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Tochukwu Ben Onyido
David Boyd and
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Tochukwu Ben Onyido, David Boyd and Niraj Thurairajah
Birmingham School of the Built Environment, Birmingham City University

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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*: Capacity development; eco-refurbishment; environmental business values; socio-environmentally responsible practices; sustainable energy solutions*

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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 and 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: first, 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 reviews 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 remainder 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.

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.

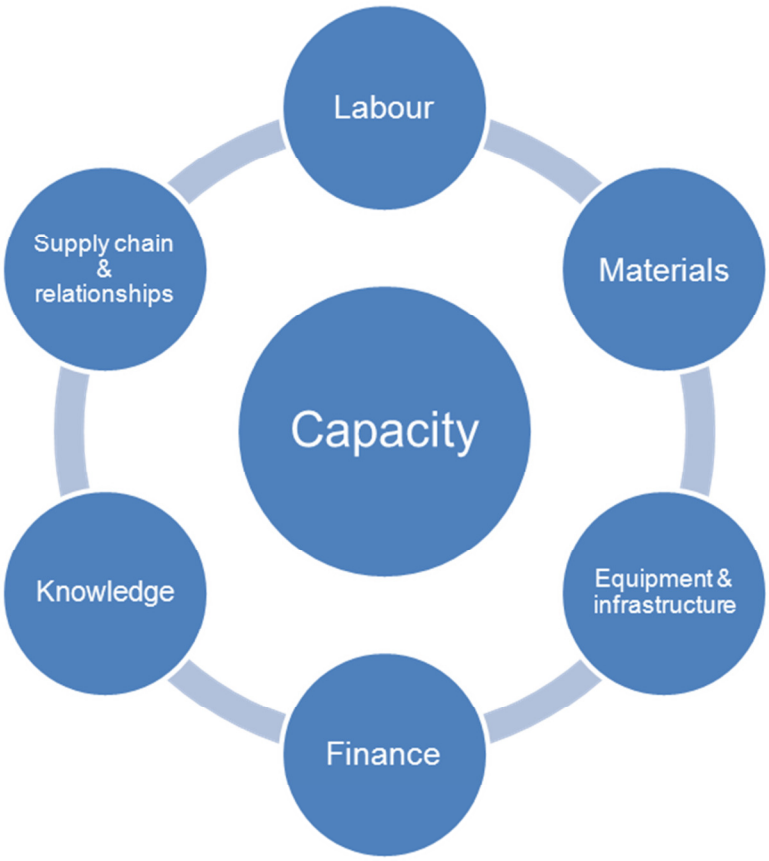

Figure 1: Components of capacity as determined from literature research

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.

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.

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.

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.

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.

