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Towards a framework to enable construction small and medium-sized enterprises (SMEs) to manage sustainability

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TOWARDS A FRAMEWORK TO ENABLE CONSTRUCTION SMALL AND MEDIUM-SIZED ENTERPRISES (SMES) TO MANAGE SUSTAINABILITY

By
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A dissertation thesis submitted in partial fulfilment of the requirements for the award of the degree Doctor of Engineering (EngD), at Loughborough University

November 2015

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ACKNOWLEDGEMENTS

This research project has, without a shadow of a doubt, pushed me right to my limits. There have been times during these past four years when I have struggled for motivation, questioned my ability to complete this project and even toyed with throwing in the towel. It really has been the biggest challenge I have faced and has certainly satisfied my curiosity for further academic discovery. However, for every trial there has been a success; for every trough there has been a peak, and now, some four years later I have somehow found my way to the finishing line – one that at times seemed almost impossible to reach. I am under no illusions that I am indebted to a number of people for helping me get there and I express my thanks to them below.

First and foremost, I wish to express my sincerest gratitude to my industrial supervisor Ian Nicholson and my two academic supervisors Professors Jacqui Glass and Andrew Dainty. Without their expertise, advice, support and patience over the duration of this project there is no doubt that it would not have been completed.

I also wish to thank Dr Shamir Ghumra of Responsible Solutions Ltd, whose vast knowledge of the subject area and experience in completing his own EngD several years previously ensured that I kept on the right path and focused on my end goals. My other colleagues at Responsible Solutions also deserve a mention, for making the office an enjoyable place to work, providing those endless cups of coffee and for lending a sympathetic ear when it was needed.

Outside of work my family and friends have helped me to maintain at least some degree of sanity and have provided many a welcome distraction during this research programme. Several of them are completing or have completed their own doctoral level studies and so understood first hand exactly the types of challenges I was facing.

Last, but by no means least, I would like to thank my girlfriend Sian for everything else. Her humour, patience, support and sympathy really does deserve a medal for keeping me going through especially the final 18 months. Hopefully the journey was worth it, and we can now move on to better things…

ABSTRACT

The careful management of sustainability issues is increasingly being demanded by construction clients and others within the construction supply chain. Certification to sustainability standards is widely recognised as a means of demonstrating performance in this regard, and many pre-qualification questionnaires and tender processes now explicitly require their suppliers to provide evidence of sustainability standard certificates and policies. However, implementation of these standards is a costly and time consuming process, especially for small and medium-sized enterprises (SMEs). Smaller firms often lack the fundamental know-how of how to address the requirements of standards and are required to engage the services of consultancies in order to implement them, which further increases the costs associated with their implementation.

This Engineering Doctorate (EngD) was instigated to address the barriers to SME sustainability certification, with an emphasis on the relationship between learning and sustainability. A number of research methods are employed, including a case study, data analysis and interviews, to examine the influences on the ability of SMEs to engage with such standards. The research reveals that higher levels of organisational learning and absorptive capacity determine SME's abilities to implement standards effectively, and a learning framework is developed to support smaller firms in addressing this. The subsequent validation of the approach demonstrates that it yields cost savings by focusing attention on key requirements of certification and compliance. It provides Responsible Solutions with a practicable tool that they can deploy when supporting such firms in the future. A number of recommendations for the further development of the framework are proposed as well as directions for further research in this space.

KEY WORDS

Sustainability standards, small and medium-sized enterprise (SME), learning framework, responsible sourcing, organisational learning, absorptive capacity.

PREFACE

This thesis has been prepared to summarise the research completed as part of an Engineering Doctorate (EngD) programme managed at Loughborough University through the Centre for Innovative and Collaborative Construction Engineering (CICE), based in the School for Civil and Building Engineering. This particular research was undertaken between October 2011 and September 2015, and was sponsored by Responsible Solutions Ltd, an environmental and corporate social responsibility consultancy. Additional sponsorship was provided by the Engineering and Physical Sciences Research Council (EPSRC).

The EngD programme is recognised as a radical alternative to the traditional PhD, with its fundamental aim to produce postgraduate research that is more streamlined to the needs of industry. An EngD is thus carried out predominantly within a sponsoring company, with the researcher given the opportunity to produce innovative research and solutions that benefit both the sponsoring company and the wider industry.

The EngD is examined based on a thesis, supplemented with between three and five published papers (one of which must be a journal paper). These published papers support the thesis by providing detailed accounts of the work that was carried out during the research programme, and as such, should be read in conjunction with the thesis. This particular thesis contains five peer reviewed papers which are included as appendices; three that were presented at conferences, one journal paper that is in review and one that is published in a peer review journal.

USED ACRONYMS / ABBREVIATIONS

ACAP	Absorptive Capacity
AESOP	An Ethical and Social Responsibility Portfolio for construction professionals
ARCOM	Association of Researchers in Construction Management
BES	BRE Environmental and Sustainability Standard
BRE	Building Research Establishment
BREEAM	BRE Environmental Assessment Method
BSI	British Standards Institute
CEEQUAL	Sustainability assessment, rating and awards scheme for civil engineering
CICE	Centre for Innovative and Collaborative Construction Engineering
CIRIA	Construction Industry Research and Information Association
CSR	Corporate Social Responsibility
DIR	Design – Implement – Review process
EC	European Commission
EMS	Environmental Management System
EngD	Engineering Doctorate
ETO	Engineer-To-Order
GDP	Gross Domestic Product
ICE	Institution of Civil Engineers
IEMA	Institute of Environmental Management and Assessment
ISO	International Standards Organisation
LCA	Life Cycle Assessment
LOA	Level of Attainment
OHSAS	Occupational Health and Safety Advisory Services
OL	Organisational Learning
PACAP	Potential Absorptive Capacity
PQQ	Pre-Qualification Questionnaire
QA	Quality Assurance
RACAP	Realised Absorptive Capacity
RS	Responsible Sourcing
ROI	Return on Investment
SCM	Supply Chain Management

SCSS	Supply Chain Sustainability School
SSC	Strategy for Sustainable Construction
SME	Small and Medium sized Enterprise
UK	United Kingdom

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LIST OF PUBLICATIONS

The following papers, included in the appendices, have been produced in partial fulfilment of the award requirements of the Engineering Doctorate during the course of the research.

PAPER 1 (SEE APPENDIX F)

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2012). Integrating responsible sourcing in the construction supply chain. *In:* Smith, S. (2012) (ed). *Proceedings of the 28th Annual ARCOM Conference,* Edinburgh, 3-5 September 2012, 1311-1319.

PAPER 2 (SEE APPENDIX G)

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2013). Characterising the relationship between responsible sourcing and organisational reputation in construction firms. *In: Proceedings of the Sustainable Building and Construction Conference,* Coventry, 3-5 July 2013, 215-224.

PAPER 3 (SEE APPENDIX H)

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2015). Analysis of responsible sourcing performance in BES 6001 certificates. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* 168(2), 71-81.

PAPER 4 (SEE APPENDIX I)

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (forthcoming). Implementing sustainability in small and medium-sized construction firms: The role of absorptive capacity. *Engineering, Construction and Architectural Management,* 23(4) (pagination TBC).

PAPER 5 (SEE APPENDIX J)

Upstill-Goddard, J., Glass, J., Dainty, A. and Nicholson, I. (2015). Developing a sustainability assessment tool to aid organisational learning in construction SMEs. *In:* Raiden, A. B. and

Aboagye-Nimo, E. (eds). *Proceedings of the 31st Annual ARCOM Conference*, 7-9 September, Lincoln, UK, Association of Researchers in Construction Management, 457-466.

OTHER PUBLICATIONS NOT INCLUDED WITHIN THE THESIS

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2014). Absorptive capacity as an enabler of sustainability implementation in construction firms. *Corporate Responsibility Research Conference,* Leeds University, Leeds 15-17 September 2014.

Upstill-Goddard, J. (2014). Assessing the need to demonstrate responsible sourcing of construction products. *Innovation and Research Focus,* 99, 6-7.

Upstill-Goddard, J. (2015). Improving learning to improve sustainability management. *Innovation and Research Focus,* 103, 1.

1 BACKGROUND TO THE RESEARCH

1.1 INTRODUCTION

This chapter presents the background to the research undertaken as part of this EngD. In particular it provides, in broad terms, an introduction to the general subject domain of sustainability certification within the UK construction industry, the role and interests of the industrial sponsor and the research context. It also states the overarching aim and four objectives that were used to develop the research programme, and justifies why these objectives were chosen and how these contribute to achieving the overarching aim of the research.

1.2 THE GENERAL SUBJECT DOMAIN

The construction industry contributes around 6.4% of the total UK economic output, equating to approximately £92 billion (Rhodes, 2015) and 5.9% of gross domestic product (GDP) (ONS, 2015). During the 1990s, the industry underwent significant changes prompted by the need to drive efficiency improvements within UK construction. Two seminal industry reports were published which identified improvements through partnering and collaboration (Latham, 1994) and elimination of waste or non-value adding activities from the construction process (Egan, 1998). The legacy of these reports saw the setting up of various boards and forums culminating in the formation of the Strategic Forum for Construction in 2001 to help facilitate government and industry collaboration. This has six key commitments; one of which is to drive sustainability, and in 2008 was involved in the development of the Strategy for Sustainable Construction (SSC) (BERR, 2008). The Strategy identifies 12 ‘means’ and ‘ends’ for the development of a sustainable built environment and sets objectives, targets and activities under each of these.

Three years later, the publishing of the Construction Strategy 2011 (Cabinet Office, 2011) called for change in the relationship between public authorities and the construction industry, with the aim of generating better social and economic infrastructure. This strategy document challenges industry business models and practices, advocates collaboration and demands cost reduction and innovation within the supply chain.

In 2013, a joint industrial and government strategy entitled Construction 2025 (BIS, 2013) identified the need to be sustainable as one of its five aspirations for UK construction by leading

in low-carbon and green construction exports. Underpinning this aspiration are supply-chain wide opportunities for greater resource efficiency and adapting the built environment to cope with climate change.

Such policy drivers and targets for sustainability have led to organisations seeking means of managing their sustainability impacts. Assessment tools such as BREEAM (BRE, 2014b) for the built environment and CEEQUAL (CEEQUAL, 2015) for civil engineering projects have become increasingly important for demonstrating sustainability. At the organisational level, management systems and product standards have also come to the forefront, with a wide range of product manufacturers, contractors and construction clients now striving for certification to a broad range of sustainability standards to demonstrate management of a range of environmental, social and ethical issues. However, certification to these standards is often a difficult prospect, particularly for the small and medium-sized enterprise (SME) given their limited access to financial and other resources, such as available staff numbers and time. Therefore, providing a means for construction SMEs to comply with such standards that does not demand such intensive use of resources is vital to improving the construction industry's holistic approach to sustainability.

1.3 THE INDUSTRIAL SPONSOR

Responsible Solutions primarily focuses on the provision of specialised business support in the areas of environmental and social responsibility, with its client base lying predominantly within the construction sector. Particularly, the company are focused on delivering:

- Cost savings and operational efficiency;
- Greater ability for clients to win work by differentiating these businesses in ways that increasingly matter to their clients;
- Improved reputation with all stakeholders built on real and demonstrable commitment to environmental responsibility.

Responsible Solutions have always strived for a bespoke approach by tailoring a specific service to meet the individual company's needs – whether that is through compliance with standards or certification schemes, or through a more flexible means to improve environmental performance. Primarily working within the UK construction sector, they are leaders in the field

of responsible sourcing (RS) in construction, and have assisted a number of companies in obtaining certification to the BES 6001 standard (BRE, 2009; 2014a). They have also been involved with stakeholder consultations on BES 6001 (BRE, 2009; 2014a) and often provide training courses and workshops on RS.

Responsible Solutions also provide the technical support function to CEEQUAL (the sustainability assessment and awards scheme for civil engineering, infrastructure landscaping and public realm; CEEQUAL, 2015), and are the training partners to the Supply Chain Sustainability School (SCSS), holding a number of positions on steering groups within it. As part of its role as a training provider, Responsible Solutions provide a number of training materials, such as e-learning modules and workshops on specific topics, such as responsible sourcing and environmental management, among others. In addition to major clients such as CEEQUAL and the SCSS, the company has a track record of working with a number of SMEs, and as an SME themselves, Responsible Solutions have recognised that there is an imbalance between the requirements placed upon SMEs to address sustainability requirements and their ability to do so.

Responsible Solutions was formed in February 2003 and has since grown to a team of six full time employees, plus three to four regularly utilised freelance associates. In 2011, the Managing Director of Responsible Solutions Ian Nicholson recognised that in order to maintain the company's leading position with regard to RS, and the need to address the certification agenda to render it more approachable for the SME, the company would need to appoint a researcher. This position would look to keep the company at the front end of the construction industry with regard to support on RS and broader sustainability issues. The company is among the founding members of the APRES (Action Programme for Responsible Sourcing) network, and after a series of meetings with the APRES Chair Professor Jacqui Glass of Loughborough University, this EngD project was initiated. The research carried out as part of this EngD has delivered outputs that will be further developed by Responsible Solutions in future years. In particular, the framework discussed later in this thesis is the subject of an innovation programme that Responsible Solutions have enrolled on, which will commercialise the research into a product that can assist in the deliverance of future projects.

1.4 THE CONTEXT OF THE RESEARCH

UK construction companies, both contractors and product manufacturers are under increasing pressure to comply with the sustainability targets of clients and customers and major contractors respectively. As such, they are required to demonstrate compliance with a broad range of requirements, from simply demonstrating that policies are held for particular issues on one hand, to operation of product or management system standards on the other.

Traditionally, sustainability was often regarded as a 'bolt-on' to an organisation's operations, with limited integration into business operations (Grayson and Hodges, 2004). Nowadays, demands for evidence of engagement with sustainability are often satisfied by the certification of an organisation to standards, as this indicates at least a benchmark level of performance is being met. Provision of copies of certificates is often necessary when completing pre-qualification questionnaires (PQQs) and tenders, with an inability to do so potentially harming the organisation's chances of being awarded a work or supplier contract. For example, for an organisation that can demonstrate it holds an ISO 14001 (BSI, 2004) certificate for environmental management systems (EMS), it can be said that it has met a benchmark level of environmental management practice and this has been audited against the requirements by a third party. This certificate means the customer does not then need to carry out time consuming and costly audits themselves on that supplier to determine the level of their environmental practice.

There are however, a number of 'sustainability' standards available, such as those published by the British Standards Institute (BSI) (e.g. ISO 14001, BS 8903 and ISO 26000), the Building Research Establishment (BRE) (e.g. BES 6001) and independent bodies such as Social Accountability International (SAI; SA 8000), among others. However, these standards often compartmentalise sustainability into one of its three pillars, such that a standard is considered 'environmental' or 'social' in nature, rather than 'sustainable', perhaps with the notable exception of BES 6001 (BRE, 2009; 2014a), which has drawn aspects of all three pillars of sustainability into one standard. Furthermore, sustainability standards also tend to be marred by a lack of cohesion, meaning that organisations must often undergo multiple audits to comply with sustainability targets, costing a substantial amount of money, time and demanding the mobilising of considerable other resources, but. These issues are magnified in the case of the small and medium sized enterprise (SME) community, which represents around 99% of all firms (EC, 2013), and those with less than 250 employees and a turnover of less than €50 million

(EC, 2005). Typically, due to their smaller sizes and turnovers, they often operate under much greater resource constraints in terms of time, staff numbers and finances. Although one could argue their small size may render them more flexible than their larger counterparts when it comes to implementation of standards, their inability to devote sufficient resources often limits their ability to engage with the sustainability agenda. For example, implementing such standards becomes the 'secondary' remit of employees who have other primary roles within the organisation, which can further limit the time available to implement them. Furthermore, it is suggested that the design of standards lend them more to the larger company as their current design appears limited when applied to the SME (Baden *et al.*, 2011; Tsai and Chou, 2009). Therefore, the application of and engagement with sustainability standards by the SME is an important, but under-theorised and under-researched area.

Within the UK construction industry, responsible sourcing (RS) has become a core focus of the sustainability agenda since the publishing of the BES 6001 (BRE, 2009; 2014a) framework standard for the responsible sourcing of construction products. The standard is performance based, and 'points' are awarded under a number of headings depending upon the level of compliance that an organisation can demonstrate. Organisations are awarded a 'pass', 'good', 'very good' or 'excellent' rating depending upon the number of credits that are accrued. However, gaining certification to BES 6001 can be argued to almost represent a 'fourth audit' of the sustainability certification agenda, as it is not possible to obtain anything higher than a pass rating if the organisation does not hold at least one of ISO 9001 (BSI, 2008) for Quality Assurance, ISO 14001 (BSI, 2004) for Environmental Management Systems (EMS) or the Occupational Health and safety standard, OHSAS 18001 (BSI, 2007). It can therefore be plausibly suggested that companies should implement these three standards prior to undergoing an audit for BES 6001 (BRE, 2009; 2014a) if they wish to strive for high performance. This, as mentioned previously, will have huge cost and resource implications. Certification may cost thousands of pounds and draw in many hours of staff time, which although not so much of an issue for larger organisations, may represent a substantial burden on an SME.

In addition to these operational and administrative challenges, organisations may also struggle to implement such standards due to limited knowledge and understanding of the workings of the standards and the language they use. As such, this lack of understanding further supports the theory that standards are implemented as a 'bolt-on'; embedding such practices into the organisation's operations requires a level of knowledge and understanding that is often absent

in organisations that do not have dedicated sustainability departments. As such, the knowledge and levels of learning may create additional barriers to implementing standards.

Therefore, implementation of standards in the SME is beset by a number of barriers, namely financial, resource and particularly knowledge barriers, which limits their ability to implement standards. Additionally, when standards are implemented in the SME, does the fact that customer pressure has influenced their implementation, rather than a voluntary drive on the part of the company, cause them to have limited value? This thesis presents the development of a framework that addresses the learning required to implement standards, enabling organisations to focus on increasing their knowledge and understanding of sustainability requirements prior to implementing them, leading to reduced costs and time. The framework also ensures the requirements of these standards are embedded within the organisation in order to maximise their value.

1.5 AIM AND OBJECTIVES

The overarching aim of this EngD is to: **'Develop a learning framework to enable construction SMEs to more effectively manage sustainability.'**

In order to meet the overarching aim of this EngD, a set of four broad objectives, to be completed over the four years of the project were agreed. Table 1.1 presents each of these four objectives, along with the corresponding work packages and methods that were used to address them. The outputs of each of these objectives are also listed and each output can be found within the appendices to this thesis.

Table 1.1 Identified research objectives and corresponding work packages, methods and outputs

Objective	Work Packages	Method used	Outputs
Objective 1: Identify and determine the need to focus on responsible sourcing within UK construction	WP 1: Responsible Sourcing	Literature reviews Survey analysis	Paper 1 Paper 2 APRES report
Objective 2: Analyse performance against standards	WP 2: Assessment of BES 6001 performance data	Experimental analysis	BRE Industrial Report Paper 3
Objective 3: Critically analyse the role of learning in implementing standards	WP 3: Linking BES 6001 with learning	Case study	Paper 4
Objective 4: Design, develop and pilot a learning framework for the construction SME	WP 4: Develop high-level structure WP 5: Develop detailed modules and pilot	Action research Field testing/ Interviews	Paper 5 Interview findings (Chapter 4.7)

1.5.1 JUSTIFICATION FOR THE FOCUS ON RESPONSIBLE SOURCING

Each of these four objectives have been identified with the aim of providing a specific contribution to knowledge (theory) and industry. Much of the research carried out in this EngD project focused on responsible sourcing (RS) and certification to BES 6001 (BRE, 2009; 2014a). At the initiation of this EngD, the intended final outcome was to deliver outputs for the construction products sector, and RS was therefore selected as a lens through which to focus the research given its potential to be regarded as an indicator of sustainability at the product level (Upstill-Goddard *et al.*, forthcoming; see appendix I). Additionally, Responsible Solutions were keen to develop their knowledge in this area (indeed this was one of the reasons for the initiation of this EngD) such that they could maintain their position as the leading consultancy for RS support. Additionally, as one of the founder members of the APRES network, Responsible Solutions also hold positions on the steering group; the researcher was afforded one of these positions. Although it was also recognised the final industrial output of

this EngD would be broader than RS, setting a number of RS-focused objectives would enable the deliverance of academic contributions in an under-researched area that have important implications for the future of sustainability within the construction industry. Furthermore, given the relatively broad coverage of holistic sustainability issues by standards for RS (when compared with other 'sustainability' standards), any conclusions drawn from research into RS are more robust when generalising to the broader sustainability agenda than conclusions drawn from a more compartmentalised standard, such as ISO 14001 (BSI, 2004) for environmental management systems, for example. As most standards tend to focus on compartmentalised 'environmental' or 'social' issues (Blowfield, 2000), when delivering a broad 'sustainability' framework, focusing on RS assessment methodologies appears plausible given its more holistic coverage of such issues.

1.5.2 JUSTIFICATION OF THE OBJECTIVES AND OUTPUTS

Objective 1 was to identify and determine the focus on responsible sourcing within UK construction, through the use of literature reviews and analysis of survey responses from the first APRES Conference held in November 2011. Specifically, this objective focused on work package 1 (responsible sourcing) with the aim to obtain an understanding that would enable a plan for the forthcoming years of the EngD project to be devised. Specific outputs from this work package are:

- A review of sustainability within the construction supply chain, focusing on the integration of RS principles within it. This work was presented at the 28th annual Association of Researchers in Construction Management (ARCOM) conference in September 2012 and is included within appendix F (Upstill-Goddard *et al.*, 2012).
- A review that links RS with corporate reputation, given that compliance with BES 6001 (BRE, 2009; 2014a) for RS is recognised as a means of managing ethical and social issues within the construction supply chain. This work was presented at the Sustainable Building Conference 2013 at Coventry University, and is included within appendix G (Upstill-Goddard *et al.*, 2013).
- A short report, disseminated among the members of the APRES steering group and attendees of the APRES conference, covering the feedback received from delegates at the first APRES Conference, held at Loughborough University in November 2011. This report provided a useful overview of the state of knowledge on responsible sourcing and

helped to stimulate debate on moving the agenda forward. This report is included in appendix B.

Objective 2 was to analyse performance against standards (specifically by using the responsible sourcing framework standard BES 6001 (BRE, 2009; 2014a) as a lens) and yielded the first empirical output of this project. This objective analysed all available RS certificates (issued between 2008 and 2013) to assess how the construction industry as a whole was performing against the standard. Specific outputs from this work package are:

- A short industrial report which was submitted to the BRE, which reports some initial analyses of the data obtained from analysing all certificate scores. This report is included within appendix C.
- The work included within the industrial report (appendix C) was then subject to additional statistical analyses to further understand the trends within the data. This was published as a journal paper in April 2015, in a special edition of the ICE *Engineering Sustainability* journal on sustainable construction. The paper is available in appendix H (Upstill-Goddard *et al.,* 2015a).

Objective 3 was to critically analyse the role of learning in implementing standards, and looked beyond the operational aspects of standard implementation, focusing more on the organisational actors responsible for implementing them. Specifically this considered implementation of BES 6001 and how organisational learning, particularly the 'absorptive capacity' (ACAP), can drive implementation of standards at the company level. This was carried out by means of a case study with two construction SMEs in order to understand how the intricacies of SMEs can affect standard implementation. This work is due to be published in the *Engineering, Construction and Architectural Management* journal in 2016. The submitted paper is included within appendix I (Upstill-Goddard *et al.,* forthcoming).

Objective 4 was to design, develop and pilot a learning framework for the construction SME, such that they can increase compliance with specific sustainability aspects, and address implementation of these by considering what the current state of knowledge is on a specific aspect at the organisational level. Actions within the framework would then look to increase the ACAP of the organisation, and hence capacity for learning. WP 4 listed in table 1.1 is based upon the findings drawn from WP 1-3. Initially a high-level framework was developed and is the subject of a conference paper which was presented at the 31st annual Association of

Researchers in Construction Management (ARCOM) conference in September 2015. The full paper is included within appendix J (Upstill-Goddard *et al.*, 2015b).

A piloting programme was then rolled out as a second work package of objective 4 (WP 5) which evaluated the applicability and novelty of the framework to the construction industry. The results of this piloting process and the amendments made in light of this pilot phase are discussed within chapter 4.8 of this thesis.

It is intended that this EngD project will have a number of implications for those involved in, and affected by the project. Firstly, it is envisaged that this project will make key contributions in the academic field of sustainability, specifically through contributing knowledge to the issue of sustainability certification, by linking this with organisational learning and ACAP. It has also particularly contributed to knowledge on RS, an area which is under-theorised given its emergence as an important concept for the sustainable construction agenda. The novelty of this project is thus twofold; although the link between sustainability and learning has been theorised, a specific focus on certification to standards and the role learning has on an organisation's capacity to implement these has not. Secondly, literature on RS is sparse, with very little looking at RS 'in practice', and so peer-reviewed papers considering the operational role of RS in construction will make a valid and timely contribution in an area of increasing importance.

The project will also lead to benefits for Responsible Solutions as the development of the learning framework will enable the company to understand how organisations should approach standards. The framework will address the problem of organisational learning within construction SMEs and the limiting effect this has on their ability to implement standards, by asking questions that specifically aim to highlight gaps in knowledge, with the aim of then providing resources (such as a number of short online e-learning modules) to address these gaps. This framework can then be used to develop a sustainability tool which can assess the sustainability activity of future clients. It is envisaged that the full sustainability tool will be developed in years subsequent to this EngD by use of the framework developed here.

Finally, this research contributes to the broader construction industry by not only providing a means for construction SMEs to comply more readily with the demands increasingly being placed upon them to implement sustainability standards, but also generates longer term value for them that extends beyond the short term pursuit of compliance, by enabling sustainability to underpin their operations. The framework demonstrates that increasing learning against sustainability aspects will enable the company to more readily comply with sustainability commitments, and ensure that these are integrated within their operations, overcoming the issue

of sustainability being thought of as a 'bolt-on' that adds limited value. It is also envisaged that the output of this research will have application and relevance to organisations operating in other sectors, and as such its use should not be confined to solely construction-based companies. However, it is also recognised by the researcher that this is somewhat speculative, and as such considerable further research would be required to understand the exact nature of its potential applicability to other sectors.

1.6 STRUCTURE OF THE THESIS

This thesis is comprised of five chapters. Chapter one has introduced the background and context of the research and set some aims and objectives. Chapter two presents the literature review of existing academic work on the topic and introduces some of the key elements of the project, such as some of the standards and theories central to the research. Chapter 3 presents the methodological considerations and research methods that were used during this research project. Chapter 4 details the research undertaken throughout the project and indicates how these fit in with the aims and objectives set out in chapter two. Chapter 5 presents the key findings of the research, the contribution of these to theory and practice and presents some suggestions for future research. Five papers were also produced during this EngD which relate to the aims and objectives identified in chapter two and the corresponding research undertaken in chapter four. These papers are referenced throughout the thesis and included in appendices F-J.

1.7 SUMMARY

This chapter has introduced the EngD project and the background to its initiation, the sponsoring company, and defined the aims and objectives for the four-year research programme. It has also discussed the rationale behind each objective that supports the overarching aim and has indicated how each of these objectives has yielded an academic output, as well as how this project has contributed to academic knowledge, the broader construction industry and Responsible Solutions. Finally, the chapter has highlighted the structure of the thesis and what is contained within each of the following four chapters.

2 ENACTING SUSTAINABILITY IN THE CONSTRUCTION SME

2.1 INTRODUCTION

This chapter introduces the key literature that has been reviewed as part of this research project. It covers sustainability in the UK construction industry and links this with the literature on organisational learning (OL) and absorptive capacity (ACAP). It also considers some of the key management systems and product standards covered during the course of this research project, assesses how these standards operate and uncovers some of the debates within the literature. Finally, the chapter closes by synthesising these topics to provide a theoretical position for the research undertaken.

