacts. However, while the West Midlands energy-efficiency programme identified the potentials of supply chain localisation, it was less definite about the feasibility and possible adverse consequences of such a move. This paper attempts to explore the supply chain localisation route in broader detail, establishing precedence for it in environmental economics studies, evaluating the current degree of its application in the sustainable energy sector, and analysing its economic and socio-environmental implications.

The next section of this paper touches on the nature and emergence of the supply chain localisation concept with respect to the commercial provision of sustainable energy products and services for the built environment. An overview of the methodology used by this author to investigate the energy-efficiency programme is then presented. Findings from the investigation are provided, with particular emphasis on the project's endorsement of supply chain localisation for the sustainable energy and sustainable building sectors. The practicality of supply chain localisation is then discussed, drawing on both literature sources and the primary research.

A Return to Old Ways?

Alaane and Saari (2006) presented the concept of localisation of the manufacture and distribution of energy products as one that has come round full circle. To illustrate their point, they cite even fundamental examples, such as the collection of wood and biomass for use as fuel within individual houses, as a practice that has origins dating back centuries. In this regard, localisation could be viewed as a resurgent phenomenon that is a reasonable alternative to the practice of globalisation and its attendant environmental and social detriments. However, the existing body of literature that offers an exposition on this perspective is quite limited. Practical applications of supply chain localisation to the commercial provision of sustainable energy products appear to vary depending on the nature of the energy product, technology, or service in question. Nor does there seem to be an established, quantitative definition of localisation in terms of distance or other geographical terms, e.g., how far away from its eventual point of use can a sustainable energy technology be produced before its production can no longer be described as "localised"?

In general, localisation refers to the improved utilisation of local resources in energy systems, and it could take the form of local fuel harvesting and storage, the promotion of local business opportunities, and the development of products and services based on local raw materials and labour (Alaane & Saari, 2006). Within the renewable energy sector and indeed other economic sectors, a prevalent trend has been western firms' location of their manufacturing—and ever increasingly, research and development—infrastructure in countries like India and China (Cusmano, Mancusi, & Morrison, 2010; Christopher, 2005). Lewis and Wiser (2007) reported that notable wind turbine manufacturers from major western markets such as USA, Germany, Denmark, and Spain first grew and developed a stable

base within their home countries before eventually relocating their facilities to China, India, and other developing economies. If the home countries provided a conducive business climate for these companies to grow and stabilise to begin with, then why did the firms choose to relocate their production activities?

Within the late 20th century, a tendency grew among manufacturing and service companies to achieve greater specialisation of their functions (Kim, 1995). Outsourcing of tasks that fell outside their core competencies became a way of realising this (Humphrey, 2003; Nassimbeni, 2003). According to Perrot and Filippov (2011), within the renewable energy sector there was also the issue of high operational costs that characterise markets like wind and solar, and which make the markets depend on production incentives, local subsidies, and tax benefits. Thus, sustainable energy companies became attracted to the low-cost advantages and large market size in emerging Asian economies, the relatively adequate level of existing skills and facilities there, and the previous success of destination countries like Taiwan and China in the manufacture of semiconductors and microchips; the stagnation of western markets at intervals between the 1980s and the current decade further catalysed this trend (Perrot & Filippov, 2011).

All through this period of off-shoring, however, locally manufactured products retained their reputation for offering shorter lead times and higher quality assurance, and in more recent times, there appears to be an increasing interest among governments and businesses in parts of the developed world in encouraging localised production (Melani, 2006). Straka (2002) offered a political perspective on the reason behind the re-emergence of localisation in the energy sector in particular, stating that concerns over political conflicts in some of the major crude oil-producing nations and their attendant risk to supply chain security heighten the need for other countries to focus on the development of local energy options. Another common social argument against the "internationalisation" of companies' operations is that it results in the loss of jobs in the companies' home countries (Hamilton & Summy, 2011; Alaane & Saari, 2006; Li, 2005). However, Perrot and Filippov (2011) suggested that the transfer of functions such as research and development to overseas locations is not always a "zero-sum game", as it does not by default lead to the closure of corresponding jobs in the home country. Other reasons that are attributed towards the support for localisation include rising labour costs in developing countries, rising energy costs, the export-import balance, currency depreciation, and the leaning of public attitudes towards environmental protection and social responsibility (Longo, Markandya, & Petrucci, 2008; Ristola & Mirata, 2007; Walker, 1995). The Economist (2012) reported that with a 5% per annum inflation rate in shipping costs and a wage inflation rate estimated at 30% per annum, by 2015 it will be just as cheap to manufacture in North America for the domestic market as it would be to manufacture in China.

Preparation for the Green Deal: A Project Case Study

The Green Deal is a UK governmental policy aimed at encouraging the widespread implementation of a diverse range of sustainable energy products across the country, from insulation to window glazing to low-energy lighting and heating systems to renewable energy technologies, and it went "fully live" in January 2013 (Richards, 2013). In order to investigate how the production and installation of sustainable energy products for buildings can be expanded to become a significant UK industry through the Green Deal, while minimising possible adverse environmental and social impacts of such a large-scale economic action, this author became involved in a major energy-efficiency programme in the West Midlands. The programme has a formal goal of increasing the uptake of sustainable energy products in both new and existing buildings within the West Midlands in particular and the UK in general. It also focused on developing supply chain, skills, finance, and other resources in preparation for the Green Deal, and on optimizing the economic, environmental, and social returns from this activity. In this regard, the programme presents a situation in which the economic activities involved in the development of business capacity for a range of sustainable energy products for buildings are actively considered within social and ecological contexts.

The programme is made up of representatives of 30 organisations from the construction, energy, and property sectors. Most of the companies represented in the programme are involved in the procurement, supply, installation, and/or maintenance of sustainable energy products in buildings. The programme also includes the contribution of big utility companies such as E.on. During the programme, company representatives frequently came together in meetings, workshops, and other sessions to decide on the type and quantity of resources and skills needed to meet the market demand that was expected to be created by the Green Deal. The participants also planned how sustainable energy products would be sourced, distributed, and installed in buildings, and they worked on putting together a supply chain network for all the activities involved.

Upon gaining access to the programme, the researcher not only listened to, watched, and recorded the verbal and written interactions that took place among participants, but also participated in these interactions as well. This was in order to gain first-hand knowledge and experiences about the planning and decision-making processes involved, and also to gain the confidence of other participants and ensure that his presence would not alter how they responded to issues. This field research technique of participating in a culture or context while at the same time recording, what is being observed, is identified as participant-observation in several research literatures (Iacono, Brown, & Holtham, 2009; Trochim, 1999; Langley, 1986). According to Iacono et al. (2009) and Trochim (1999), participant observation requires the researcher to participate in a culture or procedure while at the same time

recording what is being observed. This is in contrast to complete or direct observation, which involves the researcher being unobtrusive and wholly detached (Iacono et al., 2009; Trochim, 1999). Cresswell (2012) reported that a researcher's participation in the activity being studied could influence the behaviour of the "real" participants. Thus, in order to acquire reliable data, the researcher has to gain the confidence and trust of other research participants in order to minimise the risk of them altering their "normal" behaviour (Snow & Thomas, 2007; P. A. Adler & P. Adler, 1987). This in turn gives rise to the risk that the researcher could be required to perform "favours" for all or part of the group (for instance, the researcher could be put under pressure to support a particular viewpoint), which could run contrary to good research practice (Yin, 2003). Yin (2003) further mentioned that the participant role may require too much attention relative to the observation role, and that the researcher may thus not be able to commit enough time and effort towards recording data or conducting deeper enquiry. Other authors such as Iacono et al. (2009), Proverbs and Gameson (2008), and Trochim (1999) raise concern over the time-consuming nature of observation in general, and the propensity for researcher bias in his/her perception of what is being observed.

To ensure that the researcher's presence in the programme would not compromise the reliability of the data obtained, the researcher's participation was limited to a relatively minor role, carrying out instructions given by complete participants, i.e., company representatives, rather than contributing an original perspective. Thus, the outputs of each session were based on the contributions of the other participants and did not reflect the researcher's own views. To establish consistency, care was taken for the researcher's role to be maintained at a constant level (without becoming more active) for the duration of the programme.

Qualitative data were collected through the recording of field notes about the specific subject of investigation, i.e., the expansion of the commercial provision of sustainable energy products for buildings into a major industry whilst minimising unintended adverse environmental and social consequences (and maximising the environmental-social benefits) of the expansion. The field note has been described severally in research literatures as a written record of what researchers have observed and learnt about what is being studied, and it involves transforming observed interaction into written communication (Pope, Ziebland, & Mays, 2006; Jackson, 1990). The capturing of data by written means was preferred by this researcher due to its unobtrusive nature when compared with mechanical devices such as a video recorder; an audio recorder would have been similarly unobtrusive, but would not have been able to capture the non-verbal gestures and interactions that took place. The effectiveness of field notes in taking account of actions, speech, and text occurring within a dynamic situation, and thus generating more coordinated information, is supported by authors such as Saldana (2009) and Yuan (2001). However, the use of field notes is not devoid of criticism; an oft-cited one is that there is a lack

of research consensus about how field notes should be written and structured (Emerson, Fretz, & Shaw, 2011; Mulhall, 2003).

In order to optimise the reliability of the field note data, care was taken to ensure that the field notes exclusively contained the project participants' actions, verbal and written interactions, perspectives, plans, and decisions that related to how capacity should be developed for the production of sustainable energy products for buildings ahead of the Green Deal. Also, other important documentation created by the participants during the course of the programme—such as formal reports about the outcome of each programme task—were obtained as additional evidence.

In addition to participant observation, interviews were also conducted in order to determine the effects that a company's implementation of environmentally and socially responsible practices could have on its business capacity. Interviews are described by Holstein and Gubrium (2001) as conversations coordinated by someone (the interviewer) with the aim of obtaining information that is relevant to the research objectives. Interviewing is the most common and versatile way of collecting primary data about people's experiences by which the interviewer can probe for responses and examine issues such as motives and feelings (Kumar, 2005; Saunders, Thornhill, & Lewis, 2006; Bell, 1993). It is not without its challenges, however, as a lot of responsibility is placed on the researcher to negotiate an effective relationship with the interviewee in order to yield valid and detailed data that is only minimally affected by human complexities (Haigh, 2008). There is also a risk of bias on the parts of both the interviewee and the interviewer, and of inaccuracies due to poor recollection (Yin, 2003).