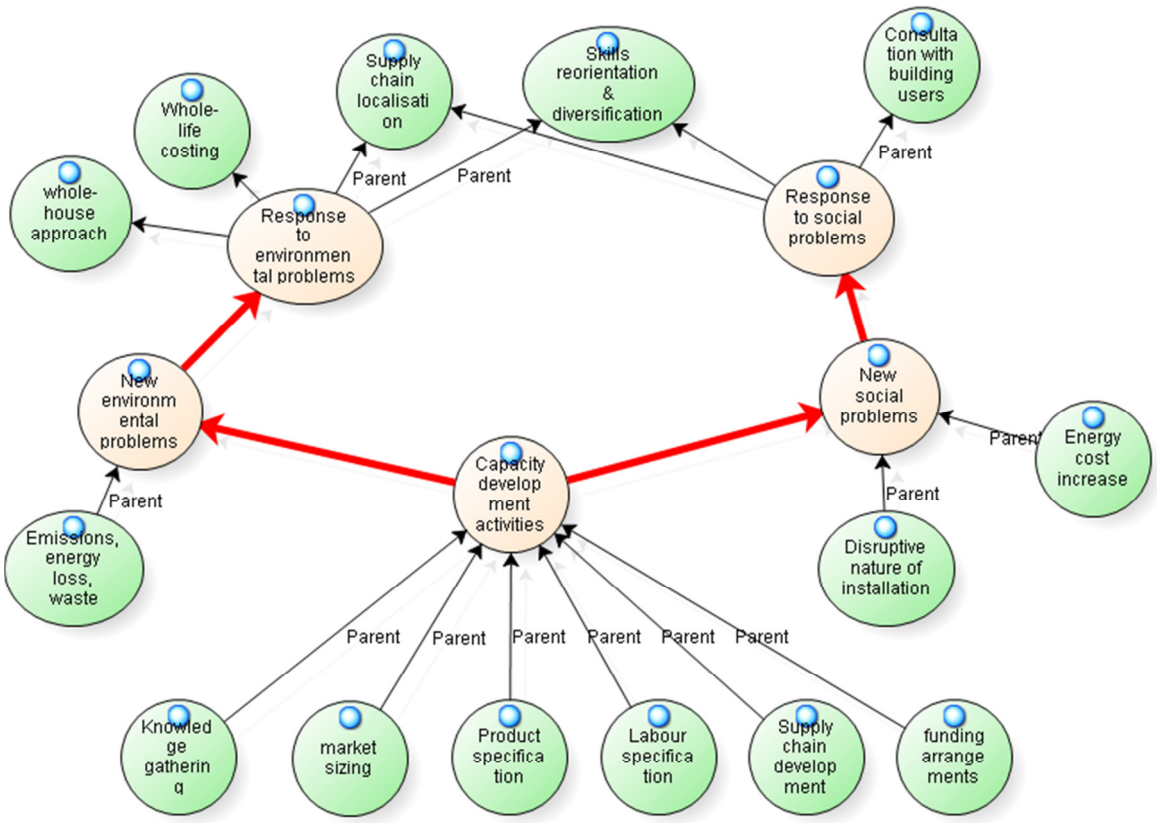

Figure 2: The capacity development activities, the new environmental and social problems they bring up, and the responses to these problems

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

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). The effects of environmental business values and socio-environmental practices are presented more expansively in Figure 3.

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

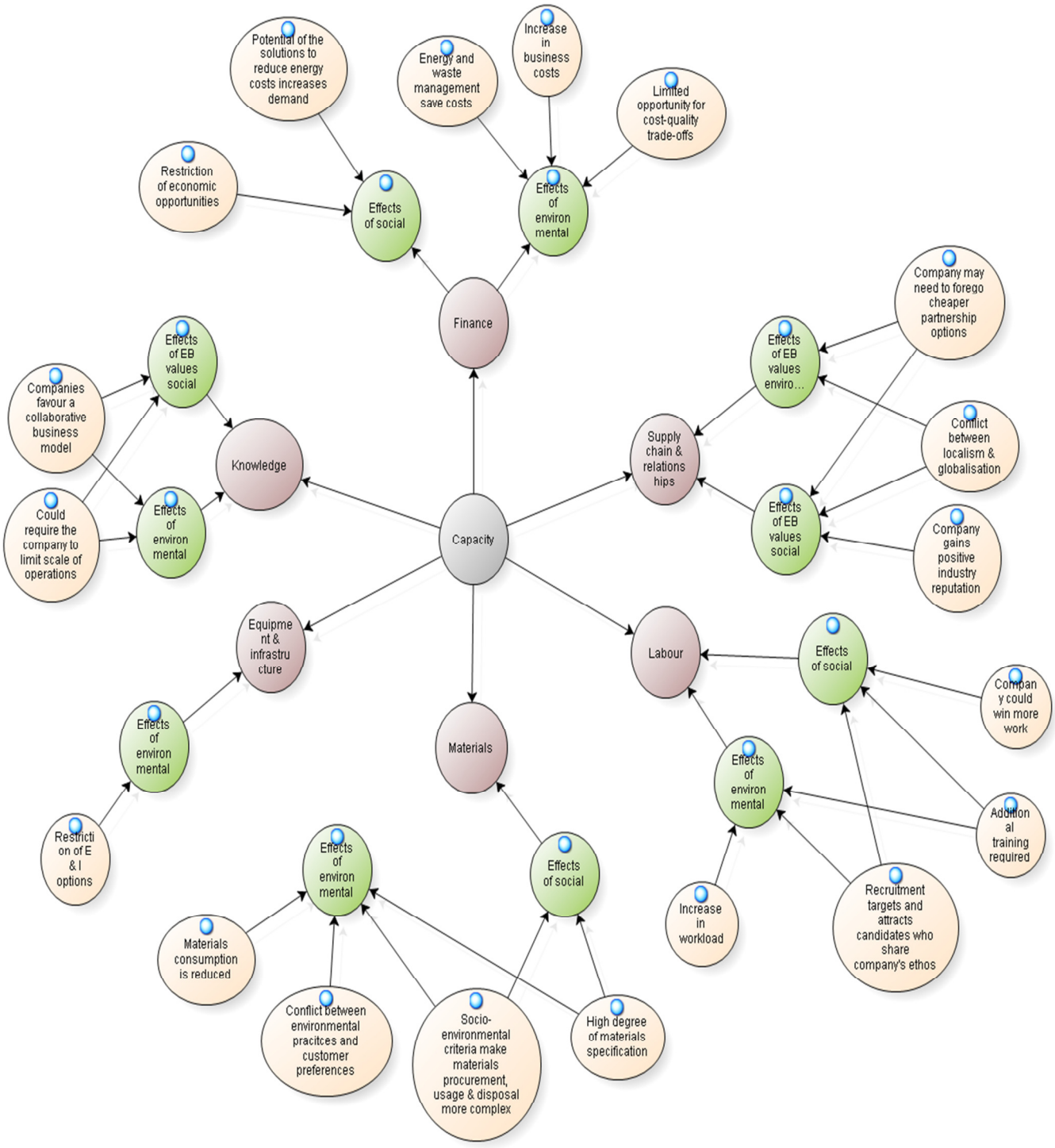

Figure 3: Effects of environmental business values and environmentally and socially responsible practices on the components of capacity

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 studied 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 of this writer 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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