2.2 SUSTAINABILITY IN THE SME

2.2.1 DEFINING SUSTAINABILITY

The most oft-cited definition of sustainability, or sustainable development, is that of Brundtland (1987); 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' Although sustainability is concerned with reaching new states of equilibria (Mulder, 2006), it should not be inferred that all Brundtland's 'needs' are the same, as these tend to differ between cultures and between individuals (Mulder, 2006). A state of sustainability is often considered to have been achieved when there is a balance between the environment, society and the economy, as shown in figure 2.1.

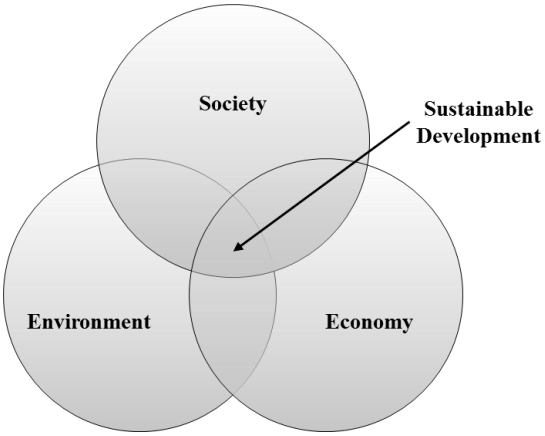


Figure 2.1 The notional balance between the 'three pillars' of sustainability leading to sustainable development (indicated by the middle section).

This so-called 'triple bottom line' (Elkington, 1994) diagram is widely replicated by academics and practitioners alike, emphasising a balancing between the three pillars of economic prosperity, environmental protection and social equity and theoretically achieving a state of equilibria, as per Mulder (2006). It has however been argued that the 'balanced' approach highlighted by figure 2.1 is in fact inappropriate, and as such the 'Russian Doll' model of sustainability (see figure 2.2) is preferred to highlight the importance of each of these 'pillars' (Levett, 1998).

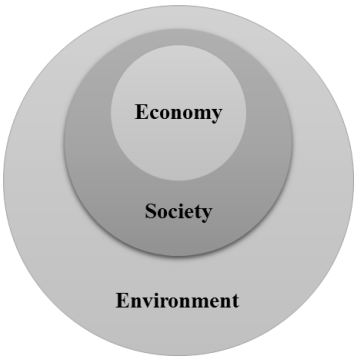


Figure 2.2 The 'Russian Doll' model of sustainability (Levett, 1998).

This model indicates that society and the economy can only exist in the presence of basic environmental life-support systems (Levett, 1998) and environmental protection is vital if a sustainable society, in which both social equity and economic prosperity are present, is to be achieved. However, according to Mulder (2006), we are in fact unable to define a sustainable

society as a final situation to strive for, and that it is much more of a direction in which to proceed.

2.2.2 SMEs AND SUSTAINABILITY

Small and medium-sized enterprises (SMEs) make up around 99% of all business (EC, 2013), and thus play a big role in helping to deliver sustainable development outcomes. The SME category comprises three thresholds by which businesses can be sorted (see table 2.2).

Table 2.1 Thresholds for micro, small and medium-sized companies (adapted from EC, 2005).

Enterprise category	No. of employees	Annual turnover	Annual balance sheet total
Medium-sized	< 250	≤ €50 million	≤ € 43 million
Small	< 50	≤ € 10 million	≤ € 10 million
Micro	< 10	≤ € 2 million	≤ € 2 million

The individual SME tends to consider themselves 'invisible' (Jenkins, 2006) as their impacts on sustainability are relatively low (Brammer *et al.*, 2011) and in proportion to their size (Hillary, 2000). Collectively, they have been cited to contribute around 60% of commercial waste and 80% of pollution in the UK (see Cassells and Lewis, 2011, for example), although Hillary (2000) doubts whether the total environmental impact of small firms can actually be calculated, suggesting instead that it is merely due to their numbers that their impacts are likely to be considerable.

SMEs are plagued by a host of problems (Hillary, 2000), limiting their ability to keep pace with ever changing policy drivers, legislation and voluntary initiatives for sustainability. Access to financial (Lepoutre and Heene, 2006) and time (Crals and Vereeck, 2005; Hsu and Cheng, 2012) resources often represent primary barriers to implementation of sustainability. Despite these resource struggles, there does appear to be an understanding of their likely collective environmental and social impacts (Jenkins, 2006; Morsing and Perrini, 2009), and many are demonstrating some degree of engagement (Brammer *et al.*, 2012). This is important due to their strong links with local communities (Russo and Perrini, 2010).

SMEs have also been shown to 'transmit' sustainability through the supply chain (Ayuso *et al.*, 2013), and so are an important vehicle for the large organisation wanting to push sustainability through all tiers of the supply chain. They are thus important in terms of not only delivering broader sustainability goals and outcomes, but also in helping to deliver supply-chain wide improvements in sustainability.

2.3 SUSTAINABILITY IN THE CONSTRUCTION INDUSTRY

2.3.1 SUSTAINABILITY IN THE UK CONSTRUCTION INDUSTRY

Sustainability for the construction industry is termed 'sustainable construction' (Adetunji *et al.*, 2003) and can be considered as the application of sustainable practices to the construction industry's operations (Shelbourn *et al.*, 2006). It includes issues such as, among others, material extraction, product manufacture, assembly of products into built assets, waste disposal and energy and water used during all phases of the product life cycle (Kibert, 2007). What is particularly interesting about Kibert's (2007) definition is that it does not include any social issues, with more core 'environmental' issues being the central focus. This is perhaps indicative of a stronger focus on environmental issues within traditional sustainability in construction.

The construction industry consumes vast quantities of environmental resources and is a major polluter to both the built and natural environment (Ding, 2008). Accordingly, approaches to sustainability in construction have accelerated since the late 1990's through the development of policies and practices that are more efficient and profitable, more socially accountable, and less detrimental to the environment (Halliday, 2008). Kibert (2007) indicates that a decade previously, the presence of rating systems, products, tools and publications to support sustainable construction were relatively few in number, but that much more recently such resources are much more widely available. Despite this, the practices that can help to deliver sustainability are adopted only by a small minority of organisations involved in the development of the built environment (Halliday, 2008), and so there is still considerable progress to be made.

The Strategy for Sustainable Construction (SSC) (BERR, 2008) is a key government policy document (Willetts *et al.*, 2010) as it sets out commitments for the UK government and industry to work towards in an attempt to progress the sustainable construction agenda. These commitments are set out through a number of 'means' and 'ends' and are identified to deliver

a sustainable built environment. Each of these includes objectives, targets and activities; these are shown in table 2.2 below.

Table 2.2 Government and industry 'means' and 'ends' of sustainable construction, as per the 2008 Strategy for Sustainable Construction (BERR, 2008)

Means	**Ends**
Procurement	Climate change mitigation
Design	Climate change adaptation
Innovation	Water
People	Biodiversity
Better regulation	Waste
	Materials

A 2009 progress report on the strategy (BERR, 2009) highlighted that progress against each target was broadly on track, although it recognised that in some cases progress had been slower than envisaged and that more needed to be done. It also indicated some revised targets around the 'climate change mitigation' chapter of the strategy in light of the passing of the 2008 Climate Change Act and The UK Low Carbon Transition Plan (TSO, 2009). In 2011, the Low Carbon Construction Action Plan (BIS, 2011) set out a joint industry and government action plan to create the certainty required by companies to invest in new skills, processes and products. This move to low carbon would be achieved by:

- Setting a transparent plan for growth;
- Reforming of public procurement;
- Maximising export opportunities; and
- Increasing co-operation between industry and government.

Furthermore, the 2011 Construction Strategy (Cabinet Office, 2011) recognised the need for a changing in the relationship between public authorities and the construction industry and challenged business models and practices, called for greater collaboration and reduced costs and better innovation within supply chains. Two years later, an updated joint industrial and

government strategy 'Construction 2025' (BIS, 2013) was published which set out a long-term vision for the UK construction industry. This vision document replaced the more rigid numerical based 'targets' of the SSC with a number of aspirations for the UK construction industry to work towards. By leading in low-carbon design and exports of 'green' construction, both government and industry can work together to strive towards the strategic priorities as outlined by the strategy:

- Smart construction and digital design;
- Low carbon and sustainable construction; and
- Improved trade performance.

In order to address these strategic priorities, a number of policy and legislative drivers have been set to encourage engagement across the sector. In terms of 'low carbon and sustainable construction', managing sustainability impacts can be addressed through a range of means; assessment schemes such as BREEAM (BRE, 2014b) and CEEQUAL (CEEQUAL, 2015) are becoming more widely used, and management system and product standards are increasingly used to manage performance against a range of sustainability issues at the organisation and product levels. It is these standards that form the major area of research for this EngD.

Traditionally, construction organisations have used the cost and speed of build as factors to differentiate themselves on (Revell and Blackburn, 2007), although improving sustainability is becoming increasingly important for construction firms (Ortiz, 2009). However, when sustainability issues are a low priority for clients and architects, builders and contractors see little point in differentiating themselves on sustainability credentials (Revell and Blackburn, 2007), inferring wider uptake through the supply chain can be achieved if clients drive the sustainability agenda. Supply chain pressure from larger organisations can also motivate SMEs to enact sustainability (Baden *et al.*, 2009; Ciliberti *et al.*, 2009) and the power of large organisations can also lead to them dictating sustainability requirements to their SME suppliers (Amaeshi *et al.*, 2008; Ciliberti *et al.*, 2009). However, due to the often limited resources of SMEs (see chapter 2.2.2), meeting these sustainability requirements is challenging, and thus the construction SME is often also beset by the typical barriers faced by SMEs more generally.

2.3.2 SUSTAINABILITY AND THE CONSTRUCTION SME

In the UK construction industry, approximately 950,000 SMEs are estimated to be in operation (BIS, 2014), making up around 18% of all UK based SMEs (FSB, 2014). Although it is

recognised that the use of broad terminology such as 'construction SME' encompasses a wide range of types of organisations, such as product manufacturers, contractors and engineers, it is also true that the extent to which each of these is expected to engage with sustainability by supply chain organisations can widely vary. For example, the responsible sourcing (RS) framework standard BES 6001 (BRE, 2009, 2014a; discussed further in chapter 2.4.2) is a product certification scheme, and thus certification to BES 6001 (BRE 2009; 2014a) can only be achieved by a product manufacturer. However, a small contracting firm might be expected to use RS certified materials onsite and might therefore need some understanding as to how to differentiate between different products based on their RS status. Therefore, it is still expected that each of these types of organisation will need to pool resources into understanding and addressing RS to satisfy the needs of a construction client. In the case of a small product manufacturer, research carried out as part of this EngD (see paper 4, appendix I) has found that customer pressure is the most important factor in SMEs implementing standards (Upstill-Goddard *et al.,* forthcoming). Although the research carried out as part of this EngD is predominantly standards focused, it is recognised that standards represent a short term 'compliance' element of sustainability, and that in the long term, organisations should adopt a more structured view of their sustainability related competencies. SMEs should therefore implement standards initially to comply with the requirements of customers, but should in the long term look to use the requirements of such standards to improve their competencies in certain areas and streamline their operations.

The following section will therefore discuss how sustainability can be managed through use of such standards by focusing on a number of core areas for construction. The significance of these for the construction SME are also discussed.

2.4 SUSTAINABILITY MANAGEMENT

Management of sustainability is often realised through the use of a number of sustainability standards. This section therefore focuses on a selection of these standards that have been most relevant to the research undertaken.

2.4.1 ENVIRONMENTAL MANAGEMENT SYSTEMS

The report in which sustainable development is defined (Brundtland, 1987), also called for decision support systems for new insights into effective environmental management (To and

Lee, 2014). This, coupled with the realisation by industrial sectors that their operations were having significant impacts, saw the development of a number of environmental assessment tools and certification schemes. In 1996, the introduction of the ISO 14001 (BSI, 2004) standard for environmental management systems was launched and is now amongst the most widely used certification schemes globally with over 300,000 certifications in 171 countries (ISO, 2013).

An environmental management system (EMS) provides a framework for an organisation of any size to manage its significant environmental impacts; for the construction industry, it has been identified as a means to become 'green' (Ball, 2002) and is a 'prerequisite for survival' (Zutshi and Creed, 2015). A certified EMS can create tangible benefits, such as cost savings (Raines, 2002) and increased trade opportunities (Prakash and Potoski, 2007), and intangible benefits, such as improved legitimacy (Bansal and Hunter, 2003). It often also eliminates the requirement to provide copies of policies, legal registers etc. to potential customers as evidence of environmental compliance (see PAS 7000; BSI, 2014, for example).

However, the importance of certification has been questioned (e.g. Christini *et al.,* 2004), with a third-party certified management system not necessarily implying an absence of mediocre processes or a presence of proactive efficiency improvements (Curkovic and Sroufe, 2011). A certified system does not necessarily lead to improved financial performance either (Heras-Saizorbitoria *et al.,* 2011; Wagner and Blom, 2011); it is therefore reasonable to suggest that theoretically, certification to ISO 14001 (BSI, 2004) represents a major cost burden for the SME.

Hillary (2004) lists a number of internal and external benefits of adopting an EMS for the SME, although these are only felt by the company once implementation of an EMS has taken place, and the time required to prepare for audit and the cost associated with this still remains very high (Curkovic and Sroufe, 2011). As a result, many SMEs complain that the third party assessment system of the ISO 14001 (BSI, 2004) EMS places the cost squarely on the company and they would not pursue with certification were it not due to external pressure from customers (Curkovic and Sroufe, 2011). There is a clear issue when it comes to adoption of a certified EMS for SMEs, especially as it has been shown a 'one-size-fits-all' approach to EMS implementation is inappropriate (Parker *et al.,* 2009). Halila (2007) presents a model for networks of like-minded SMEs to facilitate their working towards ISO 14001 (BSI, 2004) implementation, and highlights the benefits this may hold through peer-to-peer learning. Furthermore, environmental proactivity is likely to increase in the presence of knowledge

acquisition activities (Roy and Thérin, 2008) and environmental management practices are also linked with the underlying capabilities of the firm (Hofmann *et al.*, 2012) and high levels of commitment to learning and knowledge sharing (Feng *et al.*, 2014).

2.4.2 RESPONSIBLE SOURCING

Responsible sourcing (RS) has several definitions that collectively cover a broad range of sustainability issues (Young and Osmani, 2013), often causing it to be used interchangeably with terms such as 'ethical sourcing' and 'sustainable procurement' (Glass, 2011). Generally, it concerns the management of sustainability issues in the construction supply chain, often from an ethical perspective (Glass, 2011; Glass *et al.*, 2012a). It first gained prominence in the 2008 SSC (BERR, 2008), which set a national target to procure 25% of construction materials from approved RS schemes by 2012, and subsequent targets and commitments (see UKCG, 2012) have led to RS becoming more mainstream within construction. A key factor in this is the market-driven nature of RS; points are available in both BREEAM (BRE, 2014b) and CEEQUAL (CEEQUAL, 2015) for demonstrating RS and as clients increasingly seek to maximise points under these schemes, RS becomes increasingly 'quasi-voluntary', as limited attention to RS can limit business opportunities.

In 2008, the BRE launched the first version of BES 6001, the framework standard for responsible sourcing of construction products, with subsequent versions being published in 2009 and 2014. It was developed to address imbalances in the ways that different construction products were being responsibly sourced (Ghumra *et al.*, 2009); certification to BES 6001 (BRE, 2009; 2014a) is recognised in both BREEAM and CEEQUAL and so its development provided a means of 'standardising' approaches to RS. To date, around 70 companies have obtained over 100 certificates for a range of different products (BRE, 2014c), although the majority of these come from relatively short, simple supply chains, such as concrete, cement and steel, with those products originating from more complex supply chains (such as mechanical and electrical products) completely absent.

Although there is burgeoning interest in RS, and there has been considerable progress even since this EngD was initiated, there remains no agenda to drive uptake of RS both industrially and academically (Glass, 2011; Glass *et al.*, 2012a), seemingly rendering setting of quantifiable targets for RS rather futile. Furthermore, proclaiming support for contractors that procure RS products (see UKCG, 2012) appears overly-ambitious given that there is no clear responsibility for RS within contracting companies (Young and Osmani, 2013). To address such shortfalls,

the Action Programme for Responsible Sourcing (APRES, 2015a) was founded in 2011, with the core aim of providing a community for knowledge dissemination on RS practices, such that guidance could be provided to the construction industry. Membership was made up of universities, construction product manufacturers and contractors in order to foster closer links between industry and academia, and also to ensure penetration of RS throughout supply chains. Such guidance provides essential advice and support, which is particularly important for SMEs who often struggle to keep pace with the sustainability agenda.

Despite the work of the APRES network, there remains much confusion about how to address RS and until recently transparency on RS performance by individual organisations was virtually non-existent. However, given the lack of agreement on how to measure sustainability performance of supply chains (Ahi and Searcy, 2015), BES 6001 (BRE, 2014a) could be used as a means of measuring supply chain performance, given its assessment of an organisation's supply chain management practices and its potential to be seen as an indicator of sustainability in construction (Upstill-Goddard *et al.*, forthcoming). However, certification to BES 6001 (BRE, 2014a) is beset by the same problems as ISO 14001 (BSI, 2004), in that it represents a significant expense for the SME. Research carried out as part of this EngD established that, like ISO 14001 (BSI, 2004), certification to the standard is only pursued if customer pressure is evident (see paper 4, appendix I).

Given RS concerns the way that materials are purchased, it is inextricably linked with sustainable procurement, which is discussed in the following section.

2.4.3 SUSTAINABLE PROCUREMENT

Sustainable procurement can be used as a means to implement sustainability through the supply chain, given its focus on social, ethical and environmental considerations when purchasing products or services. It embeds sustainability criteria into contractual documents with the aim of encouraging suppliers to implement sustainability into their products and services (WRAP, 2015); the idealistic final scenario being a supply chain where sustainability is embedded in all tiers and within all organisations within it. DEFRA define sustainable procurement as:

> "A process whereby organisations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, while minimising damage to the environment." (DEFRA, 2006).

According to Walker and Brammer (2009), although public sector buyers are obliged to achieve social, economic and environmental benefits through procurement, some private sector firms are also beginning to engage with sustainable procurement through choice. Given the international nature of many construction supply chains, their effective governance can help guarantee responsible products and processes (Blome and Paulraj, 2013). By adopting supply chain management strategies, the potential numerous different suppliers and tiers can be appropriately managed and assessed. Risk and opportunity assessment is recognised as a key enabler of sustainable procurement (see BS 8903; BSI, 2010a).

Addressing responsible behaviour throughout the supply chain is highly relevant to supply chain management strategies (Ashby *et al.*, 2012) as 'focal firms' can be held responsible for the environmental and social performance of suppliers (Seuring and Müller, 2008). However, in a construction context, the existence of supply chain management has been questioned (Fernie and Tennant, 2013) and so it can thus be deduced that effective management and assessment of different tiers of the supply chain is generally limited in the construction industry.

In order to assist organisations in addressing sustainability in their procurement operations, the Flexible Framework was introduced by the Sustainable Procurement Task Force in 2006 (Berry and McCarthy, 2011). This framework is extended through the BS 8903 (BSI, 2010a) guidance standard for sustainable procurement and provides more detail on 'how to do' sustainable procurement (Berry and McCarthy, 2011). Specifically for construction, where there is a clear need to embed environmental, ethical and social factors into the procurement of construction materials, CIRIA published the 'Guide to sustainable procurement in construction' (Berry and McCarthy, 2011) in order to realise client's ambitions and mitigate reputational risks through effective management of the supply chain. The guide recognises the uniqueness of the construction industry and that the BS 8903 (BSI, 2010a) standard for sustainable procurement has applications to the construction industry through its generic approach. The International Standards Organisation (ISO) have also assigned a technical committee to focus on the development of an international standard for sustainable procurement, which is largely based on the British standard BS 8903 (BSI, 2010a). A draft version is currently available for public comment (see BSI, 2015).

2.4.4 SOCIAL ACCOUNTABILITY AND RESPONSIBILITY

Management of social issues is rather limited within supply chains (Klassen and Vereecke, 2012) with environmental issues tending to dominate (Ahi and Searcy, 2015; Ashby *et al.*,

2012; Seuring and Müller, 2008). As organisations strive for more holistic assessment of their supply chains however, increasing numbers of organisations are seeking to demonstrate social accountability and responsibility.

The Social Accountability 8000 standard (SA 8000; SAI, 2014) is recognised as one means that SMEs can implement sustainability (Tsai and Chou, 2009), due to its coverage of a broad range of social issues. However, levels of uptake are considerably low (only around 3,490 facilities are certified globally (SAAS, 2015)); this despite organisations obtaining it being actively encouraged to require their suppliers to obtain certification (Reynolds and Yuthas, 2007). This level of uptake is contextualised further when compared with the number of ISO 14001 (BSI, 2004) certificates (approx. 300,000 globally; ISO, 2013) that have been awarded. This relatively low level of uptake could be because dealing with social issues is difficult (Klassen and Vereecke, 2012) and so it can perhaps be inferred that understanding of how to manage social issues is rather limited. To increase adoption of the standard, Llach *et al.,* (2015) suggest it could be made more flexible to accommodate different cultural perspectives, stakeholder engagement and more SMEs that are situated within developing countries. However, in order to do this effectively, a much broader understanding of the requirements of the standard is required and so knowledge acquisition activities on these social issues are required.

ISO 26000 (BSI, 2010b) was published to provide guidance to organisations on social responsibility (Henriques, 2012). It is most useful for those organisations that are starting out on their corporate social responsibility (CSR) 'journey' and is useful in identifying starting points for implementing sustainability (Hahn, 2013). Although Hemphill (2013) does recognise ISO 26000 is not a certifiable management system, this has not deterred some organisations from claiming certification (Henriques, 2012). Clearly, demonstration of social responsibility is coveted and organisations are keen to highlight to their stakeholders that this is an important issue for them. However, Hemphill (2013) further draws attention to the costly and time-consuming nature of demonstrating social responsibility, which is identified as deterring SME engagement with the standard. Once again, financial and time resources are identified as limiting when it comes to obtaining SME involvement in standards, even non-certifiable ones for which cost is reduced through the elimination of third-party audits. However, although ISO 26000 (BSI, 2010b) does hold potential to introduce social responsibility to the SME, engagement may be influenced by SME profile and they will still require additional guidance to interpret it (Perera, 2008).

2.4.5 SUSTAINABILITY REPORTING

Many large organisations now engage with sustainability reporting, although the construction sector appears to lag behind with this (Glass, 2012). Furthermore, there is uncertainty about the extent to which such reports address economic, social and environmental issues in a balanced way (Lozano and Huisingh, 2011). One of the most widely used frameworks for sustainability reporting is the Global Reporting Initiative (GRI) (Brown *et al.,* 2009), which in its latest guidelines, sets out 91 sustainability indicators under 46 different aspects, split into seven broad sections (GRI, 2013). In addition, the GRI publish sector specific supplements; the Construction and Real Estate Sector Supplement (CRESS) also provides additional aspects and indicators that a construction organisation may wish to consider (GRI, 2014). This wide coverage of issues however causes it to be perceived as too complicated for the SME (Brown *et al.,* 2009) as its demands are too onerous for organisations with limited resources. There is no standard template for reporting by SMEs (Bos-Brouwers, 2010) and so there is often limited engagement with sustainability reporting by the SME community (Brown *et al.,* 2009).

Like some of the previously introduced standards, competitive and media pressures can influence GRI adoption (Nikolaeva and Bicho, 2011) although sustainability reporting is most effective when done voluntarily (Fifka and Drabble, 2012). Therefore, when seeking to conduct reporting activities, pressurising an organisation into doing so will lead to limited value for that organisation. As has already been suggested, SMEs tend to implement standards in the presence of customer pressure (e.g. Delmas and Montiel, 2009), but in the case of sustainability reports, this pressure can render the reports valueless for the reporting organisation.

Therefore an important point is raised; are standards implemented in the SME in such a way that leads to limited value, as customer pressure has driven their implementation, rather than the voluntary drive on the part of the company? Indeed there is a perspective that standards do not actually improve performance as intended (Simpson *et al.,* 2012). The next section addresses how SMEs implement some of the mechanisms of sustainability management discussed in this section.

2.5 IMPLEMENTING SUSTAINABILITY IN THE SME

2.5.1 USING SUSTAINABILITY STANDARDS

Demonstration of sustainability is often achieved through certification to standards, which have both 'hard' impacts (those that can be measured) and 'soft' impacts (those affecting culture and attitudes) (Henriques, 2012). However, over-emphasising the need to implement them, coupled with their associated increased bureaucracy and costs often cause frustration for SMEs (Baden *et al.,* 2011) as environmental and social responsibility resides in the organisation's culture and not in formalised processes (Fassin, 2008). Poynton (2015) presents a critique of the certification movement, indicating that, particularly for the SME, the costs associated with certification can create barriers to trade. Furthermore, the limited resources that SMEs tend to possess limit their ability to implement multiple management systems (Tsai and Chou, 2009). A review by Zutshi and Creed (2015) of environmental practices within the construction sector hinted that 'any misalignment of standards, resources and relationships can result in new barriers for organisations aiming to become leaders within their sectors.' Standards do however, have both advantages and disadvantages (see De Colle *et al.,* 2014) and from a sustainability perspective, are used to manage a broad range of sustainability criteria.

For the construction industry, it has been argued that a range of standards should be used to increase uptake of sustainability (Glass and Dainty, 2011) as they foster continuous improvement cultures (Holton *et al.,* 2010). More broadly speaking, standards provide a means of risk mitigation (Klassen and Vereecke, 2012) and can enable an organisation to develop some form of accountability (Perego and Kolk, 2012). They often require some form of third party assessment, which has been linked with reducing the potential for market failure (Deaton, 2004) yet often this is a costly process and for SMEs – who typically demand a quick return on investment (ROI) on any significant outgoings – this often represents too great a financial hurdle. Typically, ROI on certification occurs over a number of years and so does not represent an attractive proposition for the SME. Additionally, their implementation requires time commitments from staff so this places additional strain upon time resources. Furthermore, standards tend to address environmental or social issues in isolation, and as such there is limited coherence in the development or implementation of them (Blowfield, 2000). Implicit here is that for an organisation that wishes to evidence a holistic approach to sustainability, multiple standards need to be implemented given their often compartmentalised nature. For the SME, it has been suggested that they can address sustainability by implementing ISO 9001, 14001,

OHSAS 18001 and SA 8000 (Tsai and Chou, 2009), but this will have significant cost and resource implications, and does not represent a realistic proposition for a number of SMEs. Although there is overlap between many of standards, particularly the new ISO standards which will be developed according to a new high-level framework (IRCA, 2014), they are rarely implemented in a coherent manner and SMEs do not tend to possess adequate resources to implement multiple standards simultaneously (Tsai and Chou, 2009). The next section will address the barriers to standard implementation and explore in more detail some of these resource access issues.

2.5.2 BARRIERS TO SUSTAINABILITY STANDARD IMPLEMENTATION

Cost remains the major barrier to implementing an EMS (Curkovic and Sroufe, 2011), although it has been suggested that in this case, the true barriers to implementing standards are not completely understood (Stevens *et al.,* 2012). Typically, SME engagement with sustainability is also hampered by limited access to resources (Ciliberti *et al.,* 2008; Lepoutre and Heene, 2006), and implementing standards is resource-intensive in terms of finances (Revell and Blackburn, 2007) and staff time.

The external pressures for organisations to adopt sustainability standards can cause them to press ahead with implementation even if they do not have sufficient capacity to implement (Simpson *et al.,* 2012) and often they are implemented with limited flexibility so are not adapted to the organisation's specific needs (De Colle *et al.,* 2014). This pressure exerted by key players in the supply chain forms part of those organisations' supply chain management (SCM) strategies, where they seek to go beyond legislative compliance and consider the environmental and social performance of their supply chains in order to increase their competitiveness (Paulraj, 2009); sustainability assessment is becoming an increasingly important part of this (Varsei *et al.,* 2014). Suppliers are more likely to implement a certification scheme when requested to if they have a good relationship with the customers (Delmas and Montiel, 2009), yet the extent to which this is this has a positive effect on the supplier can be suggested to be uncertain. The majority of SMEs are therefore 'vulnerably compliant' (Perrini, 2006; Petts, 2000) as they neither possess sufficient resources nor sufficient knowledge to ensure full compliance with the requirements of standards. This appears to provide support for the assertion that pressure leads to implementation of standards in a way that holds limited benefits for the organisation. It can be suggested therefore, that by increasing the knowledge of an organisation, standards can be more effective and hold more impacting results. Adapting such standards to fit the specific

needs of an organisation can also be realised through increasing knowledge, as a greater understanding of the standard and the terms within it on the part of the organisation will give them greater ability to understand to what extent they can adapt specific requirements to fit their own needs, while still ensuring full compliance. Implicit in this therefore, is the need to foster a learning culture, such that standards can be implemented effectively with organisations. However, it has been found that within construction supply chains, organisational learning is considerably limited (Tennant and Fernie, 2013), and as such understanding how organisations learn is of great importance to increase supply chain sustainability.