The interviews were semi-structured, i.e., they involved the use of pre-set but open-ended questions in order to allow for expansion on points raised by the respondents, and they also left room for additional questions to be asked when necessary (Gall et al., 2003). The semi-structured interview format was selected for use due to its relatively balanced approach, which provides more consistency than informal interviews, but still allows a greater degree of freedom and adaptability in getting information from respondents when compared to structured interviews (Haigh, 2008). In all, 20 interviews were conducted, at which point "saturation"—new data fitting into categories already devised from old ones without introducing any new category (Charmaz, 2003)—was considered to have been achieved.

The field note and interview data were subsequently analysed through the process of coding. Coding involves conceptualising data, elaborating it in terms of its different properties, and relating the concepts that emerge (Strauss & Corbin, 1998). In this way the data was first organised into different subsets, and then related subsets were grouped together under the same category. Information was inferred from each category and then pieced together to generate a statement of findings. The extraction of theoretical output from data in this manner is commonly described as "induction" in literature (Alvesson & Skoldberg, 2009; Flick, 2009; Howitt & Cramer, 2008; Fereday & Cochrane, 2006).

Research Findings

The observation of the programme indicates that supply chain localisation is viewed as a useful measure that could be taken to ensure that the expansion of commercial provision of sustainable energy products for UK buildings does not create new environmental and social problems. Possible new environmental and social problems that could arise as a result of the expansion was identified in the programme as the following: the production of renewable energy technologies and other products could result in new emissions releases, energy losses, and waste generation across the products' supply chain; the wholesale installation of sustainable energy products could have a disruptive and invasive effect on existing housing structures, fittings, and occupants; and energy costs could be increased rather than reduced.

While the invasive and disruptive nature of the installation of sustainable energy products in buildings appears to be temporary in scope, lasting only for the duration of the installation process, programme participants felt that it could nevertheless serve as a disincentive for building occupants to view sustainable energy products favourably. The prospect of an increase in energy costs was attributed by participants to the inability of the current electricity grid network to absorb additional power from solar photovoltaics (PV) and other micro-generation technologies. This presents a significant case of sustainable energy products creating a social effect opposite to that which was intended, i.e., the alleviation of fuel poverty. The risk of an increase in emissions, energy loss, and waste as a result of the intensification of production activity was also acknowledged by the participants, as there was the underperformance of sustainable energy products in buildings due to the inadequate integration of the products with the existing building facilities and the behaviour of building users.

In order to prevent the occurrence of these environmental and social risks, the participants endorsed the localisation of the supply chain for sustainable energy products. The programme participants shared the view that the adoption of supply chain localism for the implementation of the Green Deal has the potential to stimulate UK economic growth to a significant extent. The creation of new businesses and employment and poverty reduction opportunities in local authority areas throughout the United Kingdom was identified as a major potential benefit of supply chain localism. For instance, this researcher observed that the participants targeted the Not in Education, Employment or Training (NEET) section of local populations as a source of new members of a multi-skilled workforce for the Green Deal. Beyond the socio-economic rationale behind the participants' support for supply chain localism, there were environmental reasons as well, in terms of the need to minimise the energy, emissions, and waste issues associated with procuring, transporting, installing, and maintaining both production materials and finished sustainable energy products. The participants were of the view that

the localism approach would allow for a closer monitoring of the production and delivery of sustainable energy solutions to guarantee that only minimal or zero harmful environmental impacts are yielded.

The need for sustainable energy products to be installed and maintained with minimum social disruption and optimum technical performance, as well as the NEET category's current lack of work experience, led the participants to propose the reskilling and multiskilling of current and future members of the building industry workforce. In addition, with respect to the implementation of sustainable energy products in buildings, the participants advocated an approach that focuses on the integration of different sustainable energy products within buildings (rather than on the efficiency of any single product in itself), in order to ensure that different products fully complement each other. They also proposed that building occupants and other building users should be engaged in the Green Deal preparation process in order for their perspectives to be obtained on how sustainable energy products can be installed with minimum disruption to their lives. However, the setting up of local supply chain activities and the skills training require a high level of financial investment, and so the participants focused on highlighting the economic benefits that might accrue to the companies in the future to offset the initial investment costs. The aim was to encourage companies to take a longer-term view of the business rather than seeking quick economic wins. Apart from cost, participants acknowledged that there are lingering issues concerning the disruption that a wholesale transition to localisation could cause the industry, which currently operates on a more globalised, neo-liberal market system and relies significantly on the procurement of renewable energy technologies and other major products from China and other external markets.

The interview data suggest that companies acknowledge local sourcing and procurement as a major way by which they can implement socio-environmental responsibility. The interviewees acknowledged the role of localisation in reducing the embodied energy of sustainable energy products (i.e., the energy consumed in the process of sourcing, producing, and distributing them), carbon emissions, and negative social impacts. As one interviewee put it:

"If you are sourcing locally, you have got a little bit of comfort that… the product itself is being manufactured in the right kinds of ways" (Onyido et al, 2013, pp.8)

Another interviewee questioned:

"What is the carbon emissions to bring that piece of material from China? ...That could be a substandard material and it is not got the lifespan that you think it is got and then you have got to dump it anyway". (Onyido et al, 2013, pp.9)

However, environmental and social criteria were found to increase the intensiveness of materials specification and add to the overall complexity of the procurement process. Interviewees conveyed

further scepticism about the cost implications of supply chain localisation. For instance, one interviewee mentions that "There is a lot of investment required for new manufacturing facilities", while another states that "The costs are more upfront as well… which is what the stumbling block, I think, is". The emphasis on localisation may also require a company to forego expansion opportunities. For example, an interviewee states:

"We could have had the model of being the biggest nationwide installation company covering the whole country, but I decided …that wasn't the best model. The better model is for there to be an installation company in every town or village or wherever …it creates local employment." (Onyido et al, 2013, pp.11)

Local partners may not always offer the financial quotes, and this means that companies may have to forego cheaper partnership options.

The Implications of Supply Chain Localisation for the Commercial Provision of Sustainable Energy Products for Buildings

The data obtained from this author's study of the West Midlands energy-efficiency programme indicate that the localisation of the sustainable energy products' supply chains has the social benefit of creating new jobs, and it also provides extra income for building occupants through their sales of surplus electricity, which in turn serves as an incentive for the public to use energy more efficiently. Environmentally, it allows for greater monitoring of production activities to ensure that they yield only minimum adverse ecological effects, and it reduces the distance across which products can be distributed, thus reducing the release of carbon emissions in the case of fossil fuel-based transportation. Authors such as Hamilton and Summy (2011) and Ristola and Mirata (2007) support these findings. Research conducted by Holweg, Disney, Holmstrom, and Smaros (2005) suggests that the closer and less dispersed a supply chain is, the easier it is to implement synchronised production and inventory control, and the greater the returns on individual collaboration between different parties in the chain. Albino, Izzo, and Kuhtz (2002) supported this position, stating that the agglomeration of production processes in a given geographic area can improve supply chain efficiency. Fisher (1997) pointed out that for innovative products—such as sustainable energy products within the UK market—a local supply chain enhances a company's ability to maintain low levels of inventory, increase flexibility, shorten lead times, and respond quickly to customer demand trends. In this regard, investment in supply chain localisation pays for itself and offsets disadvantages such as the high cost of labour when compared to outsourcing it to cheaper economies (Sheffi, 2001; Fisher, 1997). According to Christopher (2005), increased supply chain responsiveness is especially crucial to volatile markets, such as that for sustainable energy products in the UK, as such an environment severely limits the accuracy of forecasts and makes it difficult for a company to make long-term plans. Rio and Burguillo (2009) mentioned that

the social benefits of the localisation of renewable energy production activities extend beyond employment creation to impact on social cohesion, education, and income distribution. Localisation also acts as a disincentive for emigration, and in so doing it indirectly alleviates environmental problems that are connected with the depopulation of rural areas, such as desertification and erosion (Rio & Burguillo, 2009).

Despite these benefits, there are wider concerns surrounding the feasibility of localisation. From an economic angle, the infrastructure required for the setting up of a completely local manufacturing base involves a high level of initial investment, which programme participants identified as a significant barrier to the development of business capacity for the implementation of supply chain localisation and other recommended measures. This viewpoint is echoed in literature as well (Omer, 2008; Sawin, 2006). Even in the case of biomass energy systems, which benefit from the local availability of feedstock, Lam, Varbanov, and Klemes (2010) stated that extensive infrastructure networks are required for harvesting, transportation, storage, and processing activities. The relatively low energy output produced per unit volume of renewable energy sources such as biomass increases the cost, emissions, and complexity of supply chains (Lam et al., 2010). Richard (2010) indicated that independent local suppliers may only be adequate for small-scale energy generation activity; a more practical alternative to regional or global market arrangements is the operation of single companies on large contiguous land areas in order to achieve a less fragmented but distributed approach. However, this system comes with problems associated with land access and appropriation, and there is also the issue of setting up contingency plans for backup suppliers (Richard, 2010).

The issue of high implementation costs is further compounded by the ambiguity that still surrounds the funding mechanism for the Green Deal, as well as by the insufficient security of market demand, which makes such a high volume of investment harder to justify (Laughlin, Davies, Dockerill, Onyido, & Lansdell, 2012; Wustenhagen & Bilharz, 2006). The existence of an effective capital funding programme or other policy interventions run by either the government or the private sector could encourage the strengthening of local supply chains (Crone & Roper, 2001). Since the availability of these programmes can be affected by the wider economic climate within the country (for instance, in times of recession such funding streams could become narrower), it follows that the extent to which companies implement localisation is as much a reflection of external political and economic factors as it is of companies' internal resolve. Localisation also sets up a conflict with the mainstream business practice of globalisation, as noted by participants at the energy-efficiency programme.

The limitations of the supply chain localisation concept are not just confined to the social and economic fronts either. There is counter-evidence to the view that localisation is truly beneficial in an environmental sense as well. If global energy consumption remains unchanged and traditional fuels and technologies are still used, the volume of emissions reduced by decentralised renewable power plants

in particular would remain constant rather than rise (Alaane & Saari, 2006). In other words, the localisation of energy generation may redistribute global emissions but not reduce it. In regard to this, the intensification of local manufacturing and other production activities within the UK could cause a setback to the country's achievement of its energy and carbon emissions reduction targets (Anderson & Fergusson, 2006; Tsoutsos, Frantzeskaki, & Gekas, 2005). Furthermore, the potential benefits of localisation with regard to resource conservation are also liable to be exaggerated because assessment studies do not always fully take into account supply chain-related processes that take place outside a given location (Albino et al., 2002).