The overriding conclusion is therefore that standards are increasingly being recognised as a means of demonstrating management of sustainability, yet they are expensive, time consuming and are shrouded in controversy and debate. For the SME, certification is a considerable challenge due to these factors, but the number of standards now being required within construction is making the SME's task even harder, with underlying capabilities and knowledge severely hampering the ability of SMEs to implement standards. Although this EngD is predominantly concerned with sustainability certification, the research will contextualise its findings in the field of learning and absorptive capacity such that the impact of these on sustainability certification can be more broadly understood. As such, these issues are discussed in the next section.

2.6 ORGANISATIONAL LEARNING

Organisational learning has been widely researched and considered in the context of a broad spectrum of situations and disciplines. Early research introduced the concepts of single-loop and double-loop learning (Argyris and Schön, 1974), and later, deutero-learning (Argyris and Schön, 1978). Fundamentally, these definitions recognise the link between individual and organisational learning and recognises individuals as 'learning agents' for the organisation (Argyris and Schön, 1978). Borne out of much of this early work is the concept of a 'learning organisation', which was first introduced by Senge (1990).

2.6.1 THE LEARNING ORGANISATION

The learning organisation (Senge, 1990) can be defined as an:

> "…organization[s] where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together." (Senge, 1990; 3).

This implies, according to Pedler (1995), the continuous learning and development of all those employed by an organisation and the self-development of the organisation as a 'single entity'. In situations of change, it is argued (Senge, 1990) that organisations need to be flexible, adaptive and productive in order to be successful. While it is true that all people have the capacity to learn, often the structures in which these people are expected to operate, coupled with a lack of tools or guidance to understand new situations, often stifle any opportunities for engagement and reflection (Smith, 2001). Learning processes of organisations are inherently different from those in individual learning, as they are reflected in organisational culture (Love *et al.,* 2000) and it is often the organisational culture and structure that can limit this ability to learn effectively. Fundamentally, organisations cannot 'learn' *per se,* as knowledge is bound within the individuals that make up the organisation (Love *et al.,* 2000), although individual learning does not guarantee organisational learning (Senge, 1990). Therefore, an organisation can only 'learn' once there is collective learning of individuals.

2.6.2 ABSORPTIVE CAPACITY

Organisational learning is highly dependent upon an organisation's absorptive capacity (ACAP) (Kim, 1998); the ability of a firm to create competitive advantages through the implementation and exploitation of knowledge and new resources (Cohen and Levinthal, 1990; Zahra and George, 2002). According to Zahra and George (2002), there are two types of ACAP:

- Potential Absorptive Capacity (PACAP; the ability of an organisation to acquire and assimilate knowledge); and
- Realised Absorptive Capacity (RACAP; the ability of an organisation to transform and exploit this knowledge).

ACAP fundamentally draws upon both external knowledge acquisition activities and internal learning processes (Easterby-Smith *et al.,* 2008), and in an environmental context, ACAP can facilitate development of proactive environmental strategies (Delmas *et al.,* 2011) and improve sustainable performance (Sáenz *et al.,* 2014). In a construction context, it also improves capability-based competitiveness through its operationalising into a change management

approach (McAdam *et al.,* 2010) and has been linked with green innovation and performance (Gluch *et al.,* 2009); a brief discussion and diagram of this model is included within section 4 of paper 4 (appendix I). Clearly, research has explored this link between ACAP and environmental and sustainability issues, yet to the knowledge of the researcher, there has been no research into how ACAP and organisational learning might influence the sustainability agenda within the construction industry, particularly from the perspective of implementing standards. The following section synthesises these two research streams to arrive at a proposition for the research programme.

2.7 SYNTHESISING SUSTAINABILITY AND ORGANISATIONAL LEARNING

Fundamentally for this research, organisational learning and ACAP are theorised to drive the effectiveness of implementation of sustainability standards, with previous studies linking implementation of sustainability with learning (Halila, 2007; Maon *et al.,* 2009; Siebenhüner and Arnold, 2007). It is inferred that the greater the level of learning that SMEs undertake on sustainability issues, the more likely they are to fully engage with sustainability and fully implement it. For the certification agenda it can further be inferred that if SMEs engage with high levels of learning, they are more likely to implement sustainability standards, given that implementing a sustainability standard evidences engagement with sustainability. Standards comprise a number of requirements, and so in order for an organisation to ensure they are complying with these requirements, a level of knowledge about these must be held. Therefore, the link between standards and ACAP becomes apparent; organisations must be able to understand what they are required to do, obtain and understand that knowledge, and then implement it such that they are in compliance with the standard's requirements. It has been shown that organisations should approach sustainability initiatives by developing certain competencies first (Hofmann *et al.,* 2012), although over-emphasis on institutional factors has caused little consideration to be given to the role of the existing capabilities of organisations (Simpson *et al.,* 2012), such as those practices and goals that drive performance. Increasing capabilities of the organisation could be delivered through extensive training programmes (Tilley, 1999), but firms tend to be influenced in their search for new knowledge by industry knowledge (Grimpe and Sofka, 2009) which is key for environmental innovations (Halme and Korpela, 2014).

Learning has been linked to improved CSR performance by SMEs (Stewart and Gapp, 2014) and although research into SME engagement with CSR and environmental performance is relatively common, Morsing and Perrini (2009) argue that much of it lacks a focus on 'how' and 'with what impact' SMEs engage with CSR. Indeed, a focus on learning can provide an insight into the impact that sustainability has on the SME, with the learning occurring from standard adoption potentially fostering innovation on emerging issues (Klassen and Vereecke, 2012).

Standards are important to implement for the SME due to the pressure being exerted on them by customers and clients within the supply chain. However, the limited access to resources, although a considerable barrier, does not fully explain the limited engagement of the SME community with standards. Fundamentally, a lack of understanding of what is required and how to implement them is limiting the ability of the SME to implement standards. By providing a means by which an organisation can understand its capabilities and increase its learning around the requirements of these standards, it is proposed that SMEs can more readily embrace the requirements of standards in a way that fully integrates with the context of their business.

2.8 SUMMARY

This chapter has presented an introduction to the general subject area of sustainability, and has also discussed how this is applied within the construction industry. As with many other sectors, management of sustainability is most oft carried out through the implementation of a range of management system and product standards, of which this chapter has presented some of the key standards relevant to this EngD. The link between standard implementation and organisational learning and ACAP has also been explained and a path for the research programme defined.

3 ADOPTED METHODOLOGY

3.1 INTRODUCTION TO METHODOLOGICAL ISSUES

This chapter presents the methodological considerations and the philosophical position of the research and sets out how these align to the specific research objectives identified in chapter 1.5. A range of qualitative and quantitative research methods were used during the research project.

Research can be defined as 'the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions' (Oxford University Press, 2015). For anyone conducting research, in order to reach these new conclusions, they must construct a philosophical position and an orientation towards their enquiry (Dainty, 2008) as part of their methodological position. This chapter therefore presents the practical methods used and the philosophy behind their use.

3.2 METHODOLOGICAL CONSIDERATIONS

When planning the study of a particular topic, one should be mindful of their philosophical position in order to identify the most appropriate research design for that topic. This philosophical position determines the individual's perspectives on the world and hence their ontological viewpoint, as well as their associated epistemology. This position can be influenced by the type of research problem and the strategies and methods used to collect and analyse data, as well as the personal experiences of the researcher and the different actors involved in the research.

Ontology is concerned with the nature of social entities (Bryman and Bell, 2011) and has two distinct approaches; objectivism and constructivism. Objectivist researchers focus on explaining different phenomena by use of 'hard' quantitative approaches to data analysis. Epistemologically speaking, this is tied to a positivist perspective, where one determines the nature of these social entities through a 'scientific' approach by considering them as objective entities with a reality external to social actors (Bryman and Bell, 2011). Conversely, a constructivist approach to research considers these entities as social constructions that are built up by the perceptions of social actors (Bryman and Bell, 2011), requiring exploration by use of 'softer', qualitative research approaches. This constructivist perspective links to an

interpretivist epistemology, where exploring the 'nature of being' is determined by use of social constructions such as language and behaviours (Myers, 2008).

Construction management tends to draw theories from both the natural and social science fields. Traditionally, construction management researchers favoured a positivist and objectivist approach, and hence considerably more quantitative research, such as that delivered through laboratory tests and statistical analyses, was generated. This often resulted in the application of 'natural science' methods to 'explain' 'social science' phenomena (Dainty, 2008). However, a paradigmatic shift towards a more interpretivist epistemology has led to construction management researchers devoting increased attention to exploring and understanding these social entities, rather than simply explaining them.

It is recognised by the researcher that these different paradigms hold relevance for this research project, and it is of utmost importance for the validity of the research that an understanding of the researcher's own philosophical position was determined prior to designing the research methodology. Both objectivist positivist and constructivist interpretivist perspectives have validity for this research project, and as such, a 'mixed methods' or 'triangulation' approach was adopted, through combining qualitative and quantitative analyses such that a multi-dimensional view of the subject can be obtained (Fellows and Liu, 2008). The 'subject' of interest for this research project is certification to sustainability standards. Complying with these standards requires, on the one hand, the use of performance metrics and setting of objectives and targets. This type of analysis is clearly quantitative in nature, as one is considering the individual results as objective entities with no influence from external actors. Hence this reflects an objectivist and positivist paradigm. On the other hand however, once these individual results are aggregated to generate a performance profile, the results become subject to the perceptions of individual social actors about what constitutes 'good' or 'poor' performance, and hence become more constructivist and interpretivist in nature. Furthermore, standards are also enacted through the efforts of individual actors, and as such the implementation process is one that lends itself to a constructivist and interpretivist paradigm. As such, although the 'subject' of interest is certification, the unit of analysis is the capacity of an organisation to implement standards, given that their implementation requires effort from individuals within the organisation.

Linked to this 'mixed methods' approach is pragmatism (Creswell, 2012). Pragmatism arises, according to Creswell (2012), from actions, situations and consequences rather than antecedent conditions. It therefore provides a basis for research that examines the consequences of these

actions and situations at the time of observation, and is problem-centric, pluralistic and aligned to the 'real-world' (Creswell, 2012). By adopting a pragmatic approach, researchers can benefit from a freedom of choice with regard to the methods, procedures and techniques used to explore a particular problem as it is not committed to one single research philosophy (hence its alignment with the 'mixed methods' approach).

It was therefore deduced that a pragmatic, mixed methods approach to research that encompasses elements of both objectivist and constructivist perspectives and positivist and interpretivist paradigms would be used for this EngD.

With this in mind, it is important to understand the different research paradigms and how they are best applied to address different research objectives. Yin (2009) lists five research methods: experiments, surveys, archival analysis, histories and case studies. However, both Bell (1993) and Fellows and Liu (2008) recognise these as 'research styles', and include action research and ethnographic research in place of archival analysis and histories. Fellows and Liu (2008) state that in determining the most appropriate approach for a research design, the critical consideration is the logic that links the data collection and analysis to the main research question being investigated. Therefore, it is imperative that an appropriate research style is chosen, and suitable methods used. Figure 3.1 presents a research map which shows how this methodological position follows on from the high level aim and objectives of the programme, and how the research methods chosen link with the methodology and support the objectives and work packages defined in chapter 1.5.

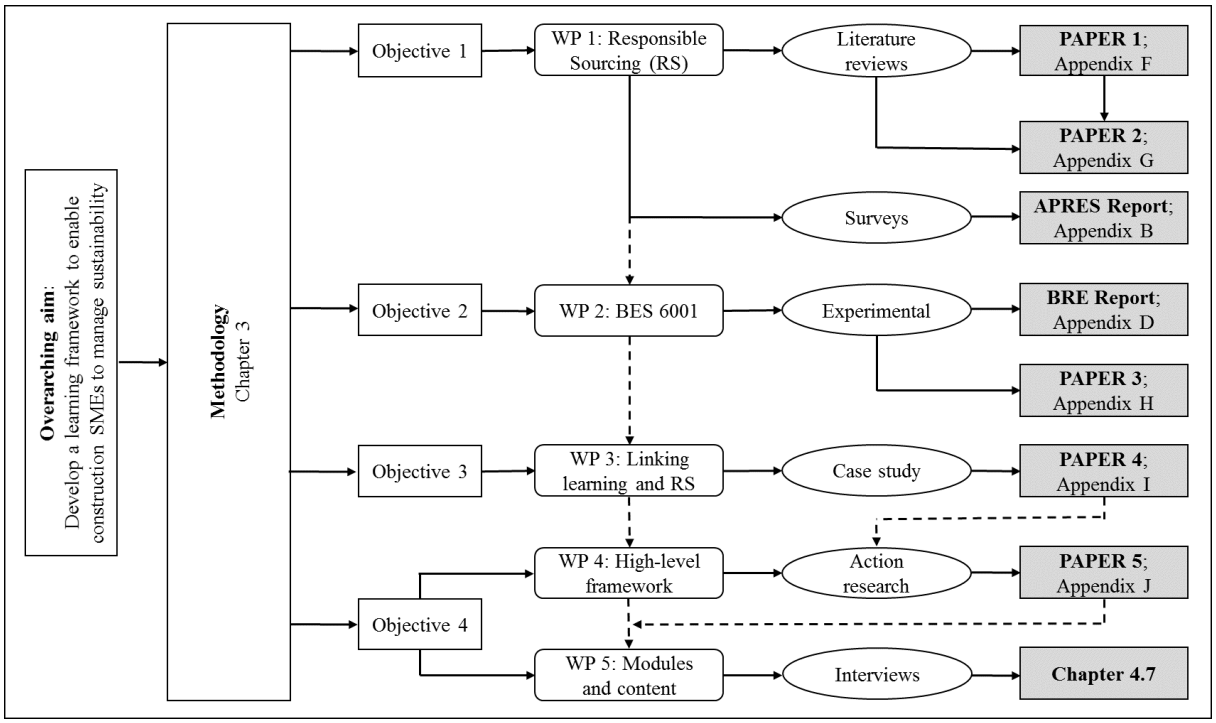


Figure 3.1 Research map linking the aim and objectives with the methodology, research methods, work packages and research outputs.

Figure 3.1 indicates how the entire research programme is linked, and how each output (five papers and two reports) contribute towards the overall conclusions of the research programme and feed into the framework developed as a conceptual piece in paper 5 (appendix J; Upstill-Goddard *et al.*, 2015b) and the more detailed useable framework in chapter 4.7 of this thesis. Figure 3.2 further indicates how the specific findings of each of these outputs (WP 1-3) cumulatively inform the learning framework developed as a high-level 'conceptual' framework in WP 4 and as more detailed specific modules in WP 5.

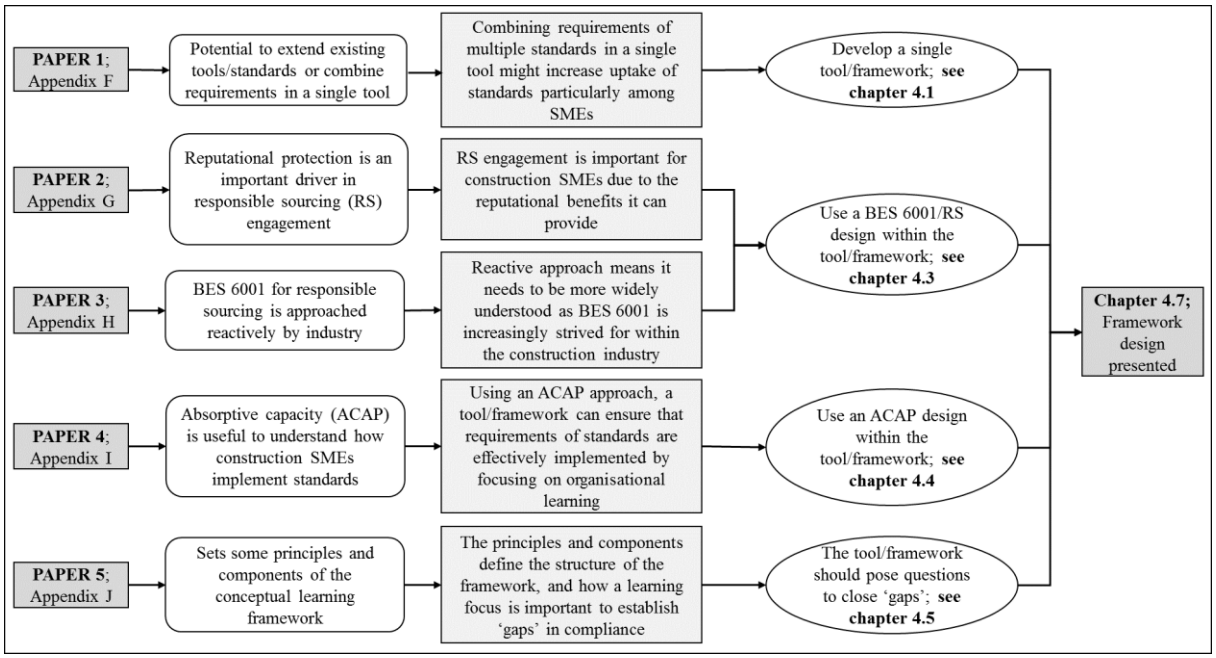


Figure 3.2 Extended research map highlighting the outputs of each work package and how these feed into the framework.

3.3 RESEARCH STYLES AND METHODS

Taking these research 'styles' (Bell, 1993; Fellows and Liu, 2008), and considering the project objectives and work packages defined in chapter 1.5, four research styles were appropriate for this research project; namely action research, experimental research, surveys and case studies.

3.3.1 ACTION RESEARCH

Action research can be used to describe the variety of approaches which are participative in nature, are grounded in experience and are action-oriented (Reason and Bradbury, 2001). Generally, it involves active participation by the researcher in the process under study (Fellows and Liu, 2008) and involves collaboration with another party involved in the research. Problems are first diagnosed and then solutions proposed based on this diagnosis (Bryman and Bell, 2011). It enables the experimentation on 'real problems' and is designed to assist in their solution while contributing both to academic theory and practical action (Bryman and Bell, 2011).

Generally, action research follows a cyclical process (research question – diagnosis – plan – intervention – evaluation) which implies some degree of iteration is involved. Specific outputs from work packages (WP) 1-3 were evaluated and used to develop the WP proposed at objective

4. At each iteration, the evaluated findings clarify the aim of objective 4, with the data collected and evaluated at the framework piloting stage through piloting interviews then fed back into the subsequent iteration of the framework. This provides the deliverable for this research project through the creation of knowledge (the development of the framework based upon findings from WP 1-3), the occurrence of an action (use of the framework by pilot companies and feedback obtained from interviews) and the subsequent evaluation of the outcomes of the action (analysis of interview data and use of feedback to improve the framework design) (Bryman and Bell, 2011).

3.3.2 EXPERIMENTAL RESEARCH

Experimental research was used in the addressing of objective 2 and WP 2 by use of quantitative data analysis methods. Experimental research enables the examination of the results of manipulating a single variable in a controlled or observed environment (Fellows and Liu, 2008). In this particular research project, two methods of experimental research were used, (Spearman's rho correlation coefficient and Cronbach's alpha) and the methodology for each of these is included within appendix M.

3.3.3 SURVEYS

Surveys were used during the addressing of specifically objective 1 and WP 1 (analysis of survey results; questionnaire with some multiple choice questions), and objective 4 and WP 5 (carrying out of interviews as part of the framework pilot process). Interviews also form part of the case study approach (discussed briefly in chapter 3.3.4). Survey analysis is concerned with the identification of causes and correlations that explain data concerned with an individual's behaviours and thoughts. Questions that are used in the survey research style can be either open-ended or closed (Fellows and Liu, 2008).

3.3.3.1 Interviews

Obtaining data by interviewing is probably the most commonly used qualitative research method (Bryman and Bell, 2011); research into the built environment is no different (Haigh, 2008). There are a variety of different types of interview (Bryman and Bell, 2011), but broadly speaking, these can be categorised as structured, semi-structured and unstructured (Fellows and Liu, 2008). Structured interviews are usually rigid in their design, providing the researcher with a great deal of control over their direction. The researcher adheres to a strict set of questions which does not allow for additional probing. In unstructured interviews the

researcher might typically introduce a topic briefly and record the interviewee's responses to them (Fellows and Liu, 2008). The interview method selected for use in this project was the semi-structured interview, due to its ability to offer both a degree of control in leading the direction for the interview, but also providing the researcher with the opportunity to conduct additional probing where necessary. Semi-structured interviews were used during both the case study research conducted as part of WP 3 and during the final piloting phase (WP 5).

Prior to conducting the interviews, the researcher should ensure a well-developed interview protocol is in place (Eisenhardt, 1989); as such, the main questions for WP 3 were designed with a series of prompts that would be used if the researcher felt additional information was required based upon the information provided by the interviewee. The interviews conducted were topical, in that they were concerned with the facts or the sequence of an event (Haigh, 2008). The interviews carried out as part of the case study conducted for WP 3 sought to explore the facts around organisational behaviours and learning as sustainability concepts were introduced to each case organisation, and were used to obtain the empirical data in paper 4 (appendix I). Those carried out during the piloting of the learning framework (WP 5) sought to explore how individuals used the framework and how useful it was to their organisation. The results of this pilot phase are discussed in chapter 4.7.

For each set of interviews conducted, a covering letter was designed which was provided to each interviewee prior to commencing the interview. The covering letter set out the purpose of the interview and also covered the ethical rights of the interviewee (i.e. how the data would be used, the rights of the interviewee, etc.; an example of this (which was used as part of the pilot process in WP 5) is included within appendix K). All interview data were transcribed and recorded, and subsequently coded by use of NVivo software. Coding is an important part of content analysis (Bryman and Bell, 2011) and it was used in each of the sets of interviews to identify themes within the data collected. NVivo was used to arrange these data into 'clusters' of similar elements from the data such that an understanding of the interaction between different themes and the organisation could be developed.

3.3.4 CASE STUDY

Case studies were specifically used during the addressing of objective 3 and WP 3 of this research project. They are used when a contemporary phenomenon has not been investigated within the context under consideration (Yin, 2009). According to Yin (2009), case study research is recognised as a unique means of examining contemporary events, potentially

offering a mixed research methodology which enables observation of phenomena from multiple perspectives (Dooley, 2002). Bell (1999) advocates the use of the case study method for individual researchers due to its ability to enable one particular aspect of a problem to be studied in depth within a limited time scale.

The case study method was selected for this research project due to its ability to enable theory development through considering the interaction between a phenomenon and its context (Dubois and Gadde, 2002). According to Eisenhardt (1989), developing theory is a central activity in organisational research, but there is also a lack of clarity around the process of actually building theory from cases.

As indicated by figure 3.1, the case study approach was used in the addressing of the research identified within WP 3, and hence paper 4 (appendix I). The use of the case study as a research method is further discussed in appendix E, which was also used to guide the development of the research methodology for WP 3.

3.4 SUMMARY

This chapter has discussed the methodological position of this EngD and presented the research methods used and their limitations. A pragmatic, mixed methods approach to research was selected which encompasses elements of both objectivist and constructivist perspectives and positivist and interpretivist paradigms. This draws research from both qualitative and quantitative approaches; specifically literature reviews, experimental analysis, a case study, interviews and use of action research. Each of these have been aligned to the four specific objectives identified at the outset of this project and thus underpin the research undertaken for this EngD which is presented in the following chapter. Limitations of each of the research methods used in this project will be discussed in chapter 5.7, where all aspects of the research are critically reflected on.

4 THE RESEARCH UNDERTAKEN: DEVELOPING THE LEARNING FRAMEWORK

4.1 INTRODUCTION

This chapter presents the research undertaken over the four-year research project. One of the major requirements of the EngD is the publication of research papers, either included as part of conference proceedings or in suitable journals. During this EngD, two journal papers and three conference papers were published. These are included in appendices F-J. These papers complement the content discussed in this chapter and readers should therefore read each part of this chapter in conjunction with the corresponding paper, as the discussion of the first three work packages is relatively brief here. This chapter presents each objective and their corresponding work packages, as presented in chapter 1.5 and the research undertaken and conclusions obtained.

4.2 UNDERSTANDING RESPONSIBLE SOURCING WITHIN UK CONSTRUCTION

The first objective was to understand the focus on responsible sourcing (RS) within UK construction, the findings of which yielded three outputs, shown in table 4.1.

Table 4.1 Outputs from first work package (WP1)

Output	Type and brief description	Thesis chapter	Appendix
WP1.1	APRES Report (March 2012) Report on the results of a survey distributed at the first Action Programme for Responsible Sourcing (APRES) Conference in November 2011. This survey looked to obtain data on drivers, performance and impact of RS. The results are also included as part of a short article by Glass *et al.* (2012b).	4.2.1	Appendix B
WP1.2	Paper 1 (Upstill-Goddard *et al.*, 2012) Conference paper presented at the Association of Researchers in Construction Management (ARCOM) Conference in September 2012. This paper discusses the RS agenda, identifies some problems with the current approach and suggests areas for future research.	4.2.2	Appendix F
WP1.3	Paper 2 (Upstill-Goddard *et al.*, 2013) Conference paper presented at the Sustainable Building Conference at Coventry University in July 2013. This paper links RS with reputation.	4.2.3	Appendix G

4.2.1 DRIVERS, PERFORMANCE AND IMPACT OF RESPONSIBLE SOURCING

The APRES report (output WP1.1; see appendix B) identified a number of drivers and barriers to RS that are presented in greater detail of section 3 of appendix B. Interestingly, client and customer demand for demonstration of RS was identified as a key driver, yet it was also found that one barrier to the enactment of RS is the perceived lack of interest among the client and customer base. This suggests there are varying ideas within the supply chain as to whether customers are interested in the RS status of a potential supplier. Results also suggested that the need to keep up with competitors is a key driver, but cost and a lack of understanding might also hinder its uptake. Furthermore, respondents to the survey indicated that engagement among the SME community was likely to be lower than among the 'non-SMEs' in the future.

Overall, the results indicated RS is of great importance to the construction business, and it will continue to be so in the future. This highlighted the need to drive research further to strengthen links between industry and academia, and provides further justification for the focus of this EngD on RS.

4.2.2 PROBLEMS WITH RESPONSIBLE SOURCING

Following on from the findings of WP1.1, WP1.2 identified five problems with the RS agenda (see section 4 of paper 1; appendix F):

- RS is under-emphasised and research on it is limited;
- There is limited familiarity with RS;
- There is a low perceived risk of exposure of poor corporate social responsibility (CSR) practices in the supply chain by some companies;
- Customers hold limited understanding and interest and for the SME, limited financial resources create major barriers to implementation of RS;
- Addressing social and environmental violations extends only as far as philanthropic values, and holds little influence within the business. Consequently, RS is a 'secondary priority' until customers demand otherwise.

In addition, adoption of RS in engineer-to-order (ETO) supply chains (see section 5, paper 1; appendix F) is even more complex as the number of different sources of components and materials is potentially very high. It is therefore difficult to manage the supply chain from an RS perspective as material source can vary on a project-by-project basis.

4.2.3 LINKING RESPONSIBLE SOURCING WITH REPUTATION

Morality and risk management and 'company brand' were identified as potential future drivers for engaging with RS (see WP1.1); both of which can be linked with organisational reputation. Furthermore, broader CSR (of which RS is part) can be considered a means of safeguarding reputation (see paper 1; appendix F). Therefore paper 2 (appendix G) looked to further explore this.

It was found that arguably organisations engage with RS if they are in the public eye and there is a perceived risk of being exposed in the media for poor ethical performance. In cases where organisations do engage with broader sustainability issues, the attitudes and support of the

individuals making up the organisation are key in influencing this engagement (Thomas and Lamm, 2012). Indeed, in the absence of such support, new initiatives are unlikely to be successful. Attitudes and support directly influence organisational behaviour, which can lead to reputational benefits. Thus positive attitudes and support can lead to both reputational benefits and increased engagement with sustainability, and in this context, increased engagement with RS. RS can also provide transparency benefits which help gain customer trust.

4.2.4 DISCUSSION

Given that SMEs are less likely to engage with RS (see appendix B; section 3.5.6), there are several key issues of importance in the context of the SME. Firstly, the ability of SMEs to gain certification to standards is often hindered by limited financial resources, and those SMEs that opt for certification to standards do so due to customer pressure. RS is a costly process, and for the SME the return on investment (ROI) can be on the order of several years, which often represents too great a financial risk.

Secondly, in the case of ETO sectors, enacting RS principles is difficult because of the scope for customisation of products and components. BES 6001 (BRE, 2009; 2014a) is hence arguably inappropriate for ETO products.

Finally, it was remarked that more widely used tools (such as ISO 14001; BSI, 2004) could be extended to incorporate some of the aspects of RS (see paper 1; appendix F).

4.2.5 KEY FINDINGS

In summary, the key findings of the first objective are that RS can provide opportunities to improve corporate image, as it is a mechanism to demonstrate legitimacy, yet the cost associated with its implementation and certification represent barriers for SMEs. For the ETO sector, barriers are more complex due to the nature of their supply chains.

Secondly, RS has been under-emphasised, creating problems around awareness and understanding. These problems could be addressed by extending existing tools or ‘combining’ the requirements of multiple standards in one tool.

4.3 UNDERSTANDING PERFORMANCE AGAINST STANDARDS

The second objective of this research was to evaluate the role that standards play with regard to sustainability. Performance against version two of the responsible sourcing framework standard, BES 6001 (BRE, 2009), was assessed by analysing the section scores on all certificates available. Analysis of such data had never previously been carried out so the output of this work package would be landmark and novel in the RS research agenda.

The findings of objective two were used to develop a journal paper (paper 3; see appendix H) which was published in a special edition on sustainable construction in the Institution of Civil Engineers' (ICE) Engineering Sustainability journal.

4.3.1 BACKGROUND AND HYPOTHESES

Three hypotheses were proposed for this piece of research:

1. Scoring highly in some clauses within section 3.4 of BES 6001 correlates to a high overall performance against the standard;
2. The higher the level of attainment (LOA), the greater the internal consistency within the results;
3. BES 6001 clauses that draw information from an organisation's environmental management system (EMS) result in a greater number of higher scores than those which do not.

4.3.2 METHODOLOGY

BES 6001 (BRE, 2009) data were collected from each of the four certification bodies that offer certification to the standard. In total, 138 score sets were obtained from 106 BES 6001 certificates and data were arranged according to three criteria:

- Level-of-attainment (LOA): a pass, good, very good or excellent rating;
- Company size: defined as small and medium-sized enterprises (SMEs) or non-SMEs;
- Product group: six broad product groups were identified from the data set.

Data in section 3.4 (environmental and social requirements) of BES 6001 (BRE, 2009) were of particular interest and were analysed according to Spearman's rho correlation coefficient and reliability analysis using Cronbach's alpha (see appendix M).

4.3.3 RESULTS

4.3.3.1 Level-of-attainment

Table 4.2 shows the categorising of the 138 assessment scores according to the assessment rating of the certificates. For data analysis purposes, very good and excellent certificates were amalgamated.

Table 4.2 Categories of assessment rating and number (n) of certificates falling within each category

Assessment rating	n
Pass	8
Good	51
Very Good	76
Excellent	3

From figure 4.1 and table 4.3, it can be deduced that:

- Spearman's rho (ρ) correlations for the pass level of attainment (LOA) were typically much higher than for good or very good/excellent certificates;
- Correlations for clause 3.4.3 (resource use) and clause 3.4.6 (life cycle assessment; LCA) are typically lower for each LOA than for the other clauses in the standard;
- There is poor reliability in the results, and although removal of clause 3.4.3 or 3.4.6 improves reliability in each case, these still do not correlate with a high overall score for section 3.4 for good or very good/excellent certificates.

Please see paper 3, section 5.1 (appendix H) for further discussion.

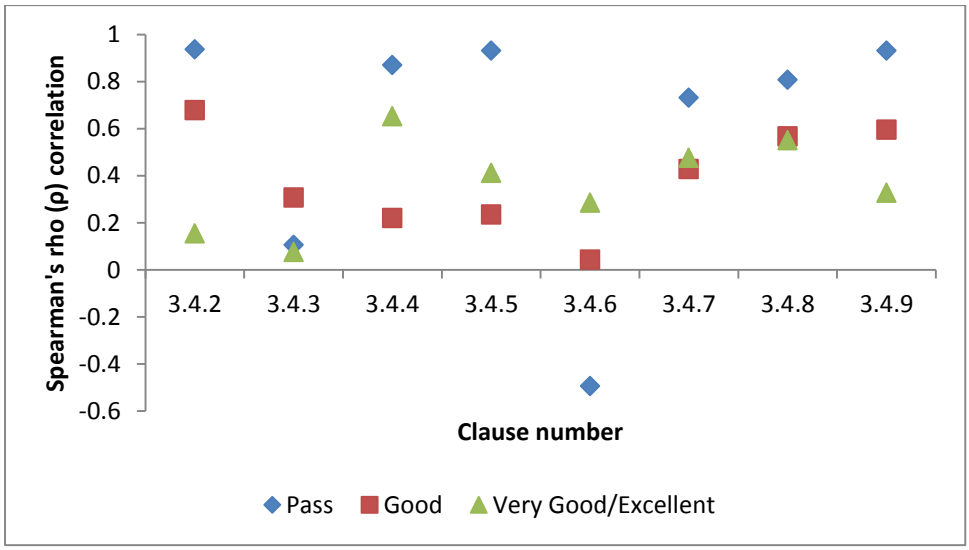


Figure 4.1 Spearman's rho (ρ) correlations for each clause of section 3.4 of BES 6001 version two with overall score for certificates according to level of attainment (LOA).

Table 4.3 Cronbach's alpha (α) values and α values if each clause were removed for each LOA.

Level of attain-ment (LOA)	α	Cronbach's alpha if clause removed							
		3.4.2 Greenhouse gas emissions	3.4.3 Resource use	3.4.4 Waste management	3.4.5 Water extraction	3.4.6 Life cycle assessment	3.4.7 Transport impacts	3.4.8 Employment and skills	3.4.9 Local communities
Pass	0.538	0.106	0.742	0.444	0.378	0.762	0.385	0.416	0.355
Good	0.117	-0.219	0.429	0.105	0.089	0.367	0.021	-0.080	-0.108
Very Good/ Excellent	0.192	0.371	0.268	-0.009	0.110	0.357	0.036	0.052	0.117

4.3.3.2 Company size

Sorting the data by company size gave a sample size of 114; 99 of these were non-SMEs and 15 were SMEs.

From figure 4.2 and table 4.4, it can be deduced that:

- ρ for clauses 3.4.3 and 3.4.6 is lower than for the other clauses;
- There is poor reliability for both categories, although if clause 3.4.3 or clause 3.4.6 are removed from the scale for the SME category, and clause 3.4.6 for the non-SME category, reliability is improved.

Please see paper 3, section 5.2 (appendix H) for further discussion.

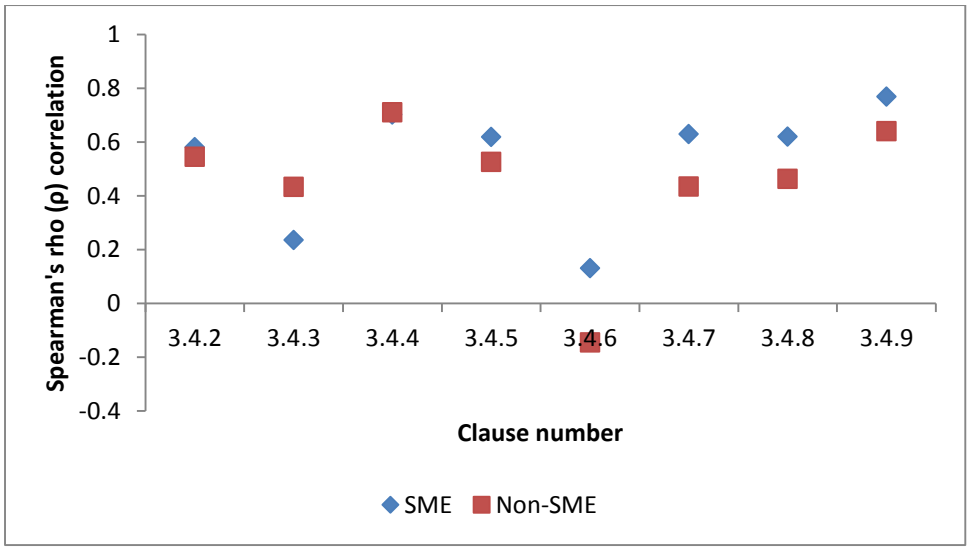


Figure 4.2 Spearman's rho (ρ) correlations for each clause of section 3.4 of BES 6001 version two with overall score for certificates according to company size.

Table 4.4 Cronbach's alpha (α) values and α values if each clause were removed for SMEs and non-SMEs.

Comp-any size	α	Cronbach's alpha if clause removed							
		3.4.2 Greenhouse gas emissions	3.4.3 Resource use	3.4.4 Waste management	3.4.5 Water extraction	3.4.6 Life cycle assessment	3.4.7 Transport impacts	3.4.8 Employment and skills	3.4.9 Local communities
SME	0.547	0.485	0.706	0.447	0.451	0.611	0.485	0.484	0.350
Non-SME	0.476	0.335	0.430	0.383	0.399	0.709	0.405	0.403	0.321

4.3.3.3 Product groups

Six broad product groups were identified; table 4.5 shows the breakdown of these product groups and *n* for each of these. In total, 109 certificate scores were analysed by product group.

Table 4.5 Product groups and number (n) of certificates falling within each group

Product group	n
Aggregates	8
Asphalt	7
Brick	46
Cement	9
Concrete	31
Steel	8

The ρ correlations for sorting of data by product category are shown in figures 4.3 and 4.4, and the α values are shown in table 4.6. From these figures it can be deduced:

- There are high and low ρ values for each product sector, with performance under each clause also differing between sectors.
- There is poor reliability in four of the six product groups (the exceptions being cement and steel).
- If clause 3.4.6 is removed in most cases, and clause 3.4.3 is removed in three of the six product groups then reliability of the scale is improved.

Please see paper 3, section 5.3 (appendix H) for further discussion.

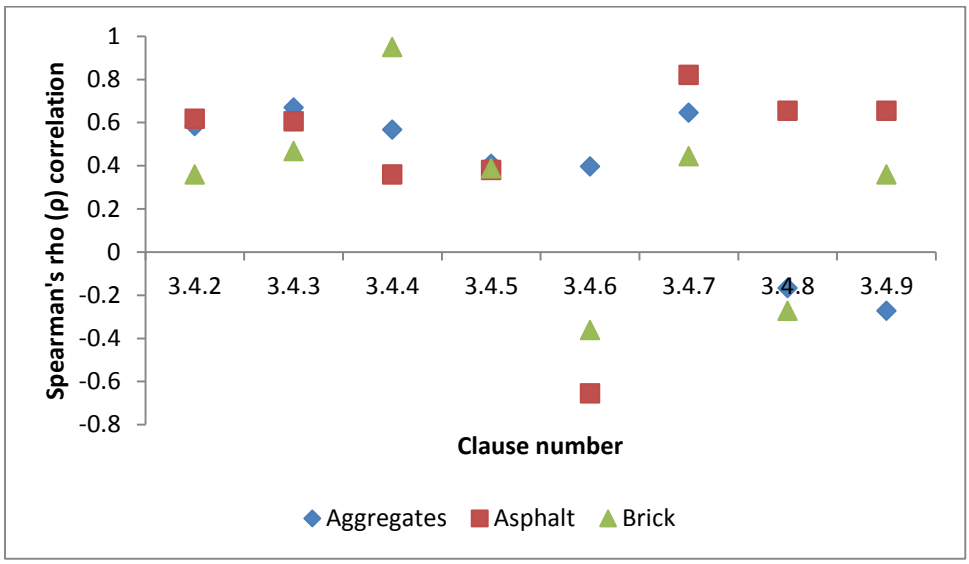


Figure 4.3 Spearman's rho (ρ) correlations for each clause of section 3.4 of BES 6001 version two with overall score for the aggregates, asphalt and brick product groups.

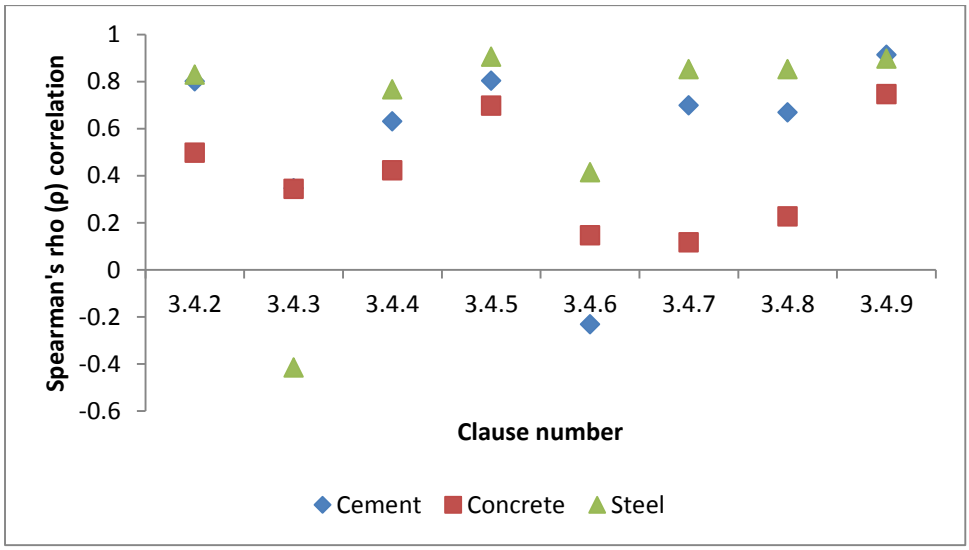


Figure 4.4 Spearman's rho (ρ) correlations for each clause of section 3.4 of BES 6001 version two with overall score for the cement, concrete and steel product groups.

Table 4.6 Cronbach's alpha (α) values and α values if each clause were removed for six product groups.

Product group	α	Cronbach's alpha if clause removed							
		3.4.2 Greenhouse gas emissions	3.4.3 Resource use	3.4.4 Waste management	3.4.5 Water extraction	3.4.6 Life cycle assessment	3.4.7 Transport impacts	3.4.8 Employment and skills	3.4.9 Local communities
Aggregates	.296	.142	.247	.129	.279	.181	.092	.345	.530
Asphalt	-.239	-.558	-1.082	-.198	-.269	.686	-1.488	-.545	-.545
Brick	.067	-.127	-.381	-.158	.041	.526	-.177	.109	-.065
Cement	.731	.620	.750	.658	.689	.852	.651	.694	.593
Concrete	.317	.165	.412	.268	.124	.479	.407	.294	-.004
Steel	.774	.687	.851	.727	.695	.822	.721	.727	.693

4.3.4 DISCUSSION

Results show that hypothesis 1 can be supported, as typically correlations between individual clauses and between individual clauses and total score are positive. The exceptions to this were clause 3.4.3 for resource use and clause 3.4.6 for life cycle assessment (LCA), and possible explanations for this are provided in section 6 of paper 3 (appendix H). Hypothesis 3 can also be supported by the data, as performance was relatively high in those clauses typically covered by an organisation's EMS (greenhouse gas emissions, waste management, water extraction, etc.). There was however, inconclusive evidence to support hypothesis 2, as the internal consistency (α values) of the data is low, and it does not appear to increase for higher performing certificates in most cases.

Finally, in addition to the data presented in paper 3 (appendix H), some analysis of the weightings and points that can be scored under each clause are provided. Clause 3.4.2 for greenhouse gas emissions and clause 3.4.3 for resource use both hold heavier weightings than the other clauses, and the first tier of each clause is a mandatory requirement under BES 6001 (BRE, 2009).

Table 4.7 Number and percentage of certificate score sets scoring higher points under each clause.

Clause	No. certificate score sets scoring clause (out of possible 138)	No. certificate score sets scoring 70% or more of the available points for that clause	Percentage of certificate score sets scoring 70% or more of the available points for that clause
3.4.2	138	118	86%
3.4.3	138	123	89%
3.4.4	137	83	61%
3.4.5	136	57	42%
3.4.6	40	4	10%
3.4.7	125	37	30%
3.4.8	134	107	80%
3.4.9	128	96	75%

Table 4.7 shows the scoring data for each clause; specifically, the number of certificate score sets scoring under each clause (*n*=138) and how many of those scored 70% or more of the total available points for that clause. Clauses 3.4.2 and 3.4.3 have the highest percentage of certificate score sets scoring the top tiers of these clauses (86% and 89% respectively). Those instances of higher scoring of the top tiers in the mandatory clauses may be because these clauses are both mandatory at the first tier, but also that these clauses hold heavier weightings than the other clauses, so complying with the top tiers of these two clauses is more lucrative in terms of the points on offer.

4.3.5 KEY FINDINGS

The main conclusion to be drawn from this research objective is that the analysis implies a largely unmethodical and reactive approach to the standard. Results show that organisations tend to favour those clauses that are covered by existing management systems which contain relatively easy to obtain points. It was concluded that a deeper understanding of organisational behaviours and interaction with the standard is needed to address the 'confused' nature of BES

6001 (BRE, 2009) implementation. This will also help to improve understanding of 'why' and 'how' such performance patterns are observed.

Given the findings of this paper, and the fact that BES 6001 (BRE, 2014a) is becoming ever more important in the sustainability agenda, it was concluded that this EngD should deliver outputs to help reduce confusion around the standard, and provide a means by which organisations can theoretically more easily address all requirements of the standard. Therefore, the output of this EngD should be focused around the structure of BES 6001 (BRE, 2014a). Contextualising this finding with the key finding of chapter 4.2 (WP 1), it can thus be concluded that any single tool that combines requirements should assume an RS form, or should closely mirror the structure of BES 6001 (BRE, 2014a), given its increasing importance in construction.

4.4 LINKING RESPONSIBLE SOURCING AND ORGANISATIONAL LEARNING

The third objective of this research project was to analyse the role of learning in implementing sustainability standards, with WP 3 focusing on linking BES 6001 (BRE, 2009) for RS with learning.

The findings of this objective were used to develop a journal paper, which is due to be published in the 'Engineering, Construction and Architectural Management' journal in 2016. This paper is included in appendix I (Upstill-Goddard *et al.,* forthcoming).

4.4.1 SELECTING CASE STUDY ORGANISATIONS

Two UK-based SME construction product manufacturers were selected for this piece of research. Both case organisations were clients of Responsible Solutions on BES 6001 (BRE, 2009) implementation projects (see paper 4, section 5; appendix I).

4.4.2 CONDUCTING THE CASE STUDY

The methodology for carrying out the case study was based upon an approach using abductive logic (Dubois and Gadde, 2002).

Three categories of staff were identified: management; sales; and production. Twelve semi-structured interviews were carried out (six with each company; two per category) as well as participatory (meeting attendance and documentation development) and non-participatory

(guided site tours) observations. Prior to obtaining data the FAME database (Financial Analysis Made Easy) was analysed for each company to obtain financial and employment figures and to generate a profile for each organisation with regard to each of these.

All interviews were recorded and transcribed and were analysed using NVivo. Other data collected from observations and FAME were also input into NVivo. Finally, data were sorted into 'nodes' such that the collected data could be reviewed. These findings were then mapped onto the Gluch *et al.,* (2009) model of ACAP in order to test its applicability to this case study. Two research questions were identified:

- What role do standards play in driving sustainability?
- To what extent is ACAP an enabler of embracing sustainability standards?

4.4.3 RESULTS

The Gluch *et al.* (2009) model of green ACAP was found to be applicable to the results of the case study. The prior experience identified in this model was found to extend from ISO 14001 (BSI, 2004) certification in this case study, with the absence of a formal management system conducive to the failure of the implementation project. Knowledge was also shown to be significant when implementing standards, with external knowledge highlighted as positively correlating with awareness of BES 6001 (BRE, 2009) and RS. The main sources of this external knowledge came from trade associations and the support provided by Responsible Solutions. Internal knowledge on the other hand, is linked to effective internal communication, which itself evidences social integration mechanisms. Furthermore, social integration mechanisms were found to be constrained by limited support from top management. This lack of drive or support from top management can also limit ACAP.

Finally, activation triggers were also shown to be significant, and are manifested through customer pressure, which is the main driver for SME engagement with standards.

4.4.4 DISCUSSION

A complete discussion of the results of paper 4, is included within the appended version (appendix I; section 7). As such, the key salient points are presented here.

Firstly, 'activation triggers' (Gluch *et al.,* 2009; Zahra and George, 2002) should be renamed 'stakeholder pressure' when applying the model of green ACAP to the implementation process of sustainability standards within SMEs, as the term 'activation triggers' implies a number of

different 'events' in tandem to initiate knowledge acquisition, whereas in the case of sustainability standards it was found that stakeholder pressure was the major 'event' to initiate knowledge acquisition. Other activation triggers were present but these are insufficient to initiate knowledge acquisition activities in the absence of customer pressure.

Secondly, external knowledge sources are central to the implementation process, although they represent only a 'secondary antecedent' as it becomes important once an organisation has opted to work towards certification, but does not represent as important a driver as stakeholder pressure.

Thirdly, the experience obtained from a pre-existing certification is important when implementing a standard, as it makes the implementation process more straightforward. Again however, this represents a secondary antecedent, as it supports the primary antecedent of 'stakeholder pressure' but is not sufficient in isolation to encourage acquisition and assimilation of knowledge.

Social integration mechanisms were found to influence all four components of ACAP, not just the transformation and exploitation of knowledge (as per Gluch *et al.*, 2009). Communication also influences attitudinal shifts and where this is not present, attitudes towards the implementation project were less open and hence support from employees was more difficult to obtain. Support from top management was also found to aid knowledge transformation and exploitation processes which links with effective leadership.

In light of these findings, the Gluch *et al.* (2009) model was slightly revised to reflect the process of ACAP when implementing sustainability standards. This revised model is presented within the paper included in appendix I and is also reproduced here, in figure 4.5. It is recognised by the researcher that the model proposed by Gluch *et al.* (2009) remains a useful tool for understanding ACAP in the context of green innovation in construction, but the model presented in figure 4.5 represents ACAP more accurately in the context of sustainability standard implementation.

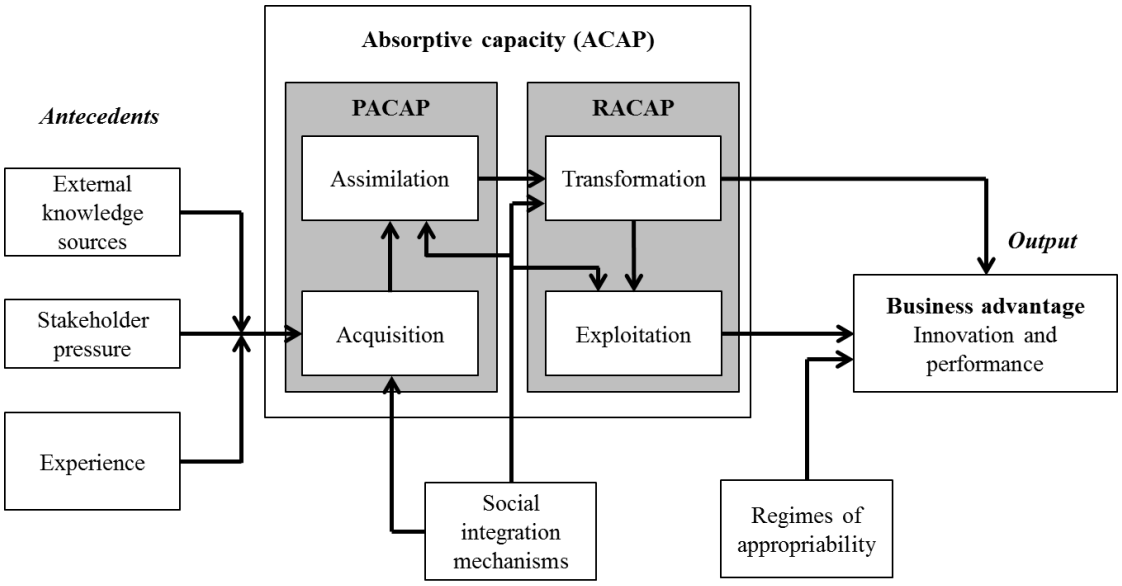


Figure 4.5 ACAP model devised by Upstill-Goddard *et al.*, forthcoming; (adapted from Gluch *et al.*, 2009).

4.4.5 KEY FINDINGS

Overall, the ACAP model for green innovation in construction (Gluch *et al.*, 2009) was found to be applicable to the implementation of a sustainability standard within an SME, albeit with some adjustments.

Firstly, 'activation triggers' should be redefined as 'stakeholder pressure', as it was found that this is the single most important driving force behind organisations implementing sustainability standard.

Secondly, the two antecedents as described in the original model have relevance to this study, although these are less important and are 'secondary antecedents' to the main driver (stakeholder pressure).

In terms of contextualising these findings with the findings of chapters 4.2 and 4.3, it can be concluded that confusion around the state of sustainability requirements within standards can be addressed by adopting an ACAP approach. This ACAP approach can aid organisations in learning around the requirements of sustainability standards. It is important to mirror the BES 6001 (BRE, 2014a) structure in any such output of this EngD because of its increasing importance within construction, but by use of an ACAP approach, the confused nature of BES 6001 (BRE, 2009) certification within the industry can be addressed.

4.5 DESIGNING THE FRAMEWORK PRINCIPLES

The fourth objective of this research project was to develop a learning framework for the implementation of sustainability standards within the construction SME. This objective was delivered through two work packages (WP), and has utilised the findings from the previous three WP in its development.

The research contained within WP 4 was used to develop a conference paper (paper 5; see appendix J) which was presented at the Association of Researchers in Construction Management (ARCOM) Conference in September 2015. This paper discusses the principles for developing a learning framework and should be referred to for a more detailed analysis and discussion of the main findings.

4.5.1 THE NEED FOR A LEARNING FRAMEWORK

The decision to develop a learning framework as the output of this EngD evidences action research (see figure 3.1 and chapter 3.3.1), as the findings of the first three objectives enabled the diagnosis of specific problems, which then enables the proposing of solutions based on this diagnosis (Bryman and Bell, 2011). The problems that were diagnosed as a result of the findings of the first three objectives are therefore discussed below.

WP 1 determined that cost is a major barrier to engaging with RS, particularly for the SME. Additionally, the nature of ETO supply chains that are typical of construction make it even more difficult to enact principles of RS. It also established that there is a limited understanding of RS within construction organisations (see paper 1; appendix F). However, despite these supposed pitfalls of implementing RS, construction companies were increasingly striving to do so, and the results of a survey (see appendix B) suggested reputational drivers may have increased significance in future years. It was concluded (see paper 2; appendix G) that RS provides a means for an organisation to increase its legitimacy in the first instance, with reputational benefits apparent if certification to RS shows the organisation as doing more than its competitors. This opportunity to increase legitimacy was linked to the drive to implement standards, and thus how organisations perform against these standards should be investigated further (objective 2).