Putting the whole picture together, while supply chain localisation has significant benefits, there is also an active risk that it could well disrupt supply beyond the short-to-medium-term, have major negative economic repercussions for the industry, and jeopardise the socio-economic potentials of localisation that have been previously identified in this work, all without achieving significant positive net energy and carbon impacts.

Conclusions

This paper has focused on supply chain localisation as a potential strategy for minimising possible negative environmental and social impacts that a major expansion of the production and installation of sustainable energy products could have. It looked at existing literature on the subject and also studied a major energy-efficiency project that is working on how the Green Deal, a major UK-wide housing retrofit initiative, can deliver optimum economic, social, and environmental benefits.

Energy loss, waste generation, and emissions release as a result of the production, distribution, and eventual disposal of sustainable energy products, could increase the negative environmental effects of the products along their lifecycle. On the social front, the Green Deal could inadvertently increase energy costs for customers, and the mass installation of sustainable energy products in buildings could be disruptive and invasive to building occupants, structures, and fittings, creating a disincentive for the public to view the products favourably. To minimise the possibility of the above environmental and social risks occurring, participants at the energy-efficiency programme endorsed among other things the localisation of the supply chain for the production, installation, and maintenance of sustainable energy products. Supply chain localisation has a number of potential economic, social, and environmental benefits, such as the creation of new businesses and jobs, the creation of additional income for building occupants, and closer environmental monitoring of production activities. However, these benefits are countered by other significant factors such as its high financial investment requirements and the constraints brought about by its conflict with mainstream globalisation practices. As a result, while supply chain localisation represents a sustainable business option in principle, the scope for its application remains limited and reliant on standard policy tools such as subsidies, tax

reliefs, and other regulatory measures that could significantly lower the cost of doing business in the UK. Future studies could focus on how to resolve the barriers to supply chain localisation rather than only promoting its benefits.

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Abstract

This paper reports on research exploring how companies that commercially provide sustainable energy solutions for use in buildings can develop their capacity to do so without creating new environmental and social problems, in addition to existing ones such as energy loss in buildings and fuel poverty. It follows from previous work by the authors which questioned whether the current eco-refurbishment of buildings within the UK, which is taking place through programs such as the government-led Green Deal and Energy Company Obligation (ECO), requires an approach that is different from conventional business, capacity development and production models in order to achieve maximum socio-environmental impact. The paper focuses on an empirical investigation of the capacity development process in sustainable energy solution provider companies, and it presents a set of 'environmental business values' with which the companies could address existing socio-environmental problems associated with energy use in buildings without creating new ones. The values are skills reorientation and diversification away from more traditional approaches in the building sector, the adoption of a whole-house approach, supply chain localisation, the use of whole-life costing to negate the desire for quick economic wins, and the effective inclusion of building occupants in the capacity development process. These environmental business values were found to have a range of beneficial and detrimental effects on the six different components of capacity proposed in this research (labour, finance, supply chain and relationships, knowledge, equipment and infrastructure, and materials).

Key Words and Phrases

Capacity Development; Eco-refurbishment; Environmental Business Values; Socio-environmentally Responsible Practices; Sustainable Energy Solutions.

1 Introduction

The question of whether the current eco-refurbishment activity that is taking place within the UK housing sector requires an approach that is different from conventional production and capacity development models has been raised in a previous paper (Onyido & Boyd, 2012). 'Eco-refurbishment' here refers to the implementation of renewable energy technologies and other energy-efficiency products and services (henceforth referred to as Sustainable Energy Solutions) in existing buildings, and it is the focus of on-going UK government initiatives such as the Energy

Company Obligation (ECO) and the Green Deal (Richards, 2013). The question was discussed on the premise that conventional production and capacity development models deterministically assume readily available energy, materials and labour, and do not always take full account of resource conservation and other socio-environmental implications of expanding production (Onyido & Boyd, 2012).

Due to their role in reducing the adverse environmental impacts of human activity, companies that provide sustainable energy solutions for buildings are commonly associated with the green economy and its focus on ecosystem preservation and social development (Brand, 2012; Isaksson *et al*., 2010; Placet *et al*., 2005; Elkington, 1998). However, there is a risk that the companies' use of conventional capacity development approaches to achieve greater energy conservation in buildings could actually increase negative socio-environmental impacts (Chappells and Shove, 2005). This is caused by a combination of three factors: firstly, new environmental and social problems could arise when the companies develop their capacity to solve existing problems associated with energy use in buildings; secondly, the sustainable energy solutions could fail to achieve the expected level of technical performance if not installed in the right manner (Schmidt, 2003; De Simone and Popoff, 2000); and thirdly, due to the still evolving and uncertain nature of the UK eco-refurbishment market, the failure of the solutions to fulfil their energy-saving potential could serve as a disincentive for their further uptake in buildings (Plows, 2008).

This paper looks at how companies that provide sustainable energy solutions for buildings can develop their capacity to do so in a manner that reduces the afore-mentioned risk. Based on a participant-observation study of a major capacity development project within the West Midlands, the paper explores the concept of a set of 'environmental business values' that could complement traditional capacity development models in order to ensure that companies effectively address the challenge of eco-refurbishing buildings without adding new negative socio-environmental impacts. The possible effects of the application of environmental business values and socio-environmentally responsible practices on various components of a company's capacity are also discussed.

The rest of the paper includes a description of the concept of capacity development. This is followed by a closer examination of the risk that sustainable energy solution provider companies could further complicate socio-environmental problems when attempting to make buildings more energy-efficient. The methodology surrounding how 'environmental business values' were determined is described. The values are then presented as findings, and the conclusions, limitations and recommendations of the study are given.

2 Capacity and Its Development

Various academic and industry definitions of capacity allude to an organization's human staff and non-human physical resources (Morin and Stevens, 2005). Other definitions focus on the volume of production an organisation could expect to achieve with its available resources; Zaeh and Mueller (2007) refer to capacity as "a measure of the number of units produced by a resource in unit time" and "the maximum level of value-added activity over a period of time", while Tan and Alp (2009) state that it is the total productive capability of all permanent and temporary productive resources. Sopariwala (2006) describes capacity as the maximum possible production that an establishment could reasonably expect to attain under normal and realistic operating conditions and fully utilizing the equipment, labour, materials, utilities, and other resources that are in place. Based on definitions such as these, there is a strong link between a business organization's capacity and its tangible resources, without capacity being entirely synonymous with the resources. Hence, while capacity could be described as consisting of an organization's tangible resources, the resources alone do not constitute capacity. In this regard, there are also references to other intangible elements such as the organization's structure, management systems, and linkages with other organizations (Strigl, 2003; Cosio, 1998). Various studies include the intangible component of knowledge in addition to physical resources such as workforce, equipment and machinery, with the term 'absorptive capacity' used to refer to the learning ability of an organization to recognize the value of new information and apply it to commercial ends, i.e. to successfully recognize, assimilate and replicate external knowledge (Azadegan, 2011; Zonooz *et al*., 2011; Hall, 2005; Tsai, 2001; Cohen and Levinthal, 1994;).

In terms of incorporating all the various aspects of capacity, an especially comprehensive description is given by Bolger (2000), who refers to the "abilities, skills, understandings, attitudes, values, relationships, behaviours, motivations, resources, and conditions" that enable an organization to carry out its functions and achieve its development objectives over time. In a bid to adopt a comprehensive approach to describing capacity in the manner of Bolger (2000), this research groups all the different elements of capacity identified within literature into six major categories which are represented in Figure 1. These components are by no means mutually exclusive; finance in the form of money is usually used to purchase labour, equipment and materials, foster and maintain business relationships, and generate knowledge, and so within this work it specifically refers to an organisation's capital base after recurrent expenditure has been deducted. Equipment and materials together constitute the physical, non-human resources for production, but they are distinguished from each other in the sense that equipment is used to convert materials into a finished good or service. Materials also refer to finished products; specifically,

when the role of a company is not the manufacturing of sustainable energy solutions for buildings, but rather the supply, installation and/or maintenance.

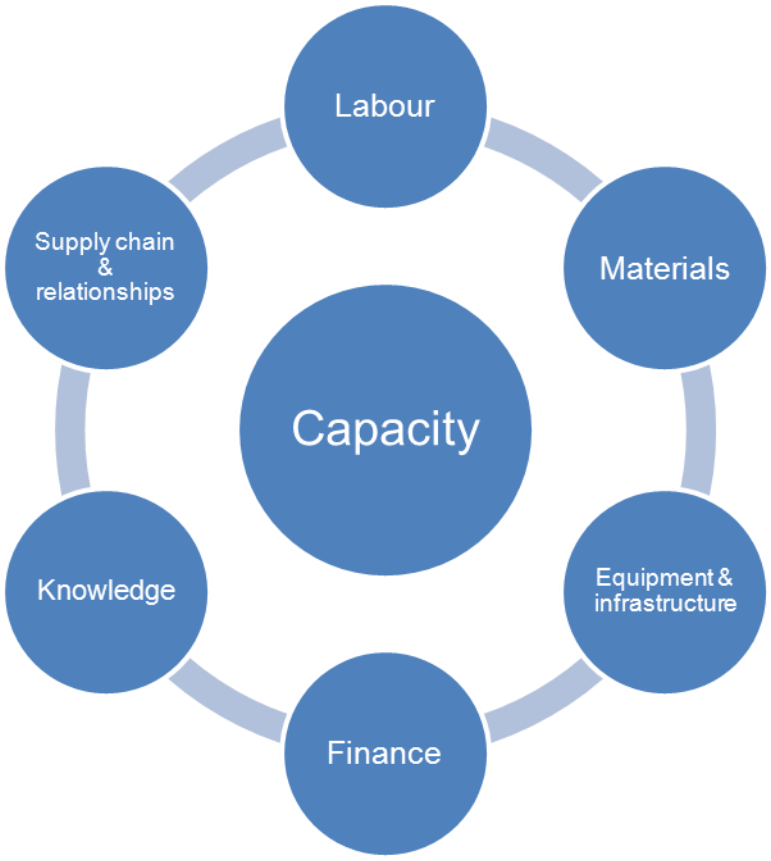

Figure 1: Components of capacity as determined from literature research

The term 'Capacity Development' has been described as 'elastic' and 'elusive' (Lusthaus *et al*., 1999) due to the fact that it can be stretched to embrace many different things across various socio-economic sectors. Lusthaus (1999) reports that capacity development as a formal term and concept has its origins in the late 1980s and 1990s in the field of international development, when it emerged as an aggregate of many other developmental approaches such as institution building, human resource development, community development, and development management/administration. It is broadly described as the process by which individuals, groups and organizations improve their ability to carry out their functions and achieve desired results over time, and the improvement of capabilities, the preparation of long-term solutions, and the increased identification and exploitation of opportunities within a changing economy (Gray, 2006; Hall, 2005).

For business organizations (as opposed to other entities such as governments, charities and international development institutions), capacity development refers to the set of activities that an

organisation performs in order to respond effectively to changes in customer demand for its products, changes in customer expectations regarding product characteristics such as quality and functionality, and changes in the organisation's core competencies and production methods (Aghezzaf, 2005; Ashayeri and Selen, 2005; Lucas *et al*., 2001). Established business capacity development theories indicate that a company's capacity is the primary characteristic of its ability to fulfil market demand, and that capacity is often viewed by companies in terms of three policies: it could lead demand (capacity under-utilisation), lag demand (capacity over-utilisation), or exist in approximate equilibrium with demand (Zaeh and Muller, 2007; Karri, 2000; Hayes and Wheelwright, 1984). Graddy and Kennedy (2010) report that the expansion of a market without a corresponding rise in supply capacity could have the consequences of creating inflationary pressure and disrupting the regular flow of research, development and knowledge transfer.

Based on literature, capacity development can thus be viewed as a fundamental strategy for gaining competitive advantage, achieving market differentiation, reducing business costs, and expanding or contracting its market reach. However, there is limited information within literature about how socio-environmental performance can be integrated with capacity development. Indeed, an opposition could well be set up between socio-environmental responsibility and the functional value of economic success that capacity development utilises. This is because socio-environmental responsibility does not always have a strong beneficial link to economic success within the deterministic, economic context within which capacity development is traditionally defined (Schmidt, 2003). This gap in the literature is particularly vivid when studying the complexities of implementing socio-environmentally responsible practices in the eco-refurbishment market, a sector which by its very nature should focus on sustainability, but which in practice may not always do so.

3 The Commercial Provision of Sustainable Energy Solutions and the Possible New Wave of Environmental and Social Harm

As part of an industry that is often associated with sustainability by default, companies that provide sustainable energy solutions for buildings are faced with the challenge of how they can simultaneously internalize environmental costs, produce goods and services at competitive prices, and remain economically successful (Placet *et al*., 2005; Stock *et al.*, 1997). The question thus arises whether there is a risk that, in trying to balance economic and environmental performances, these companies may, either by omission or design during the capacity development process, not take full account of the adverse environmental and social consequences (such as toxic emissions, energy loss, intensive land usage, exploitation of labour, and high cost of products) which may result from their use of human and non-human resources to produce, transport, install, maintain and decommission different sustainable energy solutions (Evans *et al*., 2010; Fthneakis and Kim, 2009;

Papaefthimiou *et al*., 2009; Syrakkou, 2005). Andrews (1998) suggests that this risk is intensified when the companies rely on traditional business models that place emphasis on financial success and view environmental and social responsibility as an operational burden or a box-ticking exercise. Echoing this perspective, O'Boyle (1999) indicates that mainstream economics excludes consideration of 'moral questions' on the grounds that they are 'value-laden', since for economics to be truly scientific it must be 'value-free'. Clarke (2000) acknowledges that the current economic challenge lies in securing economic progress alongside addressing the accompanying serious ecological and social issues. Stanfield and Carroll (2009) are strident in their indictment of conventional economics, describing it as "static and ahistorical" and stating that "a serious backlash has arisen" to challenge neo-liberal global economic integration (globalization) and its "concomitant increasing inequality, social instability, and cultural discontinuity". A review of the evolution of economic and production theories and models does suggest that the emergence of disciplines such as Environmental Economics and Sustainability Studies is an academic response to the limited effectiveness of conventional economic models to deal with the socio-environmental side-effects of production (Tolciu, 2010; Gintis, 2009).

It could be argued that the negative socio-environmental impacts of the companies' activities would ultimately be countered by the eventual deployment of the sustainable energy solutions in buildings and the benefits that would arise as a result, such as the enhanced environmental performance of buildings and a reduction in fuel poverty. However, in the still-evolving UK eco-refurbishment market, a second risk emerges in the sense that the solutions could fail to provide the intended environmental benefits upon their installation. This can be caused by insufficient technical understanding on the part of the companies about the integration of sustainable energy solutions with buildings, and environmentally irresponsible behaviours of building users and their inability to use the solutions according to the design specifications, (Folmer and Johansson-Stenman, 2011; Evans *et al*., 2009; Dombayci, 2007). The failure of sustainable energy solutions to conserve energy and reduce fuel bills could in turn serve as a disincentive for the further uptake of the products in a market already characterised by uncertainty (Plows, 2008). The net outcome of all these scenarios is that the socio-environmental impacts of energy use within buildings may not be significantly reduced, while new environmental and social problems may arise during the process of producing sustainable energy solutions, thus leading to an overall intensification of environmental and social damage.

Companies that provide sustainable energy solutions for buildings are often classed as environmental businesses, a term that is generally used to describe firms that produce environmental goods and services (Hernesniemi *et al*., 2007; Chopey and Ondrey, 1997). However, this definition raises a question about whether a company should be termed an environmental

business solely on the basis that it produces environmental goods or services, even in situations where these goods and services are being produced in an environmentally and/or socially unsustainable manner. In this regard, another school of thought places less emphasis on the product and more emphasis on the production process in the description of a company as an environmental business; i.e. an environmental business is *any* business that utilizes some form of environmentally-friendly practices, regardless of the good or service that it produces (Isaksson *et al*., 2010; Schaper, 2005; Schmidt, 2003). However, this perspective is not without its own ambiguities; in much of the literature it is unclear how many or how few environmentally-friendly practices a company should adopt before it qualifies as an environmental business. In addition, while the environmental problem of production and business is addressed, the social dimension is often understated, even though humans are a significant part of the ecosystem. Thirdly, an increasing number of companies across different industries have green and social responsibility statements included in their corporate policies (Powell, 2011), and it is debatable how much of this is merely a bureaucratic or compliance exercise and how much is an actual ambition of the company.

Due to this duplicity of opinion in literature, this paper explores the 'environmental business' as a conceptual framework rather than an actual organisation. The study seeks to determine the set of values (subsequently referred to as 'environmental business values') by which companies that commercially provide sustainable energy solutions for buildings can ensure that new negative environmental and social impacts do not arise from their activities and that the goods and services achieve their intended level of performance. The investigation of the capacity development stage of business operations, which takes place before the actual production of goods and services, is in line with the focus on addressing the risks earlier identified before they actually occur.

4 Methodology

The research methodology was designed to address the dilemma of determining values and their consequences. Since values are intangible, abstract qualities, they cannot be directly detected and would need to be interpreted from a more measurable phenomenon (Onkila, 2009; Place and Hanlon, 2009). Literature on previous studies done to determine values strongly indicate that a qualitative investigation of human and organisational actions and behaviours is necessary, since values are largely contained within these (Khazanchi *et al*., 2007; Bansal, 2003; Luck, 2003). Consequently, this study infers environmental business values from the actions and behaviours exhibited by and within sustainable energy solution provider companies. Values are not maintained without having positive and/or negative effects attached to them (Kachel and Jennings, 2010), and it is thus also necessary to establish the effects that environmental business values could have on the business capacity of companies that provide sustainable energy solutions for buildings.

The study involved investigating peoples' diverse and subjective actions and perceptions, interpreting them, and directing the information obtained from them towards addressing a specific practical issue – the development of capacity in such a manner as to address existing energy-related problems without adding new negative socio-environmental impacts. It was thus necessary to adopt a pragmatist philosophy which acknowledges that there is no single 'true' perception of reality, but also stresses that while knowledge does not have to be true it needs to be 'useful' enough to serve as a basis for practical action (Morgan, 2007; Meyers, 2005; Rescher, 2005). Primary research activities conducted during the study include the participant-observation of the Sustainable Housing Action Partnership (SHAP), a network initiative made up of management-level representatives of 30 organizations from the construction, energy, and property sectors. SHAP was selected for the study because it was concerned with developing supply chain, labour skills, finance and other resources in preparation for the provision of a range of sustainable energy solutions for buildings under the Green Deal. The Green Deal is a UK government policy aimed at encouraging the widespread uptake of a diverse range of sustainable energy solutions across the country, from insulation to window glazing to low-energy lighting and heating systems to renewable energy technologies, and it went 'fully live' in January 2013 (Richards, 2013). The participant-observation technique was used in order to achieve the dual goals of obtaining data while gaining first-hand knowledge and experience about the capacity development process. 23 field notes were compiled via this activity.

20 interviews were also conducted in order to capture in-depth perceptions about the effects of socio-environmental practices on the business capacity of sustainable energy solution provider companies. The interviews were semi-structured because in this way they are ordered but still allow freedom and adaptability in how responses are given by interviewees (Haigh, 2008). The interviewees were management-level staff members from companies that supply, install and maintain renewable energy technologies and insulation. The management level was targeted in order to ensure that respondents had expert perceptions about capacity development within the eco-refurbishment sector. The observation and interview data were coded in order to organise and interpret them into relevant information.

5 Environmental Business Values

The participants in the SHAP programme were observed to focus on projecting the level of market demand for sustainable energy solutions which would arise out of the Green Deal. Other activities on which they focused included determining the financial, knowledge, labour and supply chain requirements for the adequate provision of sustainable energy solutions to meet the projected demand. They also specified the type of products and services that would be most economically suitable for companies to invest in providing.

In the course of the SHAP study, the following environmental problems were identified which could emerge as a result of the new production activities for which capacity was being developed for: new toxic emissions, energy consumption and waste generation. Concerning potential new social problems, a significant issue that emerged was the inconvenience that the installation of sustainable energy solutions would cause building occupants during the progress of the work. The installation process also looked set to disrupt existing housing structures and fittings as well, such as the displacement of floorboards in order to install floor insulation. Another possible social problem is the prospect of an increase in energy costs for building occupants, due to the inability of the current electricity grid network to absorb the additional power from micro-generation technologies, mainly solar PV.