WP 2 determined, by again using RS as the lens for the research, that performance against these standards is reactive, and there is a lack of consistency in approach. However, drawing back on the findings of objective 1, it is recognised that due to the requirement of BES 6001 (BRE,

2009; 2014a) for RS to determine traceability through the supply chain, this inconsistent approach may also be due to the nature of construction supply chains. Therefore, it was decided that the next step should be to understand why this is the case; why are companies approaching these standards in such a reactive and inconsistent way and why does the nature of the supply chain exacerbate this? SMEs find implementation of standards difficult due to resource issues (see outputs of objective 1), and there are limited performance data for SMEs against the standard (see paper 3; appendix H). Therefore, understanding the nature of approach to the standards for the SME holds great significance.

WP 3 determined that this reactive and inconsistent approach can be linked to the absorptive capacity (ACAP) of the organisation, which can be extended through undertaking learning activities. This can be linked back to one of the main findings of objective 1 – that there is a limited understanding of RS within construction and that one such way of addressing this might be through extending of existing tools to include RS principles. Using these conclusions, it can thus be inferred that the solution to these 'real problems' (see Bryman and Bell, 2011) is to develop some means by which organisations can implement standards in a coherent and consistent manner which seeks to ensure organisations hold an understanding of the principles of the standards they are working towards by increasing the ACAP within that organisation. Therefore, the key requirements of such a learning framework should be:

- Using the framework should deliver benefits to the user through reduced cost, and should look to merge requirements of multiple standards (objective 1);
- The framework provides a structured and consistent approach to addressing sustainability issues (objective 2); and
- It is structured to increase the organisation's capabilities around each of the four constructs of ACAP (objective 3).

4.5.2 THE FRAMEWORK STRUCTURE

4.5.2.1 Identification of aspects

The first part of the framework was designed with a focus on prioritising sustainability issues or aspects based on the risk they pose to the organisation.

Therefore some means of identifying those sustainability issues, or 'aspects' that can be deemed 'significant', in terms of the risk they pose is required such that SMEs can focus on improving their management of those aspects that cause the greatest impacts. Risk assessment is linked

to reputation management (Bebbington *et al.,* 2008) where those issues that have a greater potential to cause reputational damage can be deemed issues of higher risk. Fundamentally, poor management of individual aspects that are deemed significant might cause greater risks to the organisation's reputation (see paper 5, section 4.1; appendix J).

The first principle for the framework was thus set; it must identify those aspects that are most significant in terms of risk, such that performance against 'high risk' aspects is prioritised.

4.5.2.2 Module structure

Once the first part of the framework (discussed in chapter 4.5.2.1) has assessed which of these are significant, the next step is to determine what the organisation already has in place with regard to individual aspects. Readers are referred to section 4.2 of paper 5 (appendix J) at this point.

Once the 'position' of an organisation has been defined, operational controls can be set to strive for performance improvements. The planning and development of these is termed the 'Design' phase. Following this 'Design' stage, the organisation should aim to integrate all policies and management processes in such a way that they are fully embedded in the organisation. This next phase should be termed the 'Implementation' phase and might typically include the use of auditing and other performance monitoring processes. Finally, there needs to be a 'Review' element to the framework, in order to review data and audit results, and propose any corrective actions where necessary. The use of a 'review' phase implies a cyclical 'Design-Implement-Review' (DIR) process and also contributes towards a continual improvement culture, as advocated by many ISO management systems (Upstill-Goddard *et al.,* 2015b). This also emphasises the need for learning and innovation as well as the development of institutional knowledge (Asif *et al.,* 2013). The second principle is thus set; the framework should address each sustainability 'aspect' in a modular way and follow a systematic DIR process for each of these.

4.5.2.3 Learning processes

The focus on learning is to ensure that the framework enables an organisation to implement sustainability while ensuring that it avoids a 'box-ticking' approach to compliance. Learning actions should focus on the design, implementation or review of a particular module/aspect and should prescribe learning actions for each of these. In order to prescribe learning actions, each module should establish gaps in the organisation's knowledge. This will ensure that organisations can implement standards in a way that adds value to their operations. Therefore

the third principle for the development of the tool is determined; it should relate the knowledge gaps to the sustainability requirements and prescribe learning actions where the gaps exist (Upstill-Goddard *et al.*, 2015b).

4.5.3 DISCUSSION: APPLYING THE FRAMEWORK

The principles of the framework discussed in this research can then be used to guide the development of a sustainability assessment tool which can be used to help comply with the requirements of a specific sustainability standard or to address broader CSR requirements. Figure 4.6 shows how the rules established in section 4.5.2 fit within the conceptual framework.

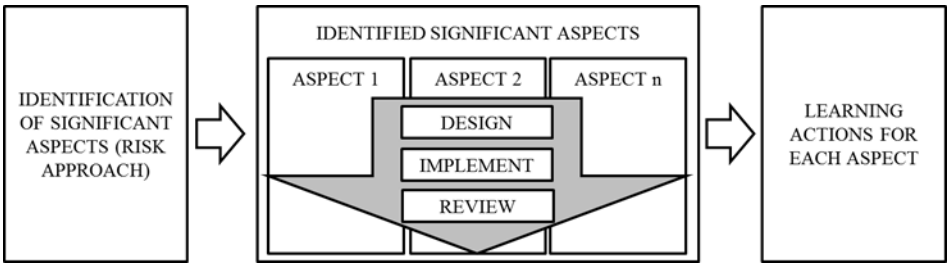


Figure 4.6 Conceptual framework

Within each individual module, question sets to understand the knowledge held about each aspect will be developed according to the modular principles developed.

4.5.4 SUMMARISING THE PRINCIPLES

This research established that the learning framework should rest upon three principles:

- It should assess which sustainability issues are 'significant' to an organisation, and thus filter out those sustainability issues that are not important in the context of that organisation;
- It should compartmentalise sustainability issues into standalone 'modules', with each individual aspect representing one 'module', which will enable an organisation to address each issue in a systematic way; and
- It should establish knowledge gaps and link these to the requirements of sustainability standards, thereby prescribing learning actions that will aid in the organisation complying with standards.

These three principles govern the three components that make up the conceptual framework and under which the detailed modules are developed. The process for the development of the detailed framework is described in chapter 4.6.

4.6 DEVELOPING THE CONTENT

The content for the framework was developed through a number of stages. This chapter builds upon the conceptual framework developed in paper 5 (appendix J) and provides detail around the principles established (see chapter 4.5.4). Three 'modules' were developed to test the framework and these are included as a CD-ROM Microsoft Excel file (appendix A). The following sub-sections present the methodology used in the development of the structure and content.

4.6.1 FRAMEWORK STRUCTURE

By using the conceptual framework indicated in figure 4.6, it was initially proposed that each section should be assigned a process that would be completed by the organisation that would use the framework. Therefore, a process would be used to identify those aspects that can be deemed significant; a process would be used to develop each 'module' through the DIR approach; and a process would be used to determine what the prescribed learning actions would be for each organisation.

The first stage is to conduct a self-assessment process, where answering of a number of broad questions would enable the identification of those aspects that are most significant to the organisation in terms of impact. This would also enable Responsible Solutions to obtain an understanding of the nature and needs of the business. By identifying these, the organisation is then able to prioritise those issues most material to its operations by eliminating those that are not deemed 'significant'. For example, it was theorised in the initial phases of the framework's development that if the organisation already holds an ISO 14001 (BSI, 2004) certificate for environmental management systems, then this self-assessment phase would eliminate the ISO 14001 (BSI, 2004) related questions from the second phase. This prioritising of issues enables the framework to align to the new 'context of the organisation' clause that now forms part of the general framework for all new ISO standards (including the revised ISO 14001: 2015 standard; see IRCA, 2014).

During the development phase of the framework, a parallel project – entitled 'An Ethical and Social Responsibility Portfolio for construction professionals (AESOP; see APRES, 2015b) – that aims to deliver a portfolio of outputs to assist the construction industry in engaging with and improving its ethical and social responsibility practices was being developed. As part of this, the AESOP project has developed a risk-assessment tool employing a self-assessment approach that determines the nature of an organisation's supply chain with regard to sustainability issues. As such, it is envisaged that this self-assessment approach used in AESOP can be used as the first part of the framework developed for this EngD.

Upon completion of this self-assessment phase, responses are returned to Responsible Solutions where they are analysed to determine the most significant aspects to that organisation. This phase will determine significance by potentially using a calculated risk coefficient and taking into consideration the context of the organisation. For example, this phase would consider the severity of a specific issue to that organisation, and consider the likelihood of a negative event occurring under that specific issue and would assign a value to each. The risk coefficient is thus determined by multiplying these together.

Once Responsible Solutions have completed analysis of the self-assessment responses and have defined those 'significant' aspects for the organisation to address, the framework is returned to the organisation in the form of a number of modules (one module per aspect). It was decided, during the course of developing the framework, that a modular structure would render the framework most approachable. This was decided because organisations are then able to address 'modules' in a systematic way and can break down requirements into smaller, more manageable sections. For example, developing a standalone 'waste' module would enable the organisation to focus entirely on its waste management practices when completing this module. This also enables organisations for whom waste does not represent a high risk or significant issue, to completely eliminate all waste-related issues by simply not addressing the waste module. Each of these modules is designed as a question set which poses questions of the organisation to determine what it is doing in respect of specific issues. For example, if an organisation has determined from its self-assessment process that waste management represents a significant aspect, then it will have a waste management module to complete, which will ask questions of its waste management processes and operations.

Figure 4.6 presents 'identified significant aspects' in the middle box, and indicates that the DIR process as discussed in paper 5 (see appendix J) is then applied to each 'aspect'. As has already been stated, each aspect is represented by a module in this framework. Therefore, if it was

identified by the approach highlighted in figure 4.6 that waste was a significant aspect for an organisation, then that organisation would then complete a waste 'module', by answering a number of waste-related questions. The questions asked of the organisation are designed to follow a DIR process, so each question asked under a given module would aim to take the organisation through this DIR process as discussed in paper 5 (appendix J).

Within the framework, each module is structured according to what various standards require organisations to implement. So for example, two of the requirements within the waste management section of BES 6001 (BRE, 2014a) for responsible sourcing are to have a waste policy, and set some performance metrics, objectives and targets. Therefore, it is clear that the questions following the DIR process should be posed at this level. Each module within the framework should thus be comprised of a number of 'sub-modules' tackling these issues. Therefore, two of the sub-modules of the waste module for this framework would be 'Waste policy' and 'Waste metrics, objectives and targets'. Figure 4.7 shows how the three modules developed for the purposes of testing the framework presented in this thesis are structured by their 'sub modules', which each address a specific requirement of that module. Each of these modules represent an 'aspect' as indicated within figure 4.6.

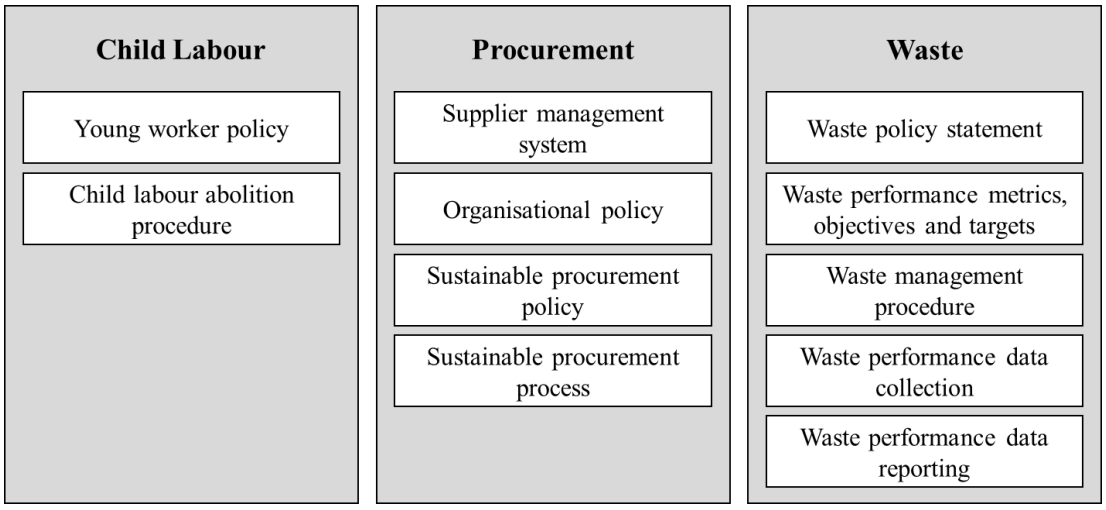


Figure 4.7 Break down of sub-modules by module developed.

For each of these sub-modules, organisations are asked one binary question initially. Example questions for the first two waste sub-modules are:

- Do you have a waste management policy?

- Do you set waste performance metrics, objectives and targets?

Clearly, organisations can answer 'yes' or 'no' to these questions; their answer then determines what information they need to provide. If they are able to answer 'yes' to these types of questions, the framework requires them to include evidence; so for example, if they answer 'yes' to the question 'Do you have a waste policy?', then the framework would require the organisation to attach the waste policy to their answer such that Responsible Solutions can review this to ensure its suitability. It may be that Responsible Solutions deem the policy to be appropriate, at which point the organisation would need to go no further in that particular sub-module and it can be marked as complete. On the other hand, if the organisation answers 'no', then they are asked a number of additional questions in order to determine what they have in place that is relevant to a particular sub-module.

When answering 'no' to the initial binary question, the framework requires that the organisation provides additional information. Given the links made between ACAP and standards implementation (see paper 4; appendix I and figure 4.5), these questions should focus upon increasing the ACAP of the organisation, i.e. to address:

- Knowledge acquisition;
- Assimilation of knowledge;
- Transformation of knowledge; and
- Exploitation of knowledge.

Organisations are thus asked four 'macro-level' questions (one per each ACAP construct) per sub-module when answering 'no' to the initial binary question. These 'macro' questions are again binary in nature, and are designed using the examples identified by Gluch *et al.* (2009) which are indicated in table 4.8. So for example, questions to focus on the 'acquisition' construct should ask questions on what the organisation already has in place around a particular issue, since this is the objective of an initial environmental review.

Table 4.8 Environmental management examples of each of the four constructs of ACAP; according to Gluch *et al.* (2009)

ACAP construct	Environmental management examples
Acquisition	Initial environmental reviews Routines to secure the observance of environmental demands and legislation
Assimilation	Training programmes Setting of measurable targets and plans to meet them LCA
Transformation	Environmental audits Use of performance indicators
Exploitation	Environmental manager's knowledge Influence on strategic decisions, operations and practices

Within each of these constructs, the questions that are asked of the organisation will inform Responsible Solutions of the level of support that each organisation requires against each specific sub-module. For example, it may be determined that the organisation needs to develop a waste management policy statement. Questions would therefore aim to take the organisation through the DIR process as set out in the high level framework (see paper 5, section 4.2; Appendix J) when addressing the development of this policy statement; once the framework is returned to Responsible Solutions with the completed answers, the level of support they require can then be easily deduced. For example, answers may indicate that the organisation has not developed a waste policy, and that the answers to their questions indicate they are unable or unsure of how to develop a waste policy. Therefore, this would therefore indicate to Responsible Solutions that they require some assistance in the 'Design' phase. On the other hand, they may have a policy, but might not have implemented this effectively within the organisation. This would then indicate to Responsible Solutions that they require some support in the 'Implementation' phase. An example of the sort of questions that would be asked should the organisation answer 'no' to the initial question is shown in figure 4.8 (as a screenshot of the framework which is included in appendix A). This is for the initial question, 'Do you have a waste policy statement?'

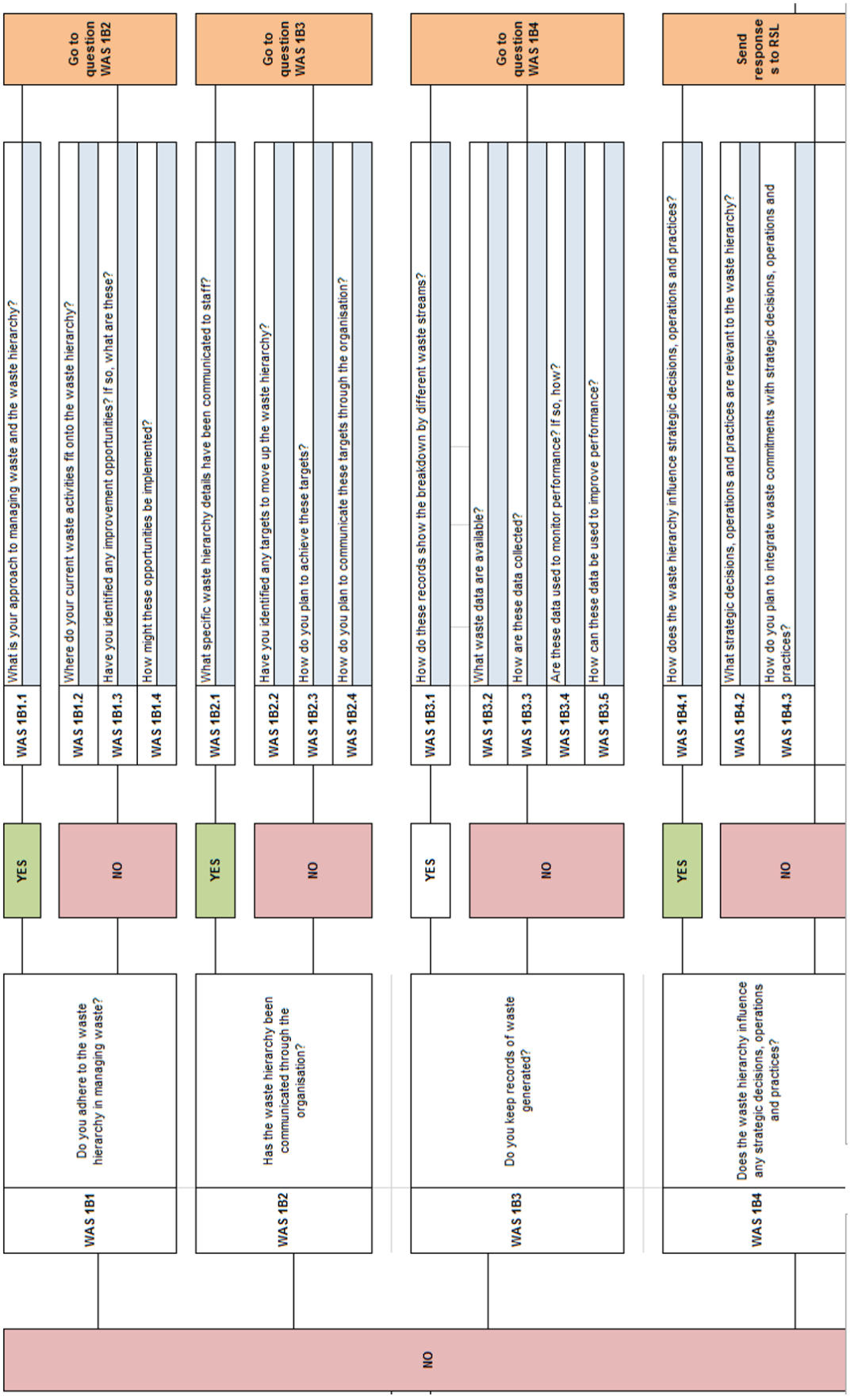


Figure 4.8 Screenshot of questions asked in the framework for the waste policy sub-module of the waste module.

Responsible Solutions are then able to deduce the level of support required, and what resources the organisation will require the provision of in order to address each of the requirements. As a significant proportion of this work can be completed without the need for face-to-face meetings, it is envisaged that this can deliver cost savings to the client, as they can avoid charge out rates typically required as part of consultancy projects.

Reflecting upon the conceptual framework presented in figure 1 of appendix E, it can be concluded that such an approach can help reduce the effects of many of the restraining forces highlighted here. Clearly, by focusing on increasing the knowledge and learning within the organisation, the 'low awareness' restraining force can be addressed. As has been alluded to in paper 4 (appendix I), learning and knowledge can also impact upon staff attitudes and so this should also act to reduce the restraining effect that attitudes can have. The framework's ability to reduce the cost associated with charge out rates can act to reduce demand on financial resources, as well as time as it reduces the need for users to commit entire days to meetings at the start of consultancy projects to initiate the implementation of a standard. This is particularly significant for the SME. Therefore, it is concluded that the structure of this framework can help to mitigate against many of the restraining forces presented in figure 1 of appendix E, which also represent the key barriers to sustainability standard implementation as identified by this EngD.

4.6.2 MODULE CONTENT

As discussed in the previous chapter, each significant aspect represents a 'module' in this framework. It has already been determined that the Global Reporting Initiative (GRI) offers a very robust framework for organisations that wish to demonstrate high levels of performance against sustainability issues. Due to its wide coverage of sustainability issues (see table 4.9), it was decided to base the framework upon these; the framework structure discussed in the previous section should therefore be able to be applied to each of these issues in the same way. However, developing modules for all the issues listed within the GRI would be exhaustive and unnecessary for the purpose of this EngD; the contribution of this project is the learning framework and not the delivery of a number of modules. However, in order to test the application of the framework, three modules were selected for development that differ sufficiently from one another in terms of scope, in order to demonstrate that the high level framework can be applied to any sustainability issue, regardless of how the issue is addressed within standards.

Table 4.9 Aspects included within the GRI G4 guidelines

Economic	**Environmental**	**Labour practices and decent work**	**Human rights**	**Society**	**Product responsibility**
Economic performance Market presence Indirect economic impacts Procurement practices	Materials Energy Water Biodiversity Emissions Effluents and waste Products and services Compliance Transport Overall Supplier Environmental Assessment Environmental Grievance Mechanisms	Employment Labour/ management relations Occupational health and safety Training and education Diversity and equal opportunity Equal remuneration Supplier assessment for labour practices Labour practices grievance mechanisms	Investment Non-discrimination Freedom of association/ collective bargaining Child labour Forced/ compulsory labour Security practices Indigenous rights Assessment Supplier human rights assessment Human rights grievance mechanisms	Local communities Anti-corruption Public policy Anti-competitive behaviour Compliance Supplier assessment for impacts on society Grievance mechanisms for impacts on society	Customer health and safety Product and service labelling Marketing communications Customer privacy Compliance

As discussed above, each sub-module will be designed such that it focuses upon increasing the ACAP of the organisation, with one question devoted to each of the four constructs of ACAP (see figure 4.8 for examples of the questions asked at each stage):

- The first question focuses on knowledge acquisition, which is the organisation's ability to identify and acquire externally generated knowledge that is critical to its operations (Zahra and George, 2002) with examples provided by Gluch *et al.* (2009) looking at

initial reviews and routines to observe demands and legislation (see table 4.8). Initial reviews are used to deduce current activity around a key issue and routines to observe demands and legislation are inferred to represent those processes that the organisation should be undertaking, or desires to undertake. Therefore, the purpose of the acquisition question within the framework should be to indicate the 'gaps' between what is required and what the organisation is currently doing.

- The second question should focus upon the assimilation of knowledge within the organisation, which Zahra and George (2002) understand to be the routines and processes that enable an organisation to interpret and understand new information. This can represent training programmes or analytical tools such as life cycle assessment (LCA) (Gluch *et al.,* 2009). Aligning the development of the 'social' side of the organisation, such as training, with those more 'technical' structures (policies, etc.) is important to give rise to a socio-technical system for CSR (Asif *et al.,* 2013). Therefore, the framework developed as part of this project considers how the organisation understands new information, so will seek to extract information around training or communication processes.

- The third question considers how knowledge is transformed, or how the organisation develops and refines its assimilation routines to facilitate combining of existing knowledge and newly acquired knowledge (Zahra and George, 2002). This is done through use of performance indictors or audit programmes (Gluch *et al.,* 2009) which are used as means of monitoring performance. As such, the developed framework asks questions on their broader performance monitoring and potential improvements.

- The fourth question considers the exploitation of knowledge, which are the routines that allow firms to refine existing competencies or create new ones by incorporating knowledge into operations (Zahra and George, 2002). In an environmental management context, Gluch *et al.* (2009) link this to the knowledge of the Environmental Manager or the influence this new knowledge has on strategic decisions, operations and practices. Evidencing sustainability incorporation at the strategic level can indicate dedication to sustainability (Beske and Seuring, 2014) and therefore the framework developed for this EngD asks questions around the influence of specific sub-modules on strategy.

4.7 TESTING THE FRAMEWORK

4.7.1 USING THE FRAMEWORK

In order to test the framework, it is first important to determine the parameters that define its usability:

- **Who will use it?** The framework has been designed to be used specifically by the construction SME. However, this does not preclude the use of the framework by 'non-SME' organisations.
- **When will it be used?** The framework has been designed to be used by an organisation when they are assessing their coverage of sustainability issues in order to implement standards.
- **What will it be used for?** The framework will be used in order to assess an organisation's coverage and understanding of sustainability issues such that they can address gaps by undertaking learning activities.
- **Why will it be used?** The framework will be used to enable an organisation to identify sustainability issues that it needs to increase its knowledge on.
- **Where will they use it?** The framework has been designed to be used in an office-based environment.
- **How will they use it?** The framework has been designed as a question set which assesses coverage and understanding of sustainability issues at the organisational level. By answering these questions, the extent of understanding and hence any learning required by the organisation can be deduced.

4.7.2 SELECTION OF PILOT ORGANISATIONS

Pilot organisations were selected based upon evidence of prior interest in sustainability. Due to the range of parameters the pilot process looked to explore, a range of organisations that demonstrated differing levels of sustainability should be invited to pilot, such that robust feedback could be generated. The organisations that were invited for pilot were categorised into three groups:

- 'Beginner' organisations (group 1): Those that had demonstrated an interest in sustainability (evidenced by attendance at a sustainability workshop or event), but had no formal management systems or certifications in place;
- 'Operational' organisations (group 2): Those that held an environmental management system (EMS) to ISO 14001 (BSI, 2004) and/or held a BES 6001 (BRE, 2009; 2014a) 'pass' or 'good' certificate. These organisations were clearly engaged with certification but there is clear potential for performance improvements; and
- 'Leading' organisations (group 3): Those organisations that held both an EMS to ISO 14001 (BSI, 2004) and a BES 6001 (BRE, 2009; 2014a) certificate at a 'very good' or 'excellent' level for product manufacturers, or an OHSAS 18001 health and safety management certificate for contractors. These organisations were classed as high performing organisations, perhaps with a great deal of experience in operating management system and product standards.

4.7.3 PILOT PROCESS

The piloting process was comprised of two main stages; using the framework; and a follow up interview, where the use of the framework and any problems or feedback could be discussed. The process for using the framework is outlined below:

- Organisations were sent the framework (Microsoft Excel) and an accompanying instruction sheet (both included within appendix A) detailing how the framework should be approached. Each organisation then completed their answers to the questions for each of the three modules, and sent the framework back to the researcher for analysis.
- The answers for each organisation were then analysed by the researcher to understand the answers to the questions posed within the framework, and to determine whether or not the answers provided yielded the required information. Arrangements were then made for interview.

The researcher interviewed a representative from each pilot organisation, with each interview lasting between 30 minutes and one hour. Interviews were semi-structured in nature, and sought to understand how each company applied the framework, the structure of the framework and the content of the questions.

A list of 32 organisations was built up from existing contacts of Responsible Solutions and the Green Book Live website (BRE, 2015) of BES 6001 certified companies. In total, 13

organisations agreed to participate, with 10 returning completed frameworks who were then interviewed. Although the framework has been designed to be specifically targeted at the construction SME, this does not preclude the use of the framework by non-SME organisations. Therefore, seven of the interviewed organisations were SMEs, and three were 'non-SMEs'. The SMEs involved in the piloting phase were able to provide feedback predominantly on the structure and application of the framework within their businesses, with the 'non-SMEs' (those involved in the process are regarded as sustainability experts; all three sat on the APRES steering group on which the researcher also sat) able to provide feedback on the content of the questions. Furthermore, the 'non-SMEs' potentially benefit from their SME suppliers using this framework, as they set the questions in pre-qualification questionnaires (PQQs) that this framework is designed to help SMEs answer.

Prior to carrying out the pilot process, the design of the framework was presented at the 31st Annual ARCOM Conference in Lincoln in September 2015 to an audience made up of predominantly academics working in the area of sustainability. Although this did not constitute any formal testing of the framework, the theory behind its design was presented and so can be considered a 'pre-pilot' phase to obtain some feedback on its broad design.