The response of the SHAP participants to the identified environmental problems appeared to centre on the introduction of a reskilling process for the existing building workforce. This is in order for the workforce to not only install the solutions with a traditional construction mind-set, but to also pay particular attention to ensuring that the solutions fully realise their environmental, energy-saving potential upon installation. A localism approach was also endorsed whereby the production of sustainable energy solutions would be situated as close as possible to the geographical areas in which the solutions would eventually be installed. This is in order to minimise the energy, emissions and waste issues associated with procuring, transporting, storing and distributing production materials and the finished products. It would also allow for a closer monitoring of the production and implementation of sustainable energy solutions to minimise harmful environmental impacts. Since the setting up of local supply chain activities requires significant financial investment, a whole-life costing standard was also endorsed as a means of encouraging companies to take a longer-term view of the business in terms of the economic benefits that might accrue to them in the future to offset the initial investment costs.

The intrusive and disruptive nature of the installation of sustainable energy solutions was addressed through the recommendation of a low-disruption approach as part of the SHAP participants' skills development efforts. Consultation with home owners and other building users was identified as a way of finding out how to minimise disruption. Concerning the risk of an increase in energy costs, the SHAP participants were not observed to come up with a response.

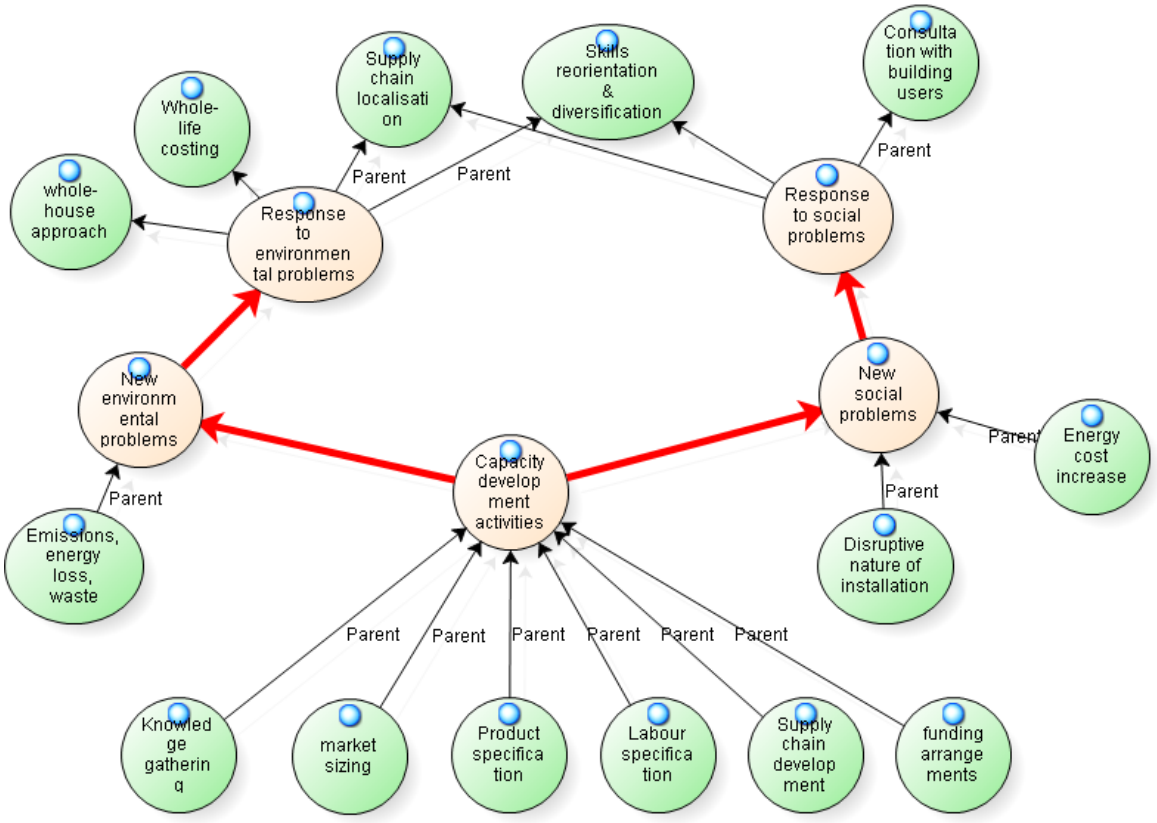

Figure 2: The Capacity Development Activities, the New Environmental and Social Problems They Bring Up, and the Responses to these Problems

Based on the observation of the SHAP capacity development activities and the participants' responses to the identified new environmental and social problems, environmental business values were interpreted. These are indicated in Table 1.

A reorientation and diversification of skills away from more traditional approaches in the building sector
The adoption of a whole-house approach that focuses on the integration of different sustainable energy solutions within buildings, rather than on the efficiency of any single solution in itself
The localisation of the supply chain
A preference for whole-life costing as an incentive for a long-term business approach
Effective inclusion of building occupants in the capacity development process

Table 1: Environmental business values

6 Effects of the Values and Socio-Environmental Practices on Capacity

The interview data suggests that the environmental practices of energy conservation and waste management reduce business costs for a company, while social responsibility increases employee loyalty and improves the organisation's prospects of winning public sector work. Despite these benefits, on the whole the application of environmentally and socially responsible practices appears to be cost-intensive and could exclude economic opportunities that are available in the mainstream building and construction sector. Indeed, there was a prevalent view among the interviewees that companies that uphold a strong socio-environmental ethos are in a less competitive market position than the more mainstream companies (*"A company that doesn't think sustainably has higher profit margins than we do"*), and that such an ethos often conflicts with customer preferences. For instance, an interviewee whose company specialises in sustainable building materials stated that *"We did have an issue recently where a client … wanted a particular type of granite stone, and this granite stone … could only be bought from one source … and it was made in a place that, you know, we were nervous about or we were uncomfortable with, and that did present us with an issue because we didn't have a choice in that matter"*. The localisation of the manufacturing of renewable energy technologies in particular was noted to require a high level of upfront investment.

Where companies apply energy conservation, carbon emissions reduction, waste minimisation and other environmental measures to the work place and transportation vehicles, these practices restrict their infrastructure options. An interviewee mentioned that while his organisation would like to expand and get new premises, it is constrained to buying or building rather than renting, as it would

not be able to increase the energy efficiency of a leased building due to its limited rights over a rented building. The interviewee went on to add that this sort of situation *"holds his company back"* compared to its competitors, because they are able to *"grow more quickly"* without such constraints.

Local sourcing and procurement appears to be a major way by which companies exhibit environmental business values. The interviewees acknowledged the role of local sourcing and procurement in reducing the embodied energy of sustainable energy solutions (in terms of the energy consumed in the process of sourcing, producing or transporting them) as well as carbon emissions and negative social impacts. As one interviewee put it: *"If you are sourcing locally, you've got a little bit of comfort that …the product itself is being manufactured in the right kinds of ways"*. Another questioned: *"What's the carbon emissions to bring that piece of material from China? … That could be a substandard material and it's not got the lifespan that you think it's got and then you've got to dump it anyway"*. However, environmental and social criteria were found to increase the intensiveness of materials specification and add to the overall complexity of the procurement process. Environmentally and socially responsible practices also appear to increase the level of training that a company would need to provide to staff, and could increase the company's workload (see the Discussion section below). According to one of the interviewees, *"There probably are more procedures to go through … there is more work involved in it"*. With regard to a company's supply chain and business relationships, environmentally and socially responsible practices could lead to the company having to forego cheaper partnership options. This is because the company could tend to form partnerships mainly with organisations that share similar values, even though these organisations may not always offer the cheapest prices. Apart from this, a conflict is set up between the environmental business value of localism and the mainstream business practice of globalisation.

In terms of knowledge sharing, environmentally and socially responsible practices appear to make companies favour collaboration, as opposed to competition, and could compel a company to limit its expansion as well as its commercial exploitation of existing products (see the Discussion section below). The effects of environmental business values and socio-environmental practices are presented more expansively in Figure 3.

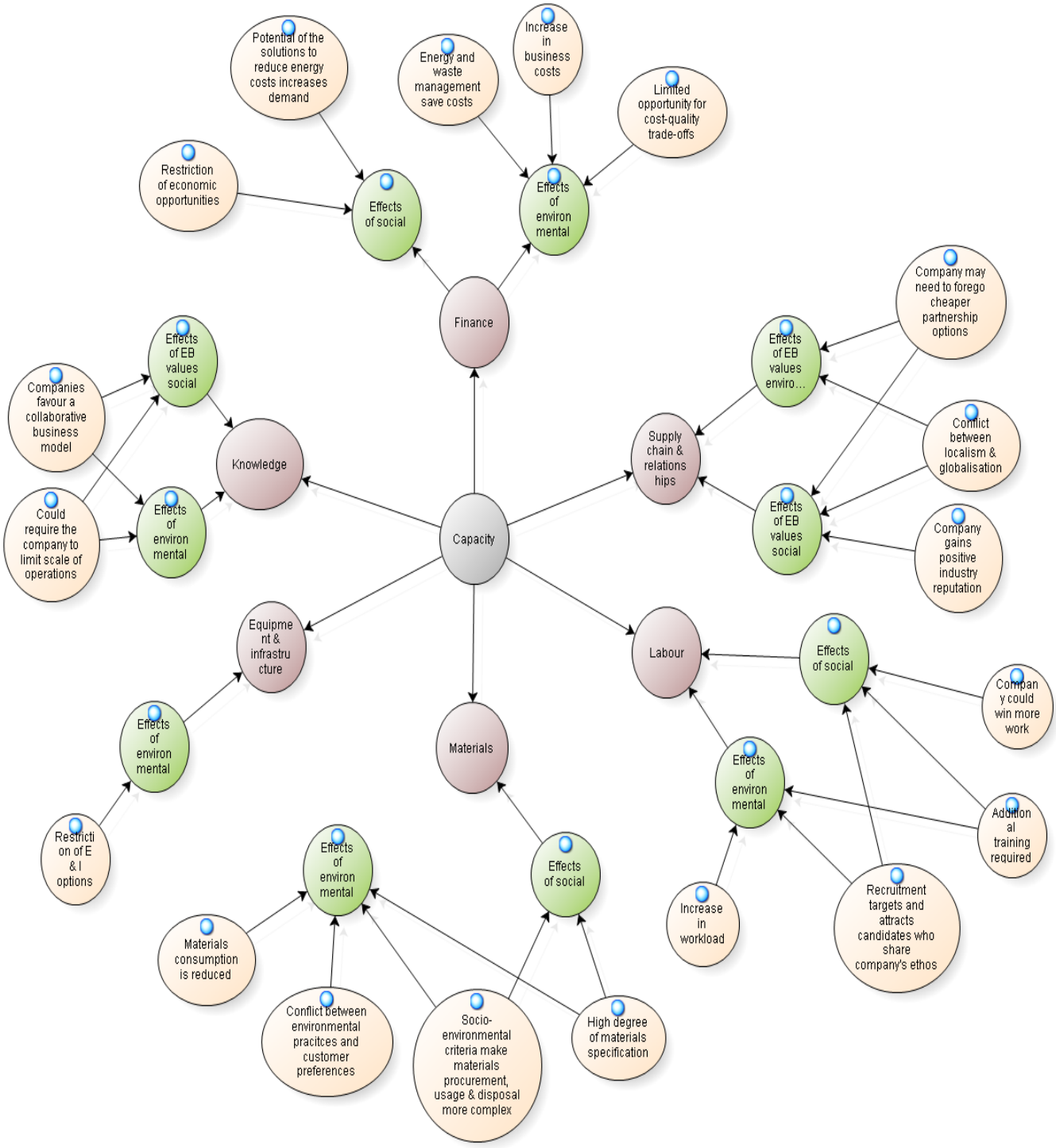

Figure 3: Effects of Environmental Business Values and Environmentally and Socially Responsible Practices on the Components of Capacity

7 Discussion

The SHAP participants' emphasis on projecting the level of Green Deal-led market demand for sustainable energy solutions provides further evidence of the strong relation between capacity and demand which was referred to in Section 2 of this paper. Also, the participants' focus on the

financial, labour, supply chain, knowledge and material requirements for the Green Deal programme supports this research's description of the key components of capacity.

The prospect of an increase in energy costs, due to the inability of the current electricity grid network to absorb the additional power from solar PV and other micro-generation technologies, presents a significant case of sustainable energy solutions creating a social effect opposite to that which was intended. In this manner it provides evidential support for the argument that sustainable energy solution provider companies could create new social problems while trying to address the issue of energy conservation in buildings. The disruptive nature of the installation of sustainable energy solutions appears to be of a temporary nature and thus may not be relevant beyond the installation period. However, Roberts and Sims (2008) allude to the longer-term problems caused by the installation of roof or wall-mounted wind turbines in particular, stating that they can cause considerable vibration which could damage older properties and even topple chimney stacks and gable ends. The SHAP participants were observed to actively target the socially-disadvantaged 'Not in Education, Employment or Training (NEET)' section of the populace to provide additional members of the workforce that will become multi-skilled, despite their lack of work experience. In this regard, skills reorientation and diversification can be regarded as being useful for carrying existing social challenges of poverty reduction and job creation alongside the new socio-environmental challenges identified from the SHAP study.

With respect to one of the findings of the research, namely, the increase in the level of staff training due to the application of socio-environmentally responsible practices, a possible reason for this is that companies may need to go beyond conducting standard staff training in order to ensure that their employees are not just able to perform basic installation, but are also able to adopt a whole-house approach and get sustainable energy solutions to perform to their full environmental potential. As an indication of this, one interviewee stated that *"We're busy retraining our staff so they can carry out whole-house measures instead of just cavity or loft installation"*, while another mentioned that *"We do a lot of training of new installers … not the initial training for them to get their MCS certification, but a lot of extra training on how to get the best out of solar systems"*. Increase in training levels can also occur when companies implement the social practice of employing socially disadvantaged, long-term unemployed people (such as those in the NEET category), rather than experienced professionals, as *"You're sort of getting them ready for work as well as doing the technical training"*. Another effect of socio-environmentally responsible practices on labour, an increase in workload, can be attributed to the existing situation of insufficient public awareness about the proper use of sustainable energy solutions. This increases the amount of *"legwork"*, and thus man-hours, that a company may have to put in to educate users on how to optimise the energy conservation potential of the solutions.

The interviewees' apparent preference for local business partners that share similar values with their companies indicates that there may be considerable reservations held by socio-environmentally responsible companies about the motives of other businesses involved in the eco-refurbishment market. This further implies that while the market concerns the provision of sustainable energy solutions, companies that provide these solutions may not always pay particular attention to conducting their operations in a sustainable manner. In terms of regulating the entry of new competitors into the evolving UK eco-refurbishment market, the promotion of the whole-life costing approach is particularly significant in the sense that it could increase the chances of attracting companies that are committed to the underlying environmental agenda of the business, rather than companies that are interested in the business only as an immediate economic venture.

The findings suggest that a company's adherence to the environmental business value of localism could require it to forego expansion. An indication of this can be found in interviewee statements such as the following: *"We could have had the model of being the biggest nationwide installation company covering the whole country, but I decided … that wasn't the best model. The better model is for there to be an installation company in every town or village or wherever … it creates local employment"*. Companies could be further obliged to forego commercial opportunities attached to an existing sustainable energy product if they regard the energy conservation potential of the product as still underdeveloped (one interviewee states: *"We want to keep things open so that when new technologies come on board, we're not restricted by what was going on two years ago"*).

Due to the cost-intensive nature of implementing the localisation of the manufacture of renewable energy technologies, the existence of an effective capital funding programme run by either the government or the private sector could serve as an incentive for companies to implement localism and other environmental business values. However, these programmes can be negatively affected by the wider UK economic climate (for instance, in times of recession such funding streams could become narrower), which in turn could limit the application of environmental business values. In this regard, environmental business values are as much a reflection of external political and economic factors as they are of companies' internal resolve, which makes a case for further macro as well as micro exploration of the concept.

Conclusion

This paper has looked at a study of how companies that provide sustainable energy solutions for buildings develop their capacity to do so. The study suggests that, in order for sustainable energy solution provider companies to address existing socio-environmental problems associated with energy use in buildings (such as high energy consumption and fuel poverty) without creating new ones, they should implement the following 'environmental business values': a reorientation and

diversification of skills away from more traditional approaches in the building sector; the adoption of a whole-house approach; the localisation of the supply chain; a preference for whole-life costing; and the effective inclusion of building occupants in the capacity development process.

The paper also shows that environmental business values and socio-environmentally responsible practices are perceived within sustainable energy solution provider companies to have both beneficial and detrimental effects on the different components of capacity (which have been classed within this research as labour, materials, knowledge, finance, equipment and infrastructure; and supply chain and relationships). These include an increase in the workload and the level of skills training for staff (labour); an improvement in the prospect of winning public sector work (labour); a conflict between localism and globalisation (supply chain and relationships); a foregoing of cheaper partnership options (supply chain and relationships); a preference for collaboration rather than competition (knowledge); the limitation of a company's scope for business expansion and commercial exploitation of existing products (knowledge); the reduction of business costs due to energy savings and reduced waste (finance); a high level of initial investment (finance); a restriction of infrastructural options (equipment and infrastructure); a high degree of product specification (materials); and a conflict between values and customer preferences (materials).

The research findings are limited by the limited access to companies that manufacture physical sustainable energy solutions, as opposed to companies that are involved in procurement, distribution, installation and maintenance. This is mainly because of the low level of manufacturing activity surrounding the Green Deal eco-refurbishment activity in West Midlands in particular, with most of the physical products being sourced from outside the UK. It is recommended that future studies focus on the manufacturing stage of the development of sustainable energy solutions for the Green Deal (in contrast to the more holistic, supply chain-wide approach taken by this research), in order to assess how much new energy consumption, waste generation and hazardous emissions releases could result from the manufacturing activity. Future studies could also replicate this research within the context of business in general (rather than just the sustainable energy solutions sector of the building industry), in order to create a greater understanding of how socio-environmental performance can be better aligned with a business organisation's economic goals.

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A2.4: Onyido, T., Boyd, D. (2012); Developing Retrofit Capacity through Environmental Businesses; Paper presented at the Retrofit 2012 Conference; Salford; 24-26 January 2012

Abstract:

The demand for retrofit building technologies to offset the use of fossil fuels is latent but must rise dramatically if environmental protocols set by the government, such as carbon emissions reduction targets, are to be met. There are many production engineering and economic models available for manufacturing and installation businesses to plan for such expansions in demand. However, conventional models assume readily available energy, materials and labour without considering the environmental consequences of production and the social implications of expanded production. This paper sets out the problem of conventional production engineering and business process design and establishes the requirements for environmental, social and economic expansion of capacity

within the context of an environmental business. These include a set of business values which are necessary to avoid creating new environmental and social problems whilst solving the major issue. Referring to interview data from a major retrofit project in Birmingham (Birmingham Energy Savers), the paper will explore how social and environmental measures can be utilized to aid capacity development by inducing a greater social awareness of environmental problems, thus bringing about a wider acceptance of retrofit building technologies in society.

Keywords:

Retrofitting, Capacity Expansion, Environmental Business, Supply Chain, Consumer Interaction

Introduction

The shift towards a lesser reliance on non-renewable energy sources and a minimal adverse environmental impact is being demanded from the built environment along with other sectors of human activity (Brown, 1996). Currently, buildings and their usage account for just under a half of total UK emissions (L.E.K., 2009). Government through its policy-making is seeking to reduce this through the use of sustainable resources and techniques in building (BIS 2010). In this it also sees an economic development opportunity through the demand for sustainable building products in the long run. There is also a need for an increased public awareness about sustainability and environmental issues so as to drive long-term demand for sustainable buildings. Whilst change is clear and implementable in new build construction, there remains the difficult and larger challenge of remedying the energy problems caused by the already existing building stock. Here retrofitting is the only viable option.

Existing buildings have an enormous variety of forms, constructions, and energy requirements, and so there is a need for a variety of retrofitting solutions, from microgeneration technologies such as photovoltaic systems and wind turbines, to insulation and the use of low-energy lighting. Apart from the challenges of developing these technologies and ensuring system compatibility, other requirements include appropriate selection of technology, regulatory acceptance, and technology installation. These problems are exacerbated by the fact that intended users do not understand the new technologies, and so do not fully trust these and the companies that develop and deliver them. While public opinion about sustainable buildings continues to gain support, this latent demand has not yet fully translated into actual demand.