4.7.4 RESULTS AND DISCUSSION

Overall, the feedback from the 10 businesses yielded very positive results, with the suggestions for improvement obtained from the feedback very minor in nature. A full bullet point list of the feedback obtained is included within appendix O.

4.7.4.1 Structure of the framework

Selected identified improvements that relate to the structure of the framework were:

- The design of the framework (please see appendix A) was confusing initially with a lot of information to take in. It was even suggested that this could be 'off-putting' for the SME. However, it was made clear that the final framework would not be in Microsoft Excel form, with users faced with one question on screen at a time, and based on their answers, would only see further questions that pertain to their answers. All interviewees agreed this was a more 'user-friendly' format and would overcome the issues that were raised with the on screen design.

- The instructions and key provided with the framework could be made clearer, as two of the companies involved in the pilot process did not complete the framework correctly, with several others reporting initial confusion about how to use it.

4.7.4.2 Content of the framework

Selected identified improvements that relate to the content of the feedback were:

- The instructions included with the framework were too long and should be shortened;
- In order to help companies understand key terms and why specific actions are important, expandable 'information boxes' should be used, and perhaps this should incorporate examples of 'best practice'. A fundamental for an SME is what they need to do to remain in business;
- Some of the content could perhaps focus on the fundamentals (specifically with regard to waste; for example, questions that focus on legal compliance and the duty of care);
- Some of the wording of questions (particularly with regard to the policy questions) could be revised. Many of the pilot organisations were unclear as to whether the policy section for each module was requesting a separate standalone policy for that specific issue, or whether a statement included as part of a broader policy would be acceptable. Some of the terminology was also highlighted as being too formal, and perhaps should reconsidered in places. When the framework is supplied to organisations, it may not necessarily be a sustainability professional who is completing it, and so over-technical terms and content could potentially cause confusion for the user;
- Inclusion of a 'check list' of final documents that should be attached with the completed framework;
- The focus of the questions should perhaps look to identify opportunities to add value to the organisation, and as a consequence of this, the organisation is also complying with the requirements of standards.

4.7.4.3 Application of the framework

Selected feedback that related to the application of the framework was that:

- The framework should have input from a number of individuals across the organisation, as it was commented that different people from different job roles may have answered some of the questions differently. This could perhaps be partially addressed by splitting

up the strategic and 'non-strategic' questions, to ensure that the strategic questions are answered by top management personnel. The current design of the framework lends itself to being completed by anybody within the organisation, although within the pilot sample it was typically completed by those in an operational capacity;

- Depending upon the knowledge of the individual(s) completing it, it could potentially be quite difficult to complete. However, those that raised this as an issue agreed that if the framework were to point users in the direction of learning activities, that it would be very useful in addressing and increasing understanding of sustainability issues.

One final point that emerged from the pilot process was that the results obtained suggested that the current design of the framework rendered it not overly applicable to the micro-SME (<10 employees). One pilot organisation could be categorised as such (with the remaining nine organisations having at least 30 employees), and although they reported no issues with understanding the questions, they did report that some of the questions were irrelevant for them. However, they also recognised that although their interest in sustainability issues was limited, and that they were in fact informally addressing many of the issues raised in the questions (for example, although they had no formal waste management policy, they were segregating waste and ensuring it was reused or recycled where possible, evidencing compliance with the waste hierarchy). Therefore, it could be argued that should they wish to formally pursue any standards, the framework could have applicability to them. It was reported that due to their size, they are often situated far back in the supply chain and their customers only ever purchase a relatively small (in the context of the total amount of materials their customers procure) of material from them. Therefore, sustainability demands are rarely placed upon them by their customers and as such there is no direct benefit to them of investing time and money to implement such standards.

4.7.5 KEY FINDINGS OF THE PILOT PROGRAMME

The main conclusions to draw from the pilot process were that overall the framework was able to be followed, although improvements are required around its 'on screen' design. This will be addressed in subsequent developments of the framework as it is envisaged it will move away from a Microsoft Excel base.

Secondly, the framework covered the salient issues in an appropriate level of detail, although extra information could be provided in the form of 'information boxes' to act as a guide to companies that are completing it. Furthermore, some questions should perhaps be refocused to

ensure they are not missing the 'basic' information. For example, several of the pilot organisations indicated their surprise at the waste module omitting relatively basic compliance concepts such as the duty of care and legal compliance. It was pointed out during these interviews that this had not been covered as the GRI have a specific 'compliance' indicator, and hence this framework would look to incorporate these issues within a 'compliance' module. However, it is recognised that particular care should be taken when developing this module to ensure adequate coverage of all compliance issues. Particular care should also be taken around the use of terminology, so as not to render the framework too confusing for the end user. Again, these issues will be addressed in future developments.

Finally, the framework was found to be applicable to the SME, as all SME companies reported generally positive experiences with using it, and felt that the framework was useful in assessing their position with regard to different issues. However, it was also reported that the framework should not be completed by one individual, but rather as a collective effort from a number of employees in order to address all the issues covered completely. During the initial design phase, it was speculated that completion of the framework may be required from a number of employees when the final framework was delivered to clients, but that the pilot phase might provide deeper insight as to whether this would be required. It is also felt however that this conclusion is not SME-specific, and that the use of the framework in a larger organisation might also require the input of a number of employees from different disciplines or departments. Furthermore, additional research is also required around the application of the framework within the very small ('micro') SME.

4.8 SUMMARY

This chapter has presented the research undertaken over the four year research period. All five work packages have been carried out to meet the objectives defined in chapter 1.5 of this thesis. The first four work packages delivered a total of five research papers which are included as appendices and each provide their own contribution to knowledge. The learning framework was developed based upon the findings of each of these work packages and these corresponding papers. The framework was subsequently developed and tested with a pilot group of 10 organisations, from which feedback was obtained which will be fed into future developments of the framework.

5 FINDINGS & IMPLICATIONS

This chapter presents the key findings from each of the four objectives and the overall four year research project. The research programme has three overarching aims which are common to any EngD; provide a contribution to existing theory and practice, provide a contribution to the industrial sponsor, and provide a contribution to industry. This chapter also discusses how this research has addressed these overarching common aims and also makes some recommendations for future research. Finally, the chapter will critically evaluate the outputs of this EngD.

5.1 THE KEY FINDINGS OF THE RESEARCH

At the outset of this project, the overarching aim was to develop a learning framework to enable construction SMEs to manage sustainability. The first three objectives of this research project and their specific findings highlighted this need, by using responsible sourcing (RS) as the lens through which to carry out this research. Objective four specifically addressed this need through the development and testing of a learning framework, which focuses on the broader subject of sustainability and those issues that are included within it. Specifically, these findings are itemised below.

- Responsible sourcing (RS) provides opportunities for construction organisations to improve their corporate image through increased legitimacy and also demonstrates morality and a risk management approach within the supply chain. However, these are deemed to be secondary drivers in the case of the construction SME, as standards tend to only be implemented at the request of customers and clients;
- There are major barriers to enactment of RS, not least through cost, but also around awareness and understanding which has led to the under-emphasis of RS within the construction industry. These are especially prevalent within the SME;
- The BES 6001 (BRE, 2009; 2014a) standard for RS tends to be approached in an unmethodical, 'reactive' manner. The limited coherence and consistency between scoring patterns suggests that its implementation is a largely confused issue, with the inference being that increasing organisational knowledge of the concepts included within BES 6001 (BRE, 2009; 2014a) might be a means of addressing this confusion;

- Models for absorptive capacity (ACAP) have applicability to the implementation of sustainability standards, and where higher ACAP is evident, implementation of these standards is a more straightforward process;
- The four constructs of ACAP (as proposed by Zahra and George, 2002) can be used to underpin the implementation of standards, and in terms of assisting organisations in understanding their competences and increasing learning has been shown to be a useful model for basing a framework on.

5.2 CONTRIBUTION TO EXISTING THEORY AND PRACTICE

Throughout the four year research programme, a total of three conference papers and two journal papers were produced, which have each resulted in contributions to theory and practice. The five papers as included in the appendices to this thesis are listed below with their specific contributions discussed:

- Paper 1 (Appendix F) – This paper presented a review of sustainability within the construction supply chain, highlighting the need for an increased focus on responsible sourcing. However, the paper also suggested that there are a number of problems with RS, and that in order to sufficiently address different product supply chains, a standardised approach may be inappropriate.
- Paper 2 (Appendix G) – This paper linked RS with 'morals' and drivers for organisational reputation. This contributes to the limited literature on RS by highlighting that an ethically-focused issue (RS) can provide intangible benefits to an organisation, through increased legitimacy, which can lead to increased reputations.
- Paper 3 (Appendix H) – This paper presented a statistical analysis of all BES 6001 (BRE, 2009) certificate scores to present an overview of the construction industry's approach to implementing responsible sourcing. Literature on RS is limited, especially when considering RS 'in practice', and so the results of this paper provide scholars and academics with valuable findings upon which further work can be based. The results of the work and a related report (included in appendix D) also provided valuable data that were used by BRE when conducting the stakeholder consultation process for the upgrade to version 3 of BES 6001 (BRE, 2014a). This paper was particularly novel as it analysed a data set that had never previously been analysed.

- Paper 4 (Appendix I) – A case study of RS within two construction SMEs was presented in this paper. This paper further adds to the limited literature on RS and provides more empirical research which further work can be based upon. The paper also highlighted the importance of fostering a learning culture when implementing standards, and that the absorptive capacity (ACAP) model for green innovation in construction (Gluch *et al.,* 2009) has applicability to understanding the extent to which the SME will find implementation an effective process. Specifically, this paper revised this model to render it more applicable to implementation of standards, with the revised model also included in figure 4.5 in this thesis.
- Paper 5 (Appendix J) – This paper presented the principles for the learning framework and provides the basis for the development of assessment questions that are based upon a more-detailed framework. It showed that adopting a learning culture when implementing standards can result in a more effective implementation project, and sets out a high level structure that the framework developed for this EngD (discussed in chapter 4.6 of this thesis) should follow.

5.3 IMPLICATIONS/IMPACT ON THE SPONSOR

Responsible Solutions has provided consultancy support since the company was set up in 2003. The development of the framework presented in this thesis represents the first stage in the development of a sustainability assessment tool which Responsible Solutions can use with clients on future consultancy projects. The questions posed in the framework developed for this EngD look at extracting information about an organisation's processes and knowledge on issues relevant to the specific standard they are working towards, and thus enables the early stages of sustainability standard implementation projects to be 'productised', which reduces the amount of time they are required on a client's site, freeing up time to spend on other projects. For Responsible Solutions, who have also conducted traditional face-to-face training for a number of years, this framework links to a broader e-learning strategy and provides a structure for designing and developing e-learning material.

Subsequent to this EngD, a number of short, 'bitesize' e-learning modules will be developed to address the learning actions contained within the framework. These modules will perhaps be hosted on Responsible Solutions' website, with it envisaged that these could be accessed either

independently, or through links built in to the learning framework. As the e-learning strategy is yet to be finalised, the exact nature and structure of these modules is yet to be decided upon. However, it has been suggested that both 'technical' and 'procedural' e-learning modules may be created, with 'technical' modules focusing upon specific topics or issues (such as a module on the waste hierarchy, for example) and 'procedural' modules looking more at 'how to do' something (for example, how to collect waste data, or how to write a policy statement for a specific issue). For SMEs, filling knowledge gaps and expanding competences of their staff is a crucial success factor (Hamburg and O'Brien, 2014), and hence undertaking learning is a key activity for them. However, enrolling on traditional training is expensive and time consuming – barriers that have already been attributed to the SMEs relative lack of engagement with sustainability standards. For this reason, less than 25% of SME staff undertake training and under 60% of employers provide training opportunities for their staff (Hamburg and O'Brien, 2014). Addressing this gap through the provision of e-learning has been recognised as a means of increasing learning opportunities, and Responsible Solutions, through involvement with the Supply Chain Sustainability School (SCSS), have already been active as a training partner for this for the construction industry.

Finally, preliminary meetings were held with the Institute of Environmental Management and Assessment (IEMA) during summer 2015 where the potential to align the learning framework and its outputs were explored. IEMA had been revising their skills map to provide a framework for increasing sustainability competence of its members, and were also developing a number of course specifications for 'working', 'managing' and 'leading' with sustainability. The revision process was also focusing upon broadening the map to include social and governance/business management issues (the previous map had focused solely on environmental issues). The outputs of the learning framework could be tailored to ensure they complement the requirements of the IEMA skills map, and as such the potential for any e-learning modules to become 'IEMA approved' is a distinct possibility. These discussions are however in the early stages, and follow up meetings are required to explore this opportunity further.

5.4 IMPLICATIONS/IMPACT ON WIDER INDUSTRY

The development of the learning framework has demonstrated that a number of questions can be asked to extract information about an organisation's processes. Furthermore, by using the ACAP theory developed by Zahra and George (2002), the questions can be framed around the

findings of Gluch *et al.* (2009) to assess the level of knowledge that an organisation has on particular sustainability issues. The framework design allows the questions to be completed by the client on their own site in their own time, and without the need for a consultant to be present while the questions are being completed. Normally, Responsible Solutions would collect the information that the framework extracts in an unstructured manner, spending typically one day on site collecting the information, and then perhaps subsequent follow ups where necessary. This has cost implications for clients, as they are expected to pay a daily charge out rate for this service. Furthermore, during this 'information gathering' stage, the client is typically in receipt of limited support, as Responsible Solutions need to gather adequate information to understand the nature of the client's business such that they can tailor their support accordingly. As the framework enables the information gathering stage to be carried out remotely, it reduces fees for clients as the charge out rate is eliminated in the early phases of a project.

5.5 RECOMMENDATIONS FOR INDUSTRY

A key conclusion to draw from all EngD research is what relevance the research has to the broader industry within which the research has been carried out. As such, the research has a number of recommendations for Responsible Solutions and those SMEs operating within the wider construction industry.

5.5.1 RESPONSIBLE SOLUTIONS

Recommendations for Responsible Solutions are focused around the next steps for the development of the learning framework, and specifically, these are:

- Develop further modules and sub-modules in line with the Global Reporting Initiative (GRI) sustainability aspects and indicators such that a complete suite of modules can be offered to future clients. In its current state, the framework is unable to be used in 'real' projects, as only a small number of modules have been developed. In particular, the learning framework could be used to develop a module to assist organisations in understanding ethical risk as a means of complying with the 2015 Modern Slavery Act.
- Carry out further research around the commerciality of the framework, perhaps by approaching those involved within the pilot process for further feedback on the framework as a product.

- Carry out further testing of the framework within the micro-SME category, to further understand the different drivers of different sizes of SME. In particular, the Federation of Small Businesses or the Chamber of Commerce could potentially be engaged during this research.
- Use the framework to develop a more sophisticated tool, perhaps to be delivered via an online platform where users can log-in and save progress, which would make completion of the modules and sub-modules easier for the client as they can be completed in various sittings at times to suit them.
- Develop a number of short e-learning modules to complement the learning actions that the framework prescribes, such that these can be offered where appropriate to future clients in tandem with the framework itself. These modules should focus on the completion of short, standalone actions such that they fit with the prescribed actions of the framework.
- Further explore the opportunity to collaborate with IEMA to ensure that the developed e-modules and subsequent iterations of the framework complement the updated IEMA skills map that is being developed.

5.5.2 THE CONSTRUCTION SME

Recommendations for the construction SME are focused around how they can benefit from adopting a learning approach to sustainability, which will of course have benefits for implementing standards. Although it is recognised in chapter 2.3.2 that the use of term as broad as 'construction SME' could lend itself to a number of interpretations, the outcomes of this research are specifically targeted at SME product manufacturers and contractors, as these types of organisation made up the pilot group (see chapter 4.7). Specifically, they could:

- Utilise the resources provided by IEMA, as these are developed with the aim of increasing sustainability competence for individuals. Therefore, those staff members within SMEs that are involved with sustainability should strive to map their competence against the IEMA skills map and undertake learning activities to increase this.
- Ensure that appropriate knowledge is passed to all those within the organisation such that sustainability requirements can be seamlessly integrated with operations. This could be achieved through commitment to training programmes and setting measurable targets and plans to achieve them, for example.

Although sustainability standards form an important part of demonstrating engagement with sustainability, SMEs should only consider implementing them if they are becoming a barrier to trade. Poynton (2015) presents a compelling case for why certification does not equal 'sustainability'. However, while many of his points are merited, it is still true that certification can often play a key role in determining whether or not organisations are selected to supply to specific projects. In such cases, engaging with certification appears wise. However, if they are not a necessity to win such contracts, they are notoriously time consuming and come with a very high opportunity cost (Poynton, 2015). The business drivers are thus very important when considering whether or not to address a particular standard.

5.5.3 THEORISING SME ENGAGEMENT WITH SUSTAINABILITY STANDARDS

For the SME, the most-oft cited barriers to engaging with sustainability are cost and access to resources, such as staff numbers and time. As such, there have been calls within the literature to address the difficulties that SMEs face in this regard. Although the research carried out as part of this EngD does not debate this, as standards require the provision of financial and staff resources, it is argued that even in cases where adequate amounts of these are provided, organisations must still undergo learning processes when implementing standards.

For example, it has been found that awareness and understanding are major barriers to enactment of RS within construction SMEs (see paper 1; appendix F) which is further supported by the findings of paper 3 (appendix H), that highlights the reactive and confused nature of RS engagement across the industry. It is suggested that even if abundant financial and staff resources are provided to an implementation project, that organisation will only overcome the awareness and understanding barrier if adequate finances are invested in learning programmes for their staff. Hypothetically, an organisation that has sufficient finances in place and has allocated sufficient human resource to the project will not necessarily hold the awareness and understanding of the concepts and terms presented in a given standard, so will still need to undertake some learning activity.

Senge's (1990) 'learning organisation' – defined as an organisation that is flexible, adaptive and productive in times of change – is clearly significant in terms of standards, given engaging with sustainability can be seen as undergoing a change process (Maon *et al.,* 2009). Organisations should therefore be flexible and adaptive to the requirements of standards, and those that are more rigid in their approach to them are therefore unlikely to feel the benefits of

engagement. Specific findings from this research (see paper 4; appendix I) highlighted that SMEs tend to be more flexible to change than larger companies, and so in theory, should adapt to the requirements of standards more readily. However, it is also highlighted by Senge (1990) that organisational culture can affect learning, and that a learning culture needs to be fostered in order to strive for collective learning of individuals which will lead to organisational learning. It can thus be suggested that perhaps culture affects the ability of SMEs to engage with standards; those that have a learning culture ingrained within their business are more likely to feel the benefits of engaging with sustainability. This particular finding is substantiated by the EngD of Paul Fuller (2011) who states that adopting a 'deutero-learning', or 'learning to learn' approach can overcome such culture barriers, as well as those posed by lack of finances and other resources by encouraging reflection on previous experiences and implementing those lessons learnt. This is perhaps most evident in the findings of paper 4 (see appendix I) where the presence of a pre-existing management system in one company played a key role in the effective implementation of the BES 6001 (BRE, 2009) standard for RS. It can thus be inferred that this company were able to benefit from a 'learning from compliance' situation, as the 'experience' obtained from certification to another standard perhaps provided the means for that company to reflect on previous experiences and implement any lessons learnt from this on the implementation of BES 6001 (BRE, 2009). As highlighted by the model for ACAP developed in paper 4 (appendix I), stakeholder pressure is the most significant driver in influencing engagement of the SME with sustainability standards, but once the decision has been made by the SME to pursue with implementation of the standard, the extent of past experience and hence the extent to which a 'learning from compliance' culture can be generated is significant to understand the knowledge obtained from external sources (both defined as 'secondary antecedents').

5.6 RECOMMENDATIONS FOR FURTHER ACADEMIC RESEARCH

This EngD research has also highlighted some areas for future academic research, either through specific research projects or questions or perhaps through future EngD or PhD projects. Future research could consider:

- Extension of RS-related research, in order to expand the body of knowledge that much of this EngD has contributed to. For example, given the recent publishing of the Modern

Slavery Act (2015), understanding in more detail how ethics and human rights fit in with broader RS schemes holds value both academically and practically.

- Explore whether organisations obtain any 'value for money' from implementing standards. This research has specifically considered the suitability of standards for the SME, and how increasing ACAP might increase their suitability; it is only after application of these standards that any questions around whether they provide value for money can be addressed.
- Further address the link made between ACAP, sustainability standards and learning from compliance. This EngD has established that there is a clear link between implementation of standards and learning, and that the 'experience' antecedent in the developed ACAP model (see figure 4.5 and paper 4, appendix I) is important for successful standard implementation and can be considered as a means for learning from past compliance activities.

5.7 CRITICAL EVALUATION OF THE RESEARCH

Common within doctoral level research to maintain a high level of academic rigour is the necessity to reflect objectively upon one's own research critically. The critical evaluation of this research project is focused on three key areas; the aims and objectives, the overall research programme and the learning framework itself.

5.7.1 AIMS AND OBJECTIVES

Due to the EngD needing to produce postgraduate research that is streamlined to the needs of industry, the selected aims and objectives should satisfy both the needs of the sponsoring company (by addressing an 'industry' problem), and also providing a contribution to academic knowledge and theory. As such, it was necessary to select overarching aims and some lower-level objectives that satisfied both these needs.

The identification of work packages for each objective enabled 'end-points' for each objective to be defined, with the wording of each objective focusing on what was going to be done, and the work packages identifying the scope within which the objective would be carried out. These work packages also enabled it to be seen whether the aim of each objective had been met by the research carried out. Specifically the aims and objectives were designed to benefit

Responsible Solutions, and the final output was always intended to be productised into a commercial offering that the company would then sell to clients. As such, the benefits to the construction SME of the aims and objectives are only felt once they have 'bought' the framework and begun to use it. Therefore, although the objectives and work packages were developed to test the theory which underpins the framework, and did deliver the overarching aim, they were not broad enough in scope to consider the extent of any benefits of using the framework. In hindsight, the research objectives could have considered the need to pilot a framework earlier on in the research project, perhaps with a client on a live BES 6001 (BRE 2009; 2014a) or ISO 14001 (BSI, 2004) project, with follow up objectives analysing the effectiveness of using the framework over more traditional consultancy support.

5.7.2 LIMITATIONS OF THE RESEARCH PROGRAMME

A mixed methods, pragmatic approach to research was selected for this EngD. A number of research methods were employed which require some degree of objective reflection upon, and these are presented here.

The APRES survey (see WP1.1 and appendix B) was not designed by the researcher, and as such it could be argued that it was not possible to tailor specific questions accordingly to any defined objective. However, due to the relative infancy of RS as a topic within construction, a broad survey that addressed a range of opinions on RS made a useful contribution to the overall research programme and helped define objectives 2-4. Analysis of the survey results was relatively simplistic, and arguably more complex analyses could have been conducted (such as correlations between responses on different questions, for example), but this was not deemed necessary for the purposes of the survey and what the APRES group required in terms of feedback.

For those interviews carried out as part of the pilot process, the aim was to generate feedback on individual companies' thoughts on the learning framework after using it. Therefore the semi-structured interview was selected in order to again maintain some degree of flexibility in selecting which questions to ask and when to ask them, as well as enabling the researcher to maintain a degree of control over the direction of the interview (and thus ensure that the goals of the interview were not lost). Overall, this worked well as a research approach with very useful feedback generated. However, the interview questions were structured to test the theory used in developing the framework, and did not consider any potential commerciality of the framework. As such, although the research yielded an understanding that the design and

structure works theoretically, there remains a little uncertainty as to the nature of the market demand for such an offering, and hence whether the framework has a commercial offering and works in practice.

In terms of the overall results and findings of the EngD, there are also a number of limitations that are apparent when reflected upon. The main limitations of these relate to the empirical data that were collected during this research (WP 2 and WP 3; papers 3 and 4 respectively). Firstly, the data set of BES 6001 scores (WP 2; paper 3) was relatively small, and as such in some cases it was difficult to draw robust conclusions from this. Furthermore, the statistical analyses that could be carried out on these data were limited as many other techniques, such as factor analysis, would require a much larger data set. Therefore, the researcher was restricted to use of Cronbach's alpha as the main form of analysis on these data. It was therefore somewhat fortuitous that this yielded relevant and useful conclusions to be drawn from the data. Since the research completed for WP 2 was completed, a number of new certificates have been awarded, and version 3.0 of BES 6001 has been published (BRE, 2014a). Therefore, at the time of publishing, the paper was analysing organisational performance against an out-of-date dataset (as all data were relevant to version 1.0 and 2.0 of the standard) and versions of BES 6001 that organisations were no longer able to gain certification to. Therefore, the usefulness of these results from a practical perspective could theoretically be challenged, although it is argued here that in an area that is fundamentally under-researched, empirical findings such as these still provide a very useful insight into a relatively new subject area.

Secondly, the empirical data collected as part of WP 3 formed a small dataset of twelve interviews; six each from two different construction SMEs. These cases were selected based on the fact they were current clients of Responsible Solutions; therefore it must be recognised that this may introduce some bias to the overarching findings as ideally, two cases at similar levels of maturity on BES 6001 (BRE, 2009) implementation would have been selected, in order to more robustly determine the challenges with the standard and how their differing approaches to learning affected this. There are also widely contested views on the size of datasets that should be used in such case studies; views by different authors debate what minimum number of cases should be used with some suggesting the use of two cases will not deliver robust enough results (see Eisenhardt, 1989, for example). However, it is recognised that using more cases, and devoting more time to enable robust analyses to be carried out would have perhaps yielded stronger conclusions, as the findings would be applicable to a greater

number of cases. The time and resource the researcher had available meant that two cases was the optimum number that could be used in order to ensure sufficient depth of study however.

WP 1-3 were used to directly inform how the learning framework was developed, with figure 3.2 depicting how each academic output (conference or journal paper) feeds into the overall development of the framework. By use of an action research approach, each specific finding of these individual WP were considered for the contribution they might make to the framework, by considering them in the context of findings of previous WP. It was consistently theorised throughout this research programme that the final output of this EngD would deliver some means of combining the requirements of different sustainability standards in a single tool, and indeed the review carried out as part of WP 1 concluded this (see paper 1; appendix F). Consequently, it was important to consider how subsequent findings from WP 2 and WP 3 could be incorporated into a final tool. In this case, the challenge was not necessarily to adopt a 'responsible sourcing' based approach (as the design of the final framework was largely based on how the BES 6001 (BRE, 2009; 2014a) standard is designed), but it was initially difficult to understand how an ACAP approach might be incorporated in the tool. Due to the requirements of BES 6001 (BRE 2009; 2014a) for an organisation to already have management systems in place, using an approach aligned to this standard would render the framework compatible with potential users' existing management systems, as BES 6001 (BRE, 2009; 2014a) has been designed to complement management systems for health and safety, environment and quality. However, it is also felt that the major theoretical academic contribution of this EngD is the deliverable of WP 3; hence its inclusion in some form in the framework was required. In particular, the findings of paper 4 (see appendix I) particularly accentuate the link between certification to BES 6001 (BRE, 2009; 2014a) and the ACAP of the organisation. The main challenge was in deciding how each individual requirement based on the BES 6001 (BRE, 2009; 2014a) structure should be addressed using an ACAP design. Asking a number of questions around each requirement to understand current and potential levels of compliance represented the most suitable approach for the framework, given its parallels with traditional consultancy. Therefore, phrasing these questions such that they can be aligned to a 'green' ACAP approach (see Gluch *et al.*, 2009 and table 4.8) enabled the inclusion of ACAP at the 'micro' level. Therefore findings from each of WP 1-3 were built upon cumulatively to inform the final design of the learning framework, the actual use of which is discussed in the following section.