This is a difficult market situation where products and processes need to be developed without there being an immediate demand for them. However, an increase in demand for retrofit building technologies, without a corresponding rise in the capacity of companies involved in the development and delivery of these technologies, disrupts technological research, development and

knowledge transfer, and creates inflationary pressure (Graddy & Kennedy, 2010), further repressing the market. To offset this, the UK government is suggesting to the construction industry that, 'based on the assumption that a major programme of refurbishment will start over the next five years, the industry should start by carrying out a full assessment of its ability to deliver' BIS (2010). This assessment of the ability to expand capacity involves evaluating resources and organizational infrastructure, the material and organizational supply chain and the availability of a trained labour force. There is an additional problem when expansion takes place as it could need to be done rapidly and without a consideration of the environmental and social consequences. These consequences include creating new environmental and social problems. Thus, there is a need now to review different approaches to capacity expansion.

This paper reviews conventional capacity development approaches and models and highlights the problems of using them within a retrofit business setting. As will be shown through existing literature, capacity expansion for individual companies using conventional production engineering and process design involves a micro-economic view which focuses internally upon improving the efficiency of the companies' equipment, labour and other resources, maximizing revenue-generating activities, and reducing non-essential costs. While such business efficiency is important, environmental and social success could similarly be pursued as a means of facilitating capacity expansion. The alignment of conventional capacity expansion goals and social and environmental responsibility is thus a crucial challenge. The paper investigates this theoretically and practically; theoretically through exploring the concept of the Environmental Business as a vehicle for aligning business reality with social and environmental values; and in practice through open-ended interview research into Birmingham Energy Savers (BES). BES is a retrofit project in the West Midlands, where the social strategies of supply chain management and community interaction were designed to assist retrofitting companies to add social and environmental elements to their capacity expansion. The conclusion is that the notion of the environmental business requires more development for this alignment task, especially since decision-making needs to accommodate multiple and sometimes conflicting criteria within a practical context.

2 Literature Review

2.1 Conventional Capacity Expansion and Modeling

Capacity can be defined as the total capability of a business' productive resources such as workforce and machinery (Tan & Alp, 2009). A business' production capacity also includes its ability to recognize, assimilate and replicate external knowledge (Tu et al, 2006). Development of capacity would therefore involve making changes to the type and quantity of a company's infrastructure, finances, production methods, and human capital. It could be carried out to enable a business

organization respond better to changes in customer demand and expectations, transit to new business methods, develop a new product or service, reduce business costs, or enhance the performance of their products or services.

There exist different types of capacity techniques and models for different business situations. Conventional capacity approaches for individual companies are often based mainly around economic considerations and aim at minimizing financial costs while maximizing output. For example, the Overall Equipment Effectiveness (OEE) and the Total Effective Equipment Performance (TEEP) indexes are used as measures of asset cost, utilization and output. However, Van Goubergen (2010) points out that OEE could stimulate overproduction, does not suitably indicate the flexibility of a particular production method, and is prone to manipulation particularly when set as a target and linked to financial reward systems for company staff. Ashayeri and Selen (2005) propose a 'Unified Planning System' model which combines capacity management with the external market by continuously keeping track of 'Customer Order Decoupling Points', where forecast diverges from actual customer orders.

Capacity models could also be classed as deterministic – in which market demand and other significant factors are assumed to be known with certainty – or stochastic, in which less certainty and more variability is displayed by factors included in the model (Riedewald et al, 2011). Bean et al (1992) acknowledges a divide between deterministic models and stochastic by stating that in practice, planners often ignore the stochastic nature of the demand process. They prefer instead to solve deterministic versions of stochastic problems, and thus a stochastic demand process is often replaced by forecasted demand (Bean et al, 1992). There are exceptions to this viewpoint, such as the Newsboy Model, which is often presented in situations where capacity additions are in small increments and the demand is stochastic (Ward et al, 1991). According to Karri (2000), this model lacks an 'economics of scale' effect, and he goes on to present a supplementary mathematical model that pays special attention to the role of technological progress and breakthrough in the timing of capacity expansion, but which also has weaknesses such as the non-inclusion of inflation and a limited consideration of capacity reduction and other different situations of capacity change. Aghezzaf (2005) mentions that a deterministic model would be useful for generating more robust capacity expansion programs while satisfying already given market demands. However, he also cautions that the uncertainty inherent in predicting unstable market demands makes it unrealistic for capacity decisions to be based only on the strength of deterministic solutions.

Whichever capacity approach is chosen, Zaeh (2007) notes that in industrial practice there is a demand for model simplicity and applicability. Also, Aghezzaf (2005) acknowledges that a capacity development solution that is optimal for one particular customer demand scenario may turn out to be far from optimal and very costly if this demand does not materialize. Hence, the most balanced

solution would be a capacity development program that may not be optimal for a particular realization of demand, but which is probably the least expensive to adapt for any highly probable realization of demand (Aghezzaf, 2005). This could prevent capacity over-utilization and under-utilization, and could also maximize the customer population a company can produce for while simultaneously driving down production costs and enhancing product performance.

2.2 Retrofit Companies and Environmental Business Values

The concept of an Environmental Business is a rather broad and ambiguous one; however, an increasing number of businesses from different sectors of the economy all include one form or the other of corporate social and environmental responsibility in their company policy. The term Environmental Business could just refer to an enterprise that is involved in environmental sustainable development (Hernesniemi et al, 2007). Thus, a retrofit company could be regarded as having the values of an environmental business, due to its outputs providing energy conservation and carbon emissions reduction. But it is then debatable whether a company that merely develops and delivers solutions to environmental problems, such as a retrofit company, can automatically be termed an environmental business. North (1997) argues that an environmental business should also safeguard the environment by integrating environmental protection into all managerial functions, with the aim of reaching an optimum balance between the economic and ecological performance of a company, and it also needs to have a positive social impact as well since humans are a significant part of the ecosystem.

This stronger notion of an environmental business focuses on 'maximizing value (for all stakeholders) created in relation to (environmental and social) harm done' (Isaksson et al, 2010). For an environmental business, the production aim should always be to fill 'the gap between (external) environmental pressures and the internal focus of the manufacturing environment' (Ashayeri & Selen, 2005). An environmental business seeks to make economic profit from their involvement in the minimization of the impact of human activities on the environment.

But business ethics does not always pay off in financial terms (Isakkson et al, 2010), and retrofit companies that implement environmental business values may insist on environmental investments being justifiable in terms of higher revenue, lower expenses, or other forms of payback. They may also prefer to direct spending towards newer, less capital-intensive efforts, such as new construction, rather than towards remedying already existing problems, such as retrofitting existing buildings. Research conducted by the Energy Scoping Group in 2009 indicates that environmental businesses consider access to funding as a major barrier, ahead of other factors such as knowledge of the sector, access to technologies, legislation and regulations, and availability of specialist skills. This may be interpreted as a fear of risk by external partners (EScG, 2009).

However, according to Nowak (2001), earlier research into the purchase of environmentally-friendly products such as retrofit technologies, indicates that if product quality exists and the consumer has strong personal norms about pro-environmental behaviour, then intentions to support the business with their purchases will be positively impacted. Thus, there is a need for enhancing public access to information on sustainable building matters and promoting public environmental participation as a whole (UNEP, 2002). Significant improvements in brand equity and consumer trust may be sufficient justification for increased adoption of environmental business policies by retrofit companies if these policies do not significantly increase costs of production (Nowak, 2001).

The environmental business values of a retrofit company should be able to take into consideration the social and environmental consequences of the company's activities and ensure economic success, while preventing the creation of new environmental and social problems when solving existing ones. Figure 1 shows this interaction.

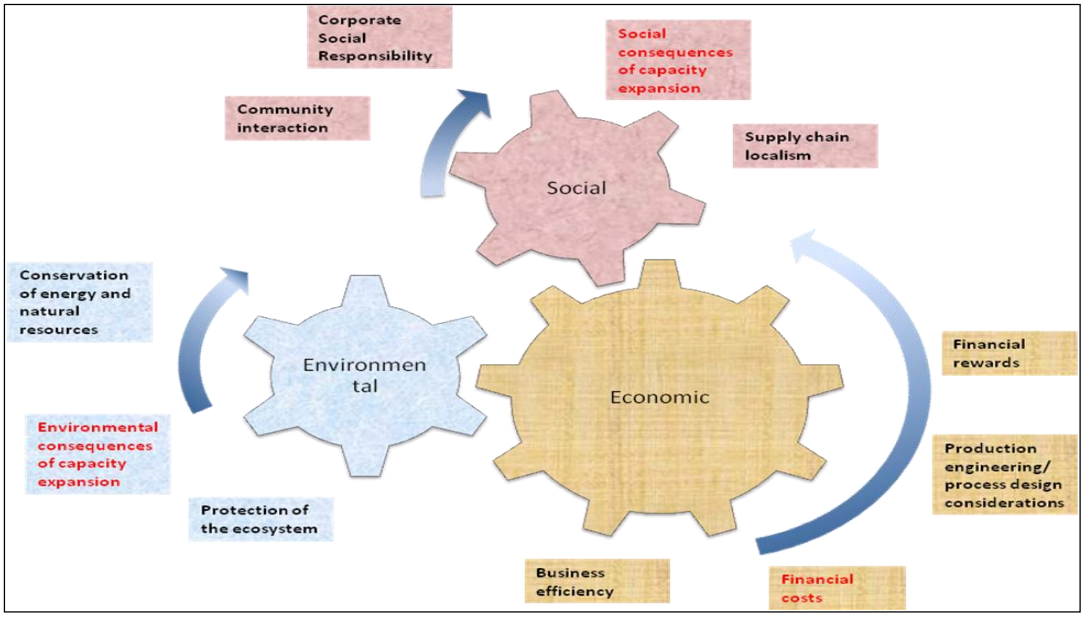

Figure 1. Company Operation within Environmental Business Values

In Figure 1, environmental and social success is being pursued as a means to enhance the prospects of economic success, which would in turn provide greater means to continue to achieve the first two goals, and without which the business' concerns for the environment and society risk being relegated to the background as a result of the company's struggle for survival (Placet et al, 2005).

According to Tebo (2005), under this type of arrangement, social and environmental issues would be viewed as opportunities for growth, rather than problems.

2.3 The Capacity Expansion Challenge for Retrofitting Companies

There is limited literature concerning capacity strategies designed for companies that utilize environmental businesses values, which brings up questions about how traditional capacity development models can best be adapted for use by these businesses. Williams (1992) contends that conventional mass production techniques can be transferred over to most renewable energy technologies. He explains that the relatively short lead times from product design to operation make it possible to identify needed improvements by field testing and to incorporate these improvements in modified designs quickly, so that many generations of technology can be introduced in considerably short periods. However, Nyaga et al (2007) are less positive about transferring a capacity management strategy between different business environments.

The problem with using conventional capacity expansion approaches within a retrofit business setting is that they are often based more on economic considerations and less on social and environmental considerations. This is somewhat at variance with the nature of the retrofit business's environmental values, which aims to reduce the impact of buildings upon the environment and make economic profit from this activity. In other words, its environmental aims are as primary to its operations as its economic aims, and in practice this could mean that it may not always go for the most cost-effective option if this will compromise the environmental performance of its products or services. It may also want to ensure that the machinery, equipment, materials and production methods used to make retrofitting products and services do not themselves have an adverse impact upon the environment. Consequently, it might approach issues such as choice of equipment and materials, site layout, and production rates and quantities, in a different manner than companies involved in less environmentally-sensitive operations.

Expansion also requires the mobilization of supply chain partners which, for an environmental business, would not only be based on which companies offer the least financial quote, but also which companies would enhance the environmental performance of its products or services and which share similar environmental business values. Environmental harm is created in supply chains and it could therefore be argued that company business ethics should be extended from the company to the entire value chain from the first supplier to the last customer (Isaksson et al, 2010).

Capacity expansion for retrofitting business may also involve more investment in skill acquisition and knowledge transfer than conventional capacity expansion, as the retrofit industry is still developing. For a capacity expansion strategy to be compatible with the retrofit sector, it has to

acknowledge the role of organizational learning in the development of the sector. Williams (1992) describes organizational learning as the process of learning and gaining more competence from experience, and he posits that some of the more recent cost reductions in the development of wind power technologies are not due to technological improvement, but due to organizational learning. Capacity expansion strategies used in business sectors that are more established may take less account of organizational learning as a greater volume of skills, knowledge, technical know-how and expertise already exists within those sectors. In the case of the retrofit industry, however, legislative and regulatory factors such as the need for planning permissions to install retrofit technologies, as well as technical issues such as the compatibility of these technologies with existing buildings (Roberts and Sims, 2008), are still evolving.

Capacity expansion is usually carried out as a response to, or in preparation for, an increase in demand, which is in turn reliant on adequate customer awareness about the product in question. Conventional capacity expansion strategies often assume the availability of an existing market to absorb the expansion, whereas retrofitting companies are faced with the challenge of raising the current level of public interest in retrofit products and services (Forsyth, 2005; Isaksson et al, 2010; Sponge, 2006). Roberts and Sims (2008) mention that 'while there is an interest in houses with more sustainable features… (people) don't know what they are asking for yet'. Sinha (2009) states that the benefits of sustainable building solutions are increasingly being recognized by building stakeholders, but useful and practical knowledge of these solutions is still limited. Isaksson et al (2010) point to a general lack of system understanding. In 2006 over 70% of homeowners claimed to know little or nothing about sustainable homes, and 9 out of 10 people thought the government should offer incentives to encourage demand (Sponge Sustainability Network, 2006); there doesn't appear to be conclusive literature evidence that this situation has changed significantly in the intervening years.

Capacity expansion for a retrofitting company would also have to take into account the entry of new competitors into the market at an accelerated rate in the future. The retrofit industry is still emerging compared to other productive sectors, and as it develops further and becomes more attractive (due to factors such as changing energy culture among the public, compliance of builders with government legislation such as the code for sustainable homes, and a drop in costs as retrofit activity increases), the rate at which it attracts new entrants into it could increase and could also be faster than that experienced in more established sectors, as implied by previous theory and research (Warkov & Meyer, 1982; Rogers, 2003).

3 Research Methodology

This paper uses a literature review to study conventional capacity development approaches and models, highlighting the problems of using them within a retrofit business setting, and exploring the concept of aligning business reality with social and environmental values. It uses the Birmingham Energy Savers retrofit project as a case study in order to study how social-environmental capacity expansion is actually implemented in practice and goes on to conduct an interview with a key member of the Birmingham Energy Savers policy team. The use of an interview is suitable because it enables the research to gain an insight into subjective interpretations of environmental businesses in the real world. The interview explored how environmental and social values were accommodated alongside economic and business process considerations in the project. The responses obtained were in-depth and included both qualitative and quantitative data. The use of the Birmingham Energy Savers project as a case study further provides a context for the issues identified in the literature review.

Information on Birmingham Energy Savers was obtained from Birmingham Energy Savers' documentation on the internet and in print. Birmingham Energy Savers is a major retrofit project in Birmingham supported by the Birmingham City Council (http://www.birminghamenergysavers.org.uk). Birmingham Energy Savers is being executed in phases, some of which have already been completed. The first phase (July 2010 – June 2011) served as a pilot for PV installation in Birmingham homes and businesses; the second, which is currently ongoing, carried out PV installation on a larger scale (2022 installations compared to 201 in the first phase), while the third phase aims at whole house retrofitting for 15000 Birmingham households (Howarth, 2011).

The Birmingham Energy Savers project was set up to encourage significant local investment in low carbon technologies, and the installation of retrofitting and eco-refurbishment technology in Birmingham homes by local firms. These activities are intended to reduce fuel poverty, cut CO_2 emissions, improve health and the built environment, and effectively generate a guaranteed 25 year income stream into the locality (Howarth, 2011). Birmingham Energy Savers coordinates procurement, customer engagement, installation, monitoring, and support services (such as legal and construction consultancy), by linking local, small, environmentally and socially responsible suppliers with each other, thus making the sector more organized. Retrofitting companies that are part of the scheme consistently engage with communities, monitor customer satisfaction, and are involved in social programs that create employment and training opportunities for local citizens.

4 Findings and Discussion

The findings revealed how environmental business values were embedded in the project and the way companies responded. Firstly, the evaluation strategy used by Birmingham Energy Savers to select companies for the retrofit supply chain involves 5 criteria: Price, Technical capability, Customer care, Jobs and skills and Environmental/social factors. For the selection of photovoltaic (PV) installation companies, these are weighted 40%, 15%, 20%, 20% and 5% respectively. The Jobs and Skills criteria refers to the requirement for the companies to work locally, be involved in local education and training programmes, and assist local charities. Thus, together with the Environmental/social factors criteria, 25% of the requirements for companies to participate in the project are based on environmental and social considerations.

One of the companies involved is G Purchase Construction which undertakes PV installation (http://www.gpurchaseconstruction.ltd.uk/). Its approach has a fundamental environmental character with senior staff promoting this commitment. Apart from having robust environmental policies, the company is engaged in developing its workforce and supporting many local social initiatives. It also believes it needs to be innovative in its approach to installation by learning from previous experiences. Its success has started to provide it with increasing amounts of high- value work, which means it can continue to maintain its positive employee practices and encourage others in the industry to take up similar values.

The interview findings also showed that the slow public acceptance of retrofit installations is a pressing challenge to the retrofit industry, ahead of conventional issues such as manufacturing and installation know-how. To address this, the retrofit companies involved in the project are expected to interact with customers not just to monitor their satisfaction with the retrofitting, but also to facilitate a change in their behaviours to ensure better energy conservation.

The interview findings also indicated that while the overall social and environmental responsibilities of the companies increase their total business costs, some basic environmental practices such as energy efficiency and waste recycling help retrofit companies to cut costs (according to the interview respondent, 'being energy efficient...and waste management makes financial sense because waste is really expensive to dispose of, why wouldn't you recycle more?...it's cheaper'...'environmentally efficient ways of doing things...make financial sense').

Based on these findings, it can be argued that companies involved in the development and delivery of retrofit solutions have to develop their environmental and social performances in order to take advantage of the business opportunities provided by major projects such as Birmingham Energy Savers. This move could also serve as a means of encouraging wider public acceptance of retrofit

installations and facilitating a better understanding of retrofit technologies by intended users. If sustained, this could translate into increased demand for retrofit solutions. The retrofit companies would then be able to plan for capacity expansion more accurately since they are the drivers of the rate of demand growth.

The Birmingham Energy Savers project identifies the need for retrofitting companies to include social and environmental processes as an integral part of their operations, rather than as merely secondary to economic performance. What is lacking, however, is a way to assist these companies to develop their environmental business values alongside their retrofit manufacturing and service skills. This would need to specifically target retrofit companies and recognize the particular set of tensions which exists between their resource and process efficiency on one hand, and their social-environmental obligations on the other.

Such an approach could be provided via a capacity model that would be able to identify all the environmental and social processes that a retrofit company can be involved in (e.g. from waste recycling and raising public awareness, to production processes with minimum negative environmental impact), determine which ones directly provide economic value (e.g. by reducing costs or increasing the company's income) and which ones are more resource-intensive, incorporate environmental and social costs into the company's economic planning and process design right from the onset (as opposed to treating them as miscellaneous expenditure), and then determine cost-effective options. The overall effect of such an approach would be to enable the retrofit company successfully adopt environmental business values even when it would be cheaper not to, and to ensure that its relationship with external agents such as its supply chain, consumers of retrofit solutions, and government, would be conducted in an equally sustainable manner. The development of such a model is currently being looked into by the authors of this paper.

5 Conclusion

The study of the Birmingham Energy Savers project shows that the adoption of environmental business values by a retrofit company would further its chances of gaining access to and taking advantage of business opportunities provided by major retrofit projects, thus providing a direct economic incentive for retrofit companies to take up more environmental business practices.

This paper has argued that capacity expansion for a retrofit company would benefit from a system that utilizes social and environmental strategies alongside conventional economic and process considerations. Current capacity expansion models are firmly set within a narrow micro-economic framework with purely functional values, whereas what is required are strategies that adopt environmental business values, thus managing costs without compromising social-environmental

responsibility and assisting behavioural change within society. There is a fundamental paradox with the use of conventional models as they set up an opposition between business success and environmental and social success. What is required is a more holistic model in which the complex and multi-criteria decision making that needs to be accommodated can be better undertaken in practice, and from this more confidence and direction given to the parties involved.

This paper is a pilot for a wider study into the development of a capacity expansion approach that would best accommodate the environmental business values of retrofitting companies. Future research in this area should focus on a broader range of retrofitting companies and solutions beyond photovoltaics.

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