5.7.3 THE LEARNING FRAMEWORK

Obtaining objective feedback on the design of the learning framework itself was obtained through a piloting process which consisted of companies using the framework within their business, and then subsequently meeting with the researcher to provide objective feedback and suggestions which were obtained by following a semi-structured interview methodology. Thirteen organisations initially agreed to participate, three of which withdrew from the study (two citing a lack of time to devote attention to it, and one business which unfortunately entered administration shortly after agreeing to participate). The feedback obtained from the 10 companies that were interviewed suggested only minor changes to the 'cosmetics' of the framework and wording of some of the questions, with no major structural or thematic shortcomings highlighted. Limited timescales meant that the time and effort required to strive for a larger sample population would be offset by the time taken to interview all companies. Furthermore, as the feedback only suggested minor changes, with a largely positive response to the tool being received, the added value obtained by interviewing more companies as part of the pilot phase would be limited. However, this EngD piloted the framework in its first iteration; it is envisaged that in subsequent iterations (which extend beyond this EngD), further pilot programmes will be required. In particular, the involvement of very small 'micro' SMEs was limited within this pilot group, and so testing of future iterations should perhaps strive to obtain greater involvement of the very small firms, where possible. However, this recommendation is included with a caveat, as such companies should have some degree of interest in sustainability and implementing it formally within their businesses, such that valuable feedback about its application to these companies can be obtained.

5.8 SUMMARY

This chapter has presented the findings and implications of the four year EngD programme. It has also presented the contributions of the research to theory and the impact that the research has had on the industrial sponsor and the wider construction industry. It has also set out a number of recommendations for Responsible Solutions and the construction SME, as well as suggesting some potential future research paths. Finally, the research has been critically evaluated in the context of the defined aims and objectives, research methodology and the learning framework itself.

6 REFERENCES

Adetunji, I., Price, A., Fleming, P. and Kemp, P. (2003). Sustainability and the UK construction industry – a review. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability*, Vol. 156, No. 4, pp. 185-199.

Ahi, P. and Searcy, C. (2015). An analysis of metrics used to measure performance in green and sustainable supply chains. *Journal of Cleaner Production*, Vol. 86, No. 1, pp. 360-377.

Amaeshi, K. M., Osuji, O. K. and Nnodim, P. (2008). Corporate Social Responsibility in Supply Chains of Global Brands: A Boundaryless Responsibility? Clarification, Exceptions and Implications. *Journal of Business Ethics*, Vol. 81, No. 1, pp. 223-234.

APRES (Action Programme for Responsible Sourcing) (2015a). Action Programme on Responsible Sourcing [Online]. Available at: http://apres.lboro.ac.uk/index.php [Accessed 01/10/2015].

APRES (Action Programme for Responsible Sourcing) (2015b). Related Research [Online]. Available at: http://apres.lboro.ac.uk/research.php [Accessed 05/10/2015].

Argyris, C. and Schön, D. A. (1974). Theory in Practice, Jossey Bass, San Francisco, CA.

Argyris, C. and Schön, D. A. (1978). Organizational Learning: A Theory of Action Perspective, Addison Wesley, Reading, MA.

Ashby, A., Leat, M. and Hudson-Smith, M. (2012). Making connections: a review of supply chain management and sustainability literature. *Supply Chain Management: An International Journal*, Vol. 17, No. 5, pp. 497-516.

Asif, M., Searcy, C., Zutshi, A. and Fisscher, O. A. M. (2013). An integrated management systems approach to corporate social responsibility. *Journal of Cleaner Production*, Vol. 56, No. 1, pp. 7-17.

Ayuso, S., Roca, M. and Colomé, R. (2013). SMEs as "transmitters" of CSR requirements in the supply chain. *Supply Chain Management: An International Journal*, Vol. 18.No. 5, pp. 497-508.

Baden, D. A., Harwood, I. A. and Woodward, D. G. (2009). The effect of buyer pressure on suppliers in SMEs to demonstrate CSR practices: An added incentive or counter productive? *European Management Journal*, Vol. 27, No. 6, pp. 429-441.

Baden, D., Harwood, I. A. and Woodward, D. G. (2011). The effects of procurement policies on 'downstream' corporate social responsibility activity: Content-analytic insights into the views and actions of SME owner-managers. *International Small Business Journal,* Vol. 29, No. 3, pp. 259-277.

Ball, J. (2002). Can ISO 14001 and eco-labelling turn the construction industry green? *Building and Environment,* Vol. 37, No. 4, pp. 421-428.

Bansal, P. and Hunter, T. (2003). Strategic Explanations for the early Adoption of ISO 14001. *Journal of Business Ethics,* Vol. 46, No. 3, pp. 289-299.

Bebbington, J., Larrinaga, C. and Moneva, J. M. (2008). Corporate social reporting and reputation risk management. *Accounting, Auditing and Accountability Journal,* Vol. 21, No. 3, pp. 337-361.

Bell, J. (1993). Doing your research project: A guide for first-time researchers in education and social science, second edition. Open University Press, Buckingham, UK.

Bell, J. (1999). Doing your research project: A guide for first-time researchers in education and social science, third edition. Open University Press, Buckingham, UK.

BERR (Department for Business, Enterprise and Regulatory Reform) (2008). Strategy for Sustainable Construction. BERR, London, UK.

BERR (Department for Business, Enterprise and Regulatory Reform) (2009). Strategy for Sustainable Construction – Progress Report: September 2009. BERR, London, UK.

Berry, K. and McCarthy, S. (2011). Guide to sustainable procurement in construction. CIRIA, London, UK.

Beske, P. and Seuring, S. (2014). Putting sustainability into supply chain management. *Supply Chain Management: An International Journal,* Vol. 19, No. 3, pp. 322-331.

BIS (Department for Business, Innovation and Skills) (2011). Low Carbon Construction Action Plan – Government response to the Low Carbon Construction Innovation and Growth Team Report. BIS, London, UK.

BIS (Department for Business, Innovation and Skills) (2013). Construction 2025 – Industrial Strategy: Government and Industry in Partnership. BIS, London, UK.

BIS (Department for Business, Innovation and Skills) (2014). Business population estimates for the UK and regions [Online]. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment/_data/file/377934/bpe_2014_statistical_release.pdf [Accessed 19/01/2015]

Blome, C. and Paulraj, A. (2013). Ethical Climate and Purchasing Social Responsibility: A Benevolence Focus. *Journal of Business Ethics*, Vol. 116, No. 3, pp. 567-585.

Blowfield, M. (2000). Ethical Sourcing: A contribution to sustainability or a diversion? *Sustainable Development*, Vol. 8, No. 4, pp. 191-200.

Bos-Brouwers, H. E. J. (2010). Corporate sustainability and innovation in SMEs: Evidence of themes and activities in practice. *Business Strategy and the Environment*, Vol. 19, No. 7, pp. 417-435.

Brammer, S., Hoejmose, S. and Marchant, K. (2012). Environmental Management in SMEs in the UK: Pressures and Perceived Benefits. *Business Strategy and the Environment*, Vol. 21, No. 7, 423-434.

BRE (Building Research Establishment) (2009). BES 6001: Issue 2.0 Framework Standard for the Responsible Sourcing of Construction Products. BRE, Watford, UK.

BRE (Building Research Establishment) (2014a). BES 6001: Issue 3.0 Framework Standard for the Responsible Sourcing of Construction Products. BRE, Watford, UK.

BRE (Building Research Establishment) (2014b). BREEAM UK New Construction – Non-domestic Buildings (United Kingdom) Technical Manual SD5076: 4.0. BRE, Watford, UK.

BRE (2014c) Responsible Sourcing of Construction Products (BES 6001): Event Details. http://www.bre.co.uk/eventdetails.jsp?id=7723 [Accessed 20/07/2015]

BRE (Building Research Establishment) (2015). Green Book Live: BES 6001 – The Framework Standard for Responsible Sourcing [Online]. Available at: http://www.greenbooklive.com/search/scheme.jsp?id=153 [Accessed 19/08/2015].

Brown, H. S., de Jong, M. and Lessidrenska, T. (2009). The rise of the Global Reporting Initiative: a case of institutional entrepreneurship. *Environmental Politics*, Vol. 18, No. 2, pp. 182-200

Brundtland, G. H. (1987) (ed). Our Common Future: the World Commission on Environment and Development. Oxford University Press, Oxford, UK.

Bryman, A. and Bell, E. (2011). Business Research Methods 3rd Edition, Oxford University Press, Oxford, UK.

BSI (British Standards Institute) (2004). Environmental management systems. Requirements with guidance for use. BSI, London, BS EN ISO 14001: 2004.

BSI (British Standards Institute) (2007). Occupational health and safety management systems. Requirements. BSI, London, BS OHSAS 18001: 2007.

BSI (British Standards Institute) (2008). Quality management systems – Requirements. BSI, London, BS EN ISO 9001: 2008.

BSI (British Standards Institute) (2010a). Principles and framework for procuring sustainably. Guide. BSI, London, BS 8903: 2010.

BSI (British Standards Institute) (2010b). Guidance on social responsibility. BSI, London, BS ISO 26000: 2010.

BSI (British Standards Institute) (2014). Supply chain risk management – Supplier prequalification. BSI, London, PAS (Publically Available Specification) 7000: 2014.

BSI (2015). Sustainable procurement – Guidance [Online]. Available at: http://drafts.bsigroup.com/Home/Details/55391 [Accessed 18/11/2015].

Cabinet Office (2011). Government Construction Strategy – May 2011 [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61152/Government-Construction-Strategy_0.pdf [Accessed 25/09/2015].

Cassells, S. and Lewis, K. (2011). SMEs and Environmental Responsibility: Do Actions Reflect Attitudes? *Corporate Social Responsibility and Environmental Management,* Vol. 18, No. 3, pp. 186-199.

CEEQUAL (2015). The Sustainability Assessment, Rating and Awards Scheme for Civil Engineering [Online]. Available at: http://www.ceequal.com/ [Accessed 20/04/2015].

Christini, G., Fetsko, M. and Hendrickson, C. (2004). Environmental Management Systems and ISO 14001 Certification for Construction Firms. *Journal of Construction Engineering and Management,* Vol. 130, No. 3, pp. 330-336.

Ciliberti, F., Pontrandolfo, P. and Scozzi, B. (2008). Investigating corporate social responsibility in supply chains: a SME perspective. *Journal of Cleaner Production,* Vol. 16, No. 15, pp. 1579-1588.

Ciliberti, F., Baden, D. and Harwood, I. (2009). Insights into corporate social responsibility practices in supply chains: a multiple case study of SMEs in the UK. *Operations and Supply Chain Management: An International Journal,* Vol. 2, No. 3, pp. 154-166.

Cohen, W. M. and Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly,* Vol. 35, No. 1, pp. 128-152.

Crals, E. and Vereeck, L. (2005). The affordability of sustainable entrepreneurship certification for SMEs. *International Journal of Sustainable Development World Ecology,* Vol. 12, No. 2, pp. 173-183.

Creswell, J. (2012). Qualitative Inquiry and Research Design: Choosing Among Five Approaches, Third Edition. Sage Publications, London, UK.

Curkovic, S. and Sroufe, R. (2011). Using ISO 14001 to Promote a Sustainable Supply Chain Strategy. *Business Strategy and the Environment,* Vol. 20, No. 2, pp. 71-93.

Dainty, A. (2008). Methodological Pluralism in Construction Management Research. In: Knight, A. and Ruddock, L. (eds.), Advanced Research Methods in the Built Environment. Wiley-Blackwell, Chichester, UK.

De Colle, S., Henriques, A. and Sarasvathy, S. (2014). The Paradox of Corporate Social Responsibility Standards. *Journal of Business Ethics,* Vol. 125, No. 2, pp. 177-191.

Deaton, B. J. (2004). A theoretical framework for examining the role of third-party certifiers. *Food Control,* Vol. 15, No. 8, pp. 615-619.

DEFRA (Department for Environment, Food and Rural Affairs) (2006). Procuring the Future. Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force. DEFRA, London, UK.

Delmas, M., Hoffmann, V. H. and Kuss, M. (2011). Under the Tip of the Iceberg: Absorptive Capacity, Environmental Strategy and Competitive Advantage. *Business and Society,* Vol. 50, No. 1, pp. 116-154.

Delmas, M. and Montiel, I. (2009). Greening the supply chain: When is customer pressure effective? *Journal of Economics & Management Strategy,* Vol. 18, No. 1, pp. 171-201.

Ding, G. K. C. (2008). Sustainable construction: The role of environmental assessment tools. *Journal of Environmental Management,* Vol. 86, No. 3, pp. 451-464.

Dooley, L. M. (2002). Case Study Research and Theory Building. *Advances in Developing Human Resources,* Vol. 4, No. 3, pp. 335-354.

Dubois, A. and Gadde, L. E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research,* Vol. 55, pp. 553-560.

Easterby-Smith, M., Graça, M., Antonacopoulou, E. and Ferdinand, J. (2008). Absorptive Capacity: A Process Perspective. *Management Learning,* Vol. 39, No. 5, pp.483-501.

EC (European Commission) (2005). The New SME definition: User Guide and Model Declaration [Online]. Available at: http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf [Accessed 17/07/2015].

EC (European Commission) (2013). The EU Emissions Trading Scheme (EU ETS) Factsheet [Online]. Available at: http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf [Accessed 24/07/2015]

Egan, J. (1998). Rethinking Construction: The report of the construction task force. Department for Environment, Trade and the Regions, London, UK.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review,* Vol. 14, No. 4, pp. 532-550.

Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review,* Vol. 36, No. 2, pp. 90-100.

Fassin, Y. (2008). SMEs and the fallacy of formalising CSR. *Business Ethics: A European Review,* Vol. 17, No. 4, pp. 364-378.

FSB (Federation of Small Businesses) (2014). Small Business Statistics [Online]. Available at: http://www.fsb.org.uk/stats [Accessed 05/08/2015]

Fellows, R. and Liu, A. (2008). Research Methods for Construction 3rd Edition, Blackwell, John Wiley & Sons, UK.

Feng, T., Zhao, G. and Su, K. (2014). The fit between environmental management systems and organisational learning orientation. *International Journal of Production Research,* Vol. 52, No. 10, pp. 2901-2914.

Fernie, S. and Tennant, S. (2013). The non-adoption of supply chain management. *Construction Management and Economics,* Vol. 31, No. 10, pp. 1038-1058.

Fifka, M. S. and Drabble, M. (2012). Focus and Standardization of Sustainability Reporting – A Comparative Study of the United Kingdom and Finland. *Business Strategy and the Environment,* Vol. 21, No. 7, pp. 455-474.

Fuller, P. A. (2011). Improving Lessons Learnt Outcomes in Multi-phase Project Environments. EngD Thesis, Loughborough University, Loughborough, UK.

Ghumra, S., Watkins, M., Phillips, P., Glass, J., Frost, M. W. and Anderson, J. (2009). Developing an LCA-based tool for infrastructure projects. *In:* Dainty, A. R. J. (ed). *Proceedings of the 25th Annual ARCOM Conference,* 7-9 September, Nottingham, UK, Association of Researchers in Construction Management, 1003-1010.

Glass, J. (2011). Briefing: Responsible sourcing of construction products. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* Vol. 164, No. 3, pp. 167-170.

Glass, J. (2012). The state of sustainability reporting in the construction sector. *Smart and Sustainable Built Environment,* Vol. 1, No. 1, pp. 87-104.

Glass, J., Achour, N. Parry, T and Nicholson, I. (2012a). Engaging small firms in sustainable supply chains: responsible sourcing practices in the UK construction industry. *International Journal of Agile Systems and Management,* Vol. 5, No. 1, pp. 29-58.

Glass, J., Achour, N., Parry, T., Nicholson, I. and Upstill-Goddard, J. (2012b). Responsible Sourcing of Construction Products and Materials: results from an industry survey. *Concrete,* February 2012 issue, pp. 47-49.

Glass, J. and Dainty, A. (2011). The Sustainable Construction Business: A missing ingredient in creating a sustainable built environment. *International Journal of Construction Management,* Vol. 11, No. 2, pp. 1-18.

Gluch, P., Gustafsson, M. and Thuvander, L. (2009). An absorptive capacity model for green innovation and performance in the construction industry. *Construction Management and Economics,* Vol. 27, No. 5, pp. 451-464.

Grayson, D. and Hodges, A. (2004). Corporate Social Opportunity! Seven Steps to Make Corporate Social Responsibility Work for your Business. Greenleaf Publishing, Sheffield, UK.

GRI (Global Reporting Initiative) (2013). G4 Sustainability Reporting Guidelines Implementation Manual. Global Reporting Initiative, Amsterdam, The Netherlands.

GRI (Global Reporting Initiative) (2014). G4 Sector Disclosures: Construction and Real Estate. Global Reporting Initiative, Amsterdam, The Netherlands.

Grimpe, C. and Sofka, W. (2009). Search patterns and absorptive capacity: Low- and high-technology sectors in European countries. *Research Policy*, Vol. 38, No. 3, pp. 495-506.

Hahn, R. (2013). ISO 26000 and the Standardization of Strategic Management Processes for Sustainability and Corporate Social Responsibility. *Business Strategy and the Environment*, Vol 22, No. 7, pp. 442-455.

Haigh, R. (2008). Interviews: A negotiated partnership. In: Knight, A. and Ruddock, L. (eds.), Advanced Research Methods in the Built Environment. Wiley-Blackwell, Chichester, UK.

Halila, F. (2007). Networks as a Means of Supporting the Adoption of Organizational Innovations in SMEs: the Case of Environmental Management Systems (EMSs) Based on ISO 14001. *Corporate Social Responsibility and Environmental Management*, Vol. 14, No. 3, pp. 167-181.

Halliday, S. (2008). Sustainable Construction. Routledge, London, UK.

Halme, M. and Korpela, M. (2014). Responsible Innovation Toward Sustainable Development in Small and Medium-Sized Enterprises: a Resource Perspective. *Business Strategy and the Environment*, Vol. 23, No. 8, pp. 547-566.

Hamburg, I. and O'Brien, E. (2014). Using Strategic Learning for Achieving Growth in SMEs. *Journal of Information Technology and Application in Education*, Vol. 3, No. 2, pp. 77-83.

Hemphill, T. (2013). The ISO 26000 guidance on social responsibility international standard: what are the business governance implications? *Corporate Governance: the International Journal of Business in Society*, Vol. 13, No. 3, pp. 305-317.

Henriques, A. (2012). Standards for change: ISO 26000 and sustainable development. International Institute for Environment and Development, London, UK.

Heras-Saizorbitoria, I., Molina-Azorin, J. F. and Dick, G. P. M. (2011). ISO 14001 certification and financial performance: selection-effect versus treatment-effect. *Journal of Cleaner Production,* Vol. 19, No. 1, pp. 1-12.

Hillary, R. (ed) (2000). Small and Medium-Sized Enterprises and the Environment: Business Imperatives. Greenleaf Publishing, Sheffield, UK.

Hillary, R. (2004). Environmental management systems and the smaller enterprise. *Journal of Cleaner Production,* Vol. 12, No. 1, pp. 561-569.

Hofmann, K. H., Theyel, G. and Wood, C. H. (2012). Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices – Evidence from Small and Medium-Sized Manufacturers. *Business Strategy and the Environment,* Vol. 21, No. 8, pp. 530-545.

Holton, I., Glass, J. and Price, A. D. F. (2010). Managing for sustainability: findings from four company case studies in the UK precast concrete industry. *Journal of Cleaner Production,* Vol. 18, No. 2, pp. 152-160.

Hsu, J. L. and Cheng, M. C. (2012). What Prompts Small and Medium Enterprises to Engage in Corporate Social Responsibility? A Study from Taiwan. *Corporate Social Responsibility and Environmental Management,* Vol. 19, No. 5, pp. 288-305.

IRCA (International Register of Certificated Auditors) (2014). IRCA briefing note on Annex SL [Online]. Available at: http://www.irca.org/Documents/press/2012/IRCA%20Annex%20SL%20brochure.pdf [Accessed 28/08/2015].

ISO (2013). The ISO Survey of Management System Standard Certifications – 2013: Executive Summary [Online]. Available at: http://www.iso.org/iso/iso_survey_executive-summary.pdf?v2013 [Accessed 20/07/2015].

Jenkins, H. (2006). Small Business Champions for Corporate Social Responsibility. *Journal of Business Ethics,* Vol. 67, No. 3, pp 241-256.

Kibert, C. (2007). The next generation of sustainable construction (editorial). *Building Research & Information,* Vol. 35, No. 6, pp. 595-601.

Kim, L. (1998). Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. *Organization Science,* Vol. 9, No. 4, pp. 506-520.

Klassen, R. D. and Vereecke, A. (2012). Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance. *International Journal of Production Economics,* Vol. 140, No. 1, pp. 103-115.

Latham, M. (1994). Constructing the team – Final Report, HMSO, London.

Lepoutre, J. and Heene, A. (2006). Investigating the Impact of Firm Size on Small Business Social Responsibility: A Critical Review. *Journal of Business Ethics,* Vol. 67, No. 3, pp. 257-273.

Levett, R. (1998). Sustainability indicators – integrating of quality of life and environmental protection. *Journal of the Royal Statistical Society: Series A (Statistics in Society),* Vol. 161, No. 3, pp. 291-302.

Llach, J., Marimon, F. and del Mar Alonso-Almeida, M. (2015). Social Accountability 8000 standard certification: analysis of worldwide diffusion. *Journal of Cleaner Production,* Vol. 93, No. 1, pp. 288-298.

Love, P. E. D., Li, H., Irani, Z. and Faniran, O. (2000). Total quality management and the learning organisation: a dialogue for change in construction. *Construction Management and Economics,* Vol. 18, No. 3, pp 321-331.

Lozano, R. and Huisingh, D. (2011). Inter-linking issues and dimensions in sustainability reporting. *Journal of Cleaner Production,* Vol. 19, No. 2-3, pp. 99-107.

Manetti, G. (2009). The Quality of Stakeholder Engagement in Sustainability Reporting: Empirical Evidence and Critical Points. *Corporate Social Responsibility and Environmental Management,* Vol. 18, No. 2, pp. 110-122.

Maon, F., Lindgreen, A. and Swaen, V. (2009). Designing and Implementing Corporate Social Responsibility: An Integrative Framework Grounded in Theory and practice. *Journal of Business Ethics,* Vol. 87, No. 1, pp. 71-89.

McAdam, R., Miller, K., McMacken, N. and Davies, J. (2010). The development of absorptive capacity-based innovation in a construction SME. *International Journal of Entrepreneurship and Innovation,* Vol. 11 No. 3, pp. 231-244.

Morsing, M. and Perrini, F. (2009). CSR in SMEs: do SMEs matter for the CSR agenda? *Business Ethics: A European Review,* Vol. 18 No. 1, pp. 1-6.

Mulder, K. (2006). Sustainable Development for Engineers: A Handbook and Resource Guide. Greenleaf Publishing Ltd, Sheffield, UK.

Myers, M. D. (2008). Qualitative Research in Business & Management. Sage Publications, UK.

Nikolaeva, R. and Bicho, M. (2011). The role of institutional and reputational factors in the voluntary adoption of corporate social responsibility reporting standards. *Journal of the Academy of Marketing Science*, Vol. 39, No. 1, pp. 136-157.

ONS (Office for National Statistics) (2015). Output in the Construction Industry: December 2015 and Quarter 4 (Oct to Dec) 2015 [Online]. Available at: http://www.ons.gov.uk/businessindustryandtrade/constructionindustry/bulletins/outputintheconstructionindustry/december2015andquarter4octtodec2015 [Accessed 23/03/2016].

Ortiz, O., Castells, F. and Sonnemann, G. (2009). Sustainability in the construction industry: A review of recent developments based on LCA. *Construction and Building Materials*, Vol. 23, No. 1, pp. 28-39.

Oxford University Press (2015). Definition of research [Online]. Available at: http://www.oxforddictionaries.com/definition/english/research [Accessed 27/05/2015].

Parker, C., Redmond, J. and Simpson, M. (2009). Review of interventions to encourage SMEs to make environmental improvements. *Environment and Planning C: Government and Policy*, Vol. 27, No. 2, pp. 279-301.

Paulraj, A. (2009). Environmental Motivations: A Classification Scheme and its Impact on Environmental Strategies and Practices. *Business Strategy and the Environment*, Vol. 18, No. 7, pp. 453-468.

Pedler, M. (1995). A guide to the learning organization. *Industrial and Commercial Training*, Vol. 27, No. 4, pp. 21-25.

Perego, P. and Kolk, A. (2012). Multinationals' Accountability on Sustainability: The Evolution of Third-Party Assurance of Sustainability Reports. *Journal of Business Ethics*, Vol. 110, No. 2, pp. 173-190.

Perera, O. (2008). How Material is ISO 26000 Social Responsibility to Small and Medium-Sized Enterprises (SMEs)? International Institute for Sustainable Development. Winnipeg, Canada.

Perrini, F. (2006). SMEs and CSR Theory: Evidence and Implications from an Italian Perspective. *Journal of Business Ethics,* Vol. 67, No.3, pp. 305-316.

Petts, J. (2000). Small and medium-sized enterprises and environmental compliance: attitudes among management and non-management. In: Hillary, R. (2000) (ed.). Small and Medium-Sized Enterprises and the Environment: Business Imperatives. Greenleaf Publishing, Sheffield, UK.

Poynton, S. (2015). Beyond Certification. Dō Sustainability, Oxford, UK.

Prakash, A. and Potoski, M. (2007). Investing Up: FDI and the Cross-Country Diffusion of ISO 14001 Management Systems. *International Studies Quarterly,* Vol. 51, No. 3, pp. 723-744.

Raines, S. S. (2002). Implementing ISO 14001 – An International Survey Assessing the Benefits of Certification. *Corporate Environmental Strategy,* Vol. 9, No. 4, pp. 418-426.

Reason, P. and Bradbury, H. (eds.) (2001). Handbook of Action Research: Participative inquiry and Practice, Sage, UK.

Revell, A. and Blackburn, R. (2007). The Business Case for Sustainability? An Examination of Small Firms in the UK's Construction and Restaurant Sectors. *Business Strategy and the Environment,* Vol. 16, No. 6, pp. 404-420.

Reynolds, M. and Yuthas, K. (2007). Moral Discourse and Corporate Social Responsibility Reporting. *Journal of Business Ethics,* Vol. 78, No. 1-2, pp. 47-64.

Rhodes, C. (2015). Construction industry: statistics and policy. House of Commons Library Briefing Paper, No. 01432. http://www.parliament.uk/briefing-papers/sn01432.pdf

Roy, M. J. and Thérin, F. (2008). Knowledge Acquisition and Environmental Commitment in SMEs. *Corporate Social Responsibility and Environmental Management,* Vol. 15, No. 5, pp. 249-259.

Russo, A. and Perrini, F. (2010). Investigating Stakeholder Theory and Social Capital: CSR in Large Firms and SMEs. *Journal of Business Ethics,* Vol. 91, No. 2, pp. 207-221.

SAAS (Social Accountability Accreditation Services) (2015). SA 8000 Certified Organisations [Online]. Available at: http://www.saasaccreditation.org/certfacilitieslist.htm [Accessed 25/08/2015]

Sáenz, M. J., Revilla, E. and Knoppen, D. (2014). Absorptive Capacity in buyer-supplier relationships: Empirical evidence of its mediating role. *Journal of Supply Chain Management,* Vol. 50, No. 2, pp. 18-40.

SAI (Social Accountability International) (2014). Social Accountability International (SAI). SA 8000 4th Edition. SAI, New York, USA.

Senge, P. (1990). The Fifth Discipline: The Art & Practice of The Learning Organisation. Century Business, London, UK.

Seuring, S. and Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production,* Vol. 16, No. 15, pp. 1699-1710.

Shelbourn, M. A., Bouchlaghem, D. M., Anumba, C. J., Carillo, P. M., Khalfan, M. M. K. and Glass, J. (2006). Managing knowledge in the context of sustainable construction. *Journal of Information Technology in Construction,* Vol. 11, No. 1, pp. 57-71.

Siebenhüner, B. and Arnold, M. (2007). Organizational Learning to Manage Sustainable Development. *Business Strategy and the Environment,* Vol. 16, No. 5, pp. 339-353.

Simpson, D., Power, D. and Klassen, R. (2012). When One Size Does Not Fit All: A Problem of Fit Rather than Failure for Voluntary Management Standards. *Journal of Business Ethics,* Vol. 110, No. 1, pp. 85-95.

Smith, M. K. (2001). Peter Senge and the learning organization, the encyclopaedia of informal information [Online]. Available at: http://infed.org/mobi/peter-senge-and-the-learning-organization/ [Accessed 28/07/2015]

Stevens, P. A., Batty, W. J., Longhurst, P. J. and Drew, G. H. (2012). A critical review of classification of organisations in relation to the voluntary implementation of environmental management systems. *Journal of Environmental Management,* Vol. 113, No. 1, pp. 206-212.

Stewart, H. and Gapp, R. (2014). Achieving Effective Sustainable Management: A Small-Medium Enterprise Case Study. *Corporate Social Responsibility and Environmental Management,* Vol. 21, No. 1, pp. 52-64.

Tennant, S. and Fernie, S. (2013). Organizational learning in construction supply chains. *Engineering, Construction and Architectural Management,* Vol. 20, No. 1, pp. 83-98.

Thomas, T. E. and Lamm, E. (2012). Legitimacy and Organizational Sustainability. *Journal of Business Ethics,* Vol. 110, No. 2, pp. 191-203.

Tilley, F. (1999). The gap between the environmental attitudes and the environmental behaviour of small firms. *Business Strategy and the Environment,* Vol. 8, No. 4, pp. 238-248.

To, W. M. and Lee, P. K. C. (2014). Diffusion of ISO 14001 environmental management system: global, regional and country-level analyses. *Journal of Cleaner Production,* Vol. 66, No. 1, pp. 489-498.

Tsai, W. H. and Chou, W. C. (2009). Selecting management systems for sustainable development in SMEs: A novel hybrid model based on DEMATEL, ANP and ZOGP. *Expert Systems with Applications,* Vol. 36, No. 2.1, pp. 1444-1458

TSO (The Stationary Office) (2009). The UK Low Carbon Transition Plan – national strategy for climate and energy. TSO, Norwich, UK.

UKCG (UK Contractor's Group (2012). UKCG statement on sustainable material procurement [Online]. Available at: http://www.ukcg.org.uk/fileadmin/clients/UKCG/document/Environment/UKCG_statement_on_the_procurement_of_materials.pdf [Accessed 14/08/2015]

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2012). Integrating responsible sourcing in the construction supply chain. *In:* Smith, S. (2012) (ed). *Proceedings of the 28th Annual ARCOM Conference,* Edinburgh, 3-5 September 2012, 1311-1319.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2013). Characterising the relationship between responsible sourcing and organisational reputation in construction firms. *In: Proceedings of the Sustainable Building and Construction Conference,* Coventry, 3-5 July 2013, 215-224.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2015a). Analysis of responsible sourcing performance in BES 6001 certificates. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* Vol. 168, No. 2, pp. 71-81.

Upstill-Goddard, J., Glass, J., Dainty, A. and Nicholson, I. (2015b). Developing a sustainability assessment tool to aid organisational learning in construction SMEs. *In:* Raiden, A. B. and Aboagye-Nimo, E. (eds). *Proceedings of the 31st Annual ARCOM Conference,* 7-9

September, Lincoln, UK, Association of Researchers in Construction Management, 457-466.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (forthcoming). Implementing sustainability in small and medium-sized construction firms: The role of absorptive capacity. *Engineering, Construction and Architectural Management*, Vol. 23, (issue number and pagination TBC).

Varsei, M., Soosay, C., Fahimnia, B. and Sarkis, J. (2014). Framing sustainability performance of supply chains with multidimensional indicators. *Supply Chain Management: An International Journal*, Vol. 19, No. 3, pp. 242-257.

Wagner, M. and Blom, J. (2011). The reciprocal and non-linear relationship of sustainability and financial performance. *Business Ethics: A European Review*, Vol. 20, No. 4, pp. 418-432.

Walker, H. and Brammer, S. (2009). Sustainable procurement in the United Kingdom public sector. *Supply Chain Management: An International Journal*, Vol. 14, No. 2, pp. 128-137.

Willetts, R., Burdon, J., Glass, J. and Frost, M. (2010). Fostering sustainability in infrastructure development schemes. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability*, Vol. 163, No. 3, pp. 159-166.

WRAP (Waste and Resources Action Programme) (2015). Sustainable procurement [Online]. Available at: http://www.wrap.org.uk/content/sustainable-procurement [Accessed 20/08/2015].

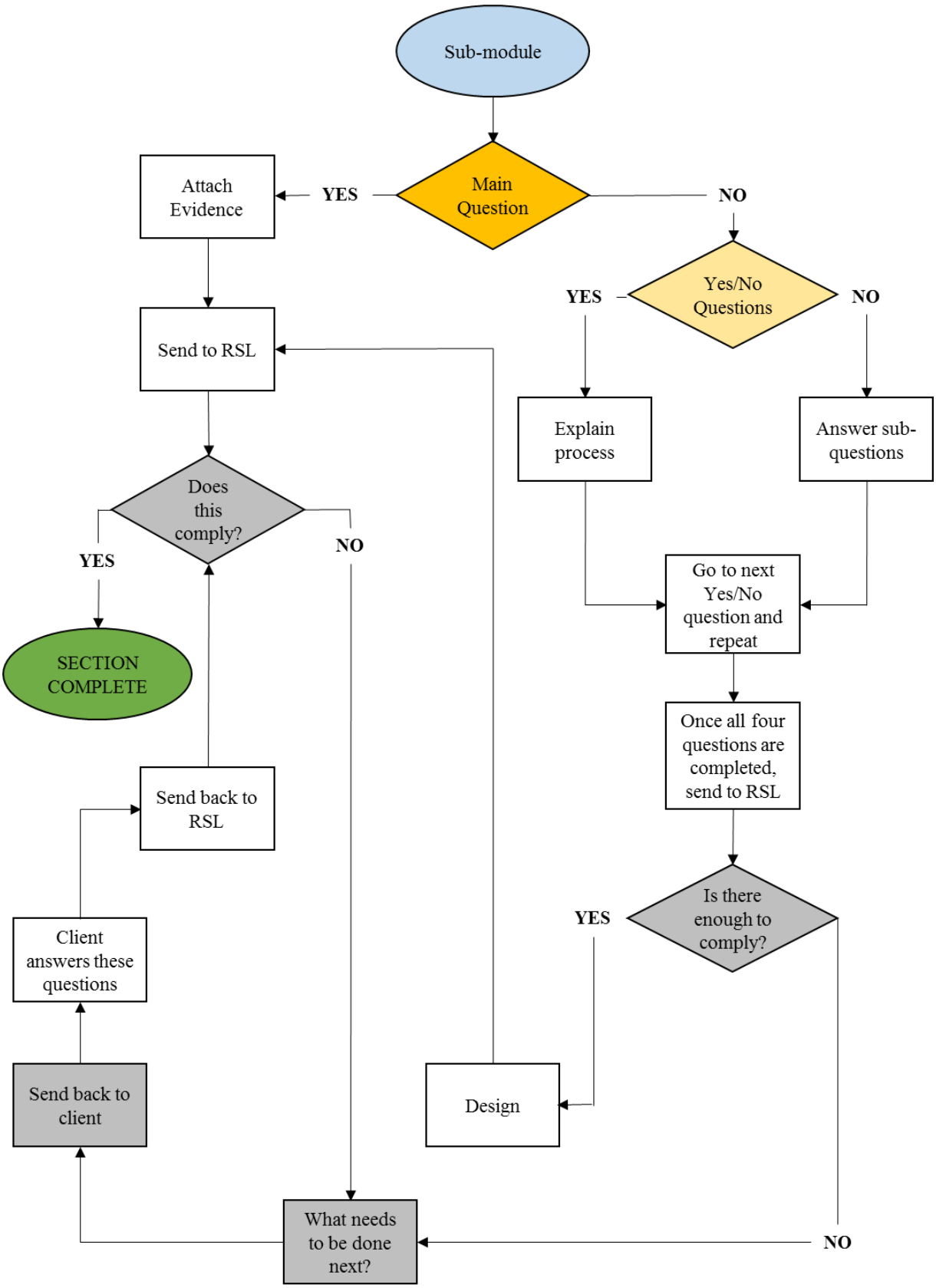
Yin, R. K. (2009). Case Study Research Design and Methods: Fourth Edition. Sage Publications.

Young, J. and Osmani, M. (2013). Investigation into contractors' responsible sourcing implementation practice. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability*, Vol. 166, No. 6, pp. 320-329.

Zahra, S. A. and George, G. (2002). Absorptive Capacity: A Review, Reconceptualization and Extension. *Academy of Management Review*, Vol. 27, No. 2, pp. 185-203.

Zutshi, A. and Creed, A. (2015). An international review of environmental initiatives in the construction sector. *Journal of Cleaner Production*, Vol. 98, No. 1, pp. 92-106.

APPENDIX A THE LEARNING FRAMEWORK



This diagram highlights the process flow map for completing the framework (included on the accompanying CD-ROM as a Microsoft Excel file).

APPENDIX B APRES REPORT

Responsible sourcing of construction products: drivers, performance and impact

SURVEY RESULTS FROM THE FIRST APRES CONFERENCE: 23-24 NOVEMBER 2011

Report compiled by James Upstill-Goddard
Email: J.D.Upstill-Goddard@lboro.ac.uk

1. INTRODUCTION

The Action Programme for Responsible Sourcing (APRES) is an EPSRC (Engineering and Physical Sciences Research Council) funded research project based in the School of Civil and Building Engineering at Loughborough University.[1] It is supported by a number of academic and industry partners and facilitates knowledge dissemination through the creation of a community 'hub'. It aims to stimulate thinking on responsible sourcing and create new research ideas that will provide guidance to the construction industry for meeting both governmental and industry targets.

The specific aims of the APRES network are to:

- Comprehensively explore the challenges involved in delivering responsible sourcing with a view to developing a co-ordinated action programme;
- Establish and sustain an enthusiastic membership base for the network such that it becomes known as a well-established community of practice;
- Map the industry's skills and knowledge needs through workshops on context, market and technology challenges;
- Define academic research and development directions and improve the quality of research interaction between academics and industry;
- Identify and disseminate outcomes and best practice to the industry and others via the APREs website, email and themed events;
- Provide an open and impartial discussion forum for the construction industry and its customers, academics, government, professional bodies, trade associations and standard-setting bodies.

The network aims to hold a series of one day, joint industry and academic conferences that address the key challenges in the responsible sourcing of construction products through presentations, panel debates and audience voting sessions.

The first conference was held at Loughborough University on 23-24 November 2011. This conference was entitled *'Responsible sourcing of construction products: drivers, performance and impact'*. This report presents the results from the survey that delegates were asked to

[1] For information about the APRES network, please contact Dr Jacqueline Glass, APRES Network Manager. J.Glass@lboro.ac.uk

complete at the close of the conference and presents some key findings and challenges for the network moving forward.

2. THE RESEARCH APPROACH

2.1. Overview

The purpose of this survey was to determine the views of industry on responsible sourcing, both prior to and after participation at the conference, with the aim of establishing the current state of knowledge and any future training or research needs that may be required. This section will briefly explain how the survey was implemented and analysed.

2.2. Participants

A paper based questionnaire was distributed to industry delegates at the first APRES conference on responsible sourcing that was held at Loughborough University. The conference was well attended, with 102 delegates from contracting, architecture, manufacturing and consultancy among others participating in the conference. This attendance of delegates from different organisations would provide overarching data about the views of industry as a whole. Participants were asked to complete the survey prior to the close of the conference, and hand the questionnaires back in at the end of the conference, although only responses from industry were required. Analysis of the results was then deferred for a period of one week to allow for any surveys returned by post. Of the 102 delegates present at the conference, 23 of these were from academia. In total, 35 responses were received, giving a response rate of 35 out of 79 (44%).

2.3. Data Analysis

Data analysis for the survey was relatively straightforward, although there were some issues with deciphering handwriting and in some cases, where asked to *'tick one option only'*, respondents had selected multiple answers, which made comparisons with other questions more problematic.

Microsoft Excel was used to collate responses and clustering was used for qualitative responses. However, for this type of well attended conference, a paper based survey is perhaps the most practical means of attaining delegate feedback. Section three of this report contains the analysis of all the questions included within this survey and section four contains a summary of the key findings that have come out of the results.

The results of this survey complement a previous survey (Glass *et al*., 2011) and a selection of the combined results are reported in Glass *et al.* (2012).

3. SURVEY RESULTS AND ANALYSIS

3.1. Introduction

This section of the report contains the analyses of the responses from the research survey. In total, 35 responses were received from the 102 delegates present at the conference. There were 39 questions in the survey covering:

- Company profile
- Awareness and prior knowledge of RS
- RS and the business
- The future for RS
- Research agenda on RS

Both quantitative and qualitative analysis of the responses has been carried out. This section will present these key findings and a short discussion of the results.

3.2. Company Profile

3.2.1. What is your organisation's primary activity?

35 respondents answered this question. 14 out of the 35 respondents (38%) described their organisation's primary activity as contracting, with 13 out of 35 (35%) describing their primary activity as manufacturing construction products; the remainder of the responses were distributed fairly evenly across the other categories. The eight respondents who selected 'Other' described their companies as trade associations (four out of eight), consultants, engineers or compliance checking administration.

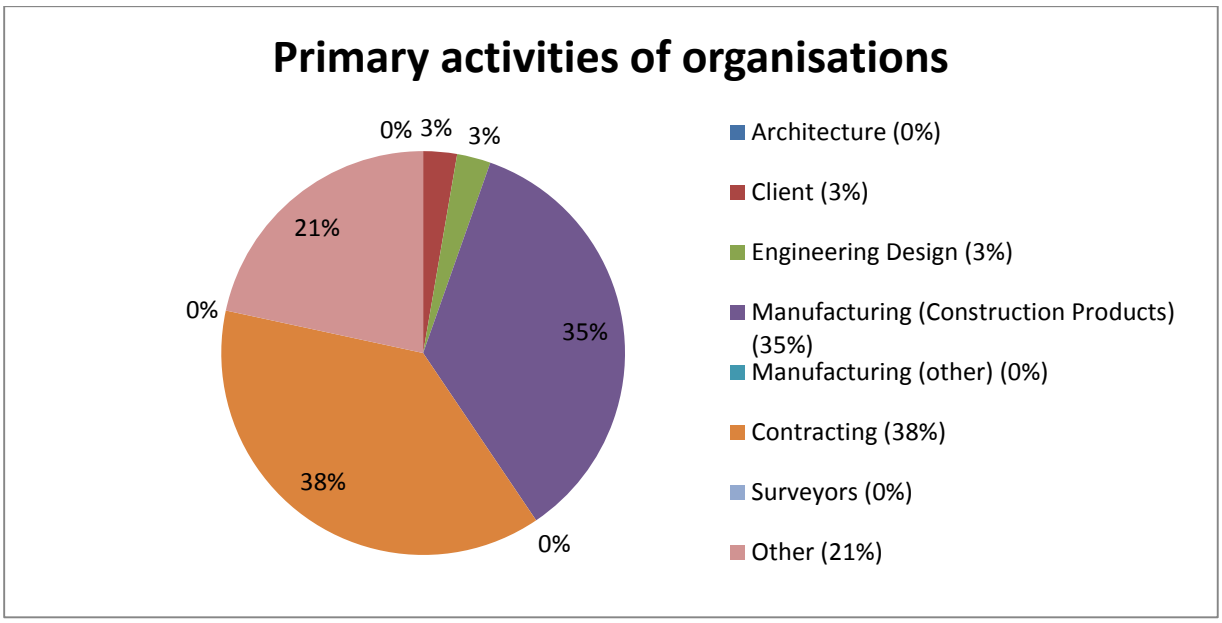


Figure 3.1: Primary activities of respondent's organisations indicating the proportion of organisations representing each discipline.

3.2.2. What is your role in the organisation?

All responses received answered this question. Recurring descriptors were used with environmental and sustainability used in 15 out of 35 (43%) of responses. The full range of descriptors is shown below.

Table 3.1: Descriptors selected by respondents when describing their job role.

Descriptor	**Number of responses**
Environmental/Sustainability	15
Marketing	7
Management[2]	6
Contracts/Procurement	4
Corporate Social Responsibility	1
Architecture	1
Consultancy	1

3.2.3. Where is your organisation based?

All 35 respondents answered this question and the results indicate a fairly even regional spread. Those regions with the highest response rate were the Eastern and Other UK regions, each receiving 17% (six out of 35) of responses. The 'Other UK' category was used as six respondents only stated 'UK' and did not offer a more specific answer with regard to region when specifying the location of their company.

[2] Many respondents indicated their role as an 'Environment Manager' or 'Sustainability Manager'. In these cases, these were recorded as environmental/sustainability descriptors and not as a management descriptor. For this reason, the number of respondents in management positions is higher than the six indicated here.

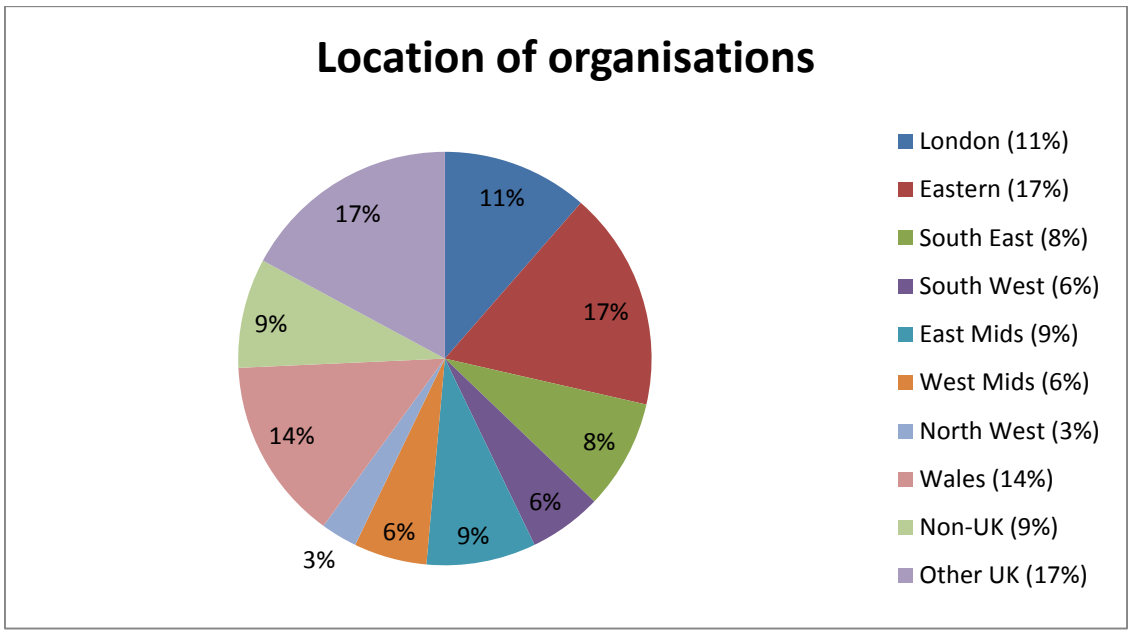


Figure 3.2: Locations of respondent's organisations. Descriptors differed greatly on this question, with some responses indicating the town/city in which their company is based, whereas others simply specified 'UK', for example.

3.2.4. How many people are employed in your organisation?

35 people answered this question, with 24 of these (68%) stating that their company employed more than 250 people, hence less than a third could be claimed to be SMEs. The maximum stated number of employees from the respondents was approximately 250,000 employees, with most of these being between 500 and 10,000 employees. Six of the respondents did not state a figure although they were aware that their company employed more than 250 people.

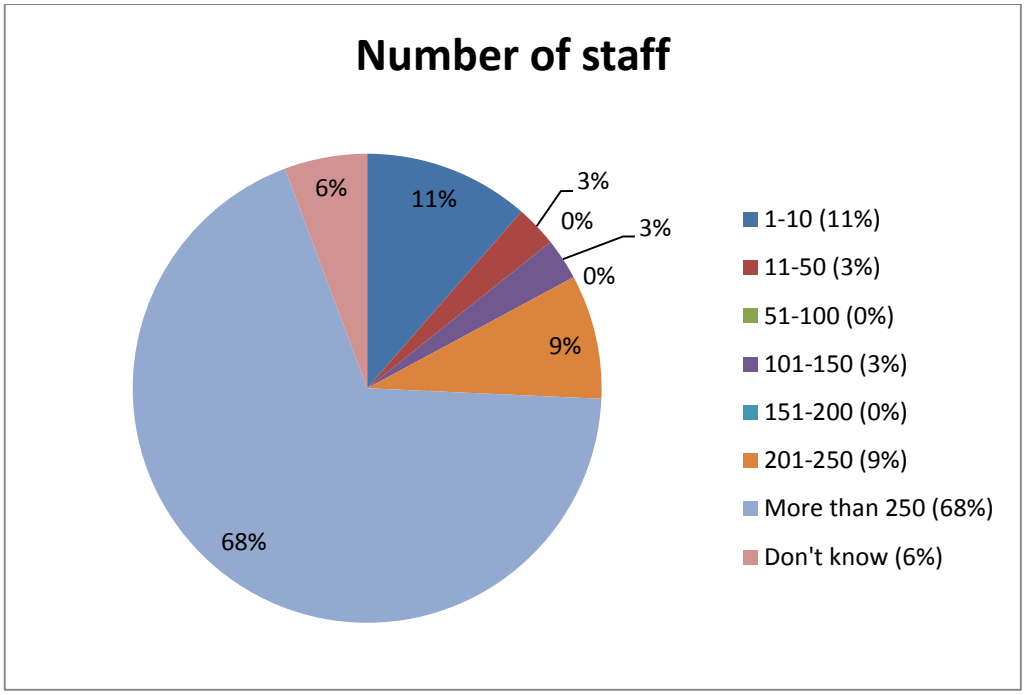


Figure 3.3: Number of employees within delegate's organisations. As can be seen, over two thirds of responses indicated that their organisation employed over 250 people.

3.2.5. What is the annual turnover of your organisation?

35 people answered this question, with 66% (23 out of 35) indicating that their company had an annual turnover greater than £42 million, again, indicating that only a third of the respondents were from SMEs. Those with annual turnovers of more than £42 million were asked to specify; the maximum annual turnover being approximately £2.3 billion. Most others over £42 million were between £100 million and £1 billion, and five responses did not state a figure, although the respondents were aware that their turnover was greater than £42 million.

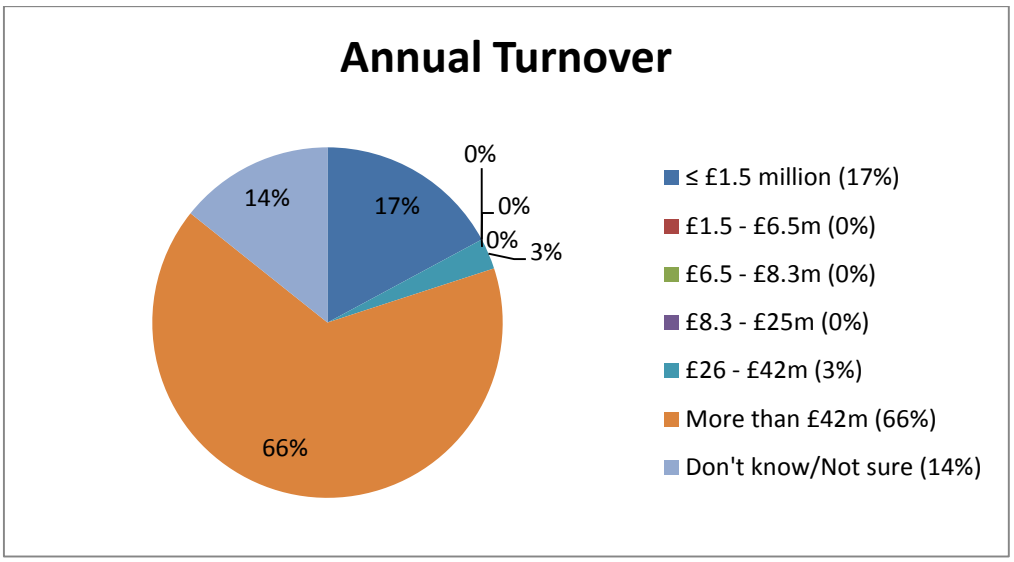


Figure 3.4: Approximate annual turnovers of those organisations responding to the survey.

3.2.6. Which construction sector(s) does your organisation operate in/supply to?

This question aimed to determine the construction and building sectors in which respondent's organisations operate. Figures show a reasonably even distribution of activity across a number of sectors, and this indicates that there does not appear to be a skew towards a particular sector. The commercial sector was the most frequently cited, with 74% of respondents, and the road and rail and power and utilities sectors had the lowest number of respondents, although this was still high at 60%. 'Other' responses included retail, nuclear industry, materials, military, research and infrastructure.

Table 3.2: Construction sectors that respondent's organisations operate in. Responses show a very even spread that is representative of major companies' activities.

Sector	**Responses**	**Response Percentage**
Commercial	26	74%
Industrial	22	63%
Power and Utilities	21	60%
Public Sector	24	69%
Residential	22	63%
Road and Rail	21	60%
Other	10	29%

3.2.7. Policies in place

34 people answered each of these questions. 91% (31 out of 34) of respondents had a sustainability policy in place and 71% (24 out of 34) of respondents had a Corporate Social Responsibility (CSR) policy in place. In some cases, respondents indicated that within their organisation, these policies were in fact the same document.

68% (23 out of 34) of respondents said that their organisation had a sustainable procurement policy in place, and 53% (18 out of 34) of respondents said their organisation had an ethical purchasing policy in place. Similar to above, some respondents indicated that these policies were the same document for their organisation.

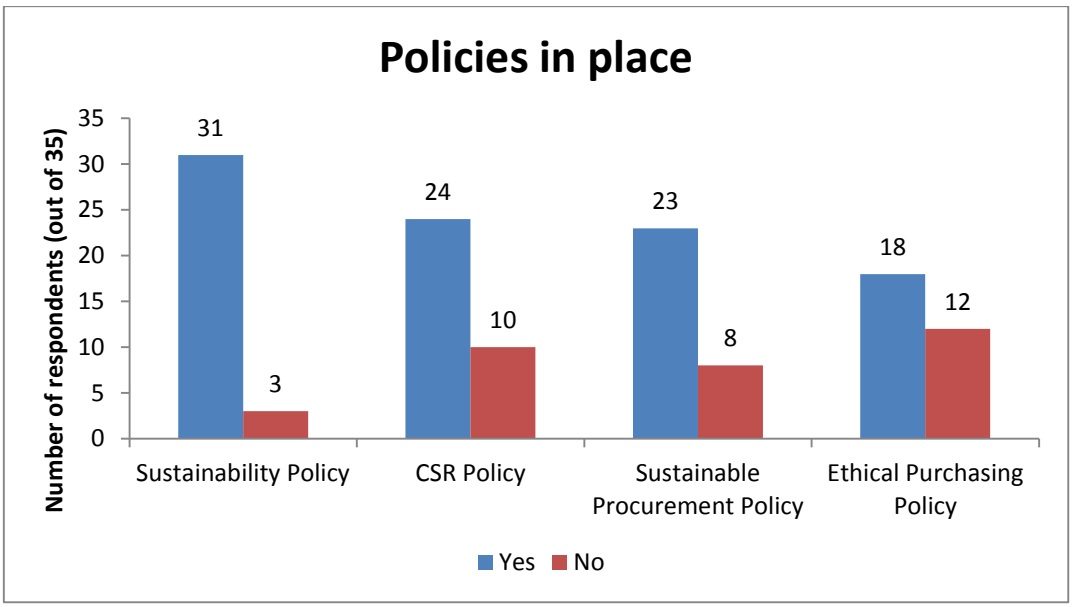


Figure 3.5: Policies that respondent's organisations have in place. These data suggest that the concept of ethical purchasing and responsible sourcing is a relatively emergent subject.

3.2.8. Does your organisation have any of its activities certified against the following standards?

31 respondents answered this question, with two of those stating that none of the standards listed were really applicable, and one stating that it was only 'involved' with ISO 9001, ISO 14001 and OHSAS 18001 through its Council for Aluminium in Buildings (CAB) membership. Therefore, if the number of respondents is taken as 28, 100% of respondents said that their organisations are ISO 9001 certified and ISO 14001 certified. 61% (17 out of 28) of respondents are certified to OHSAS 18001, although certifications to the other standards listed are much lower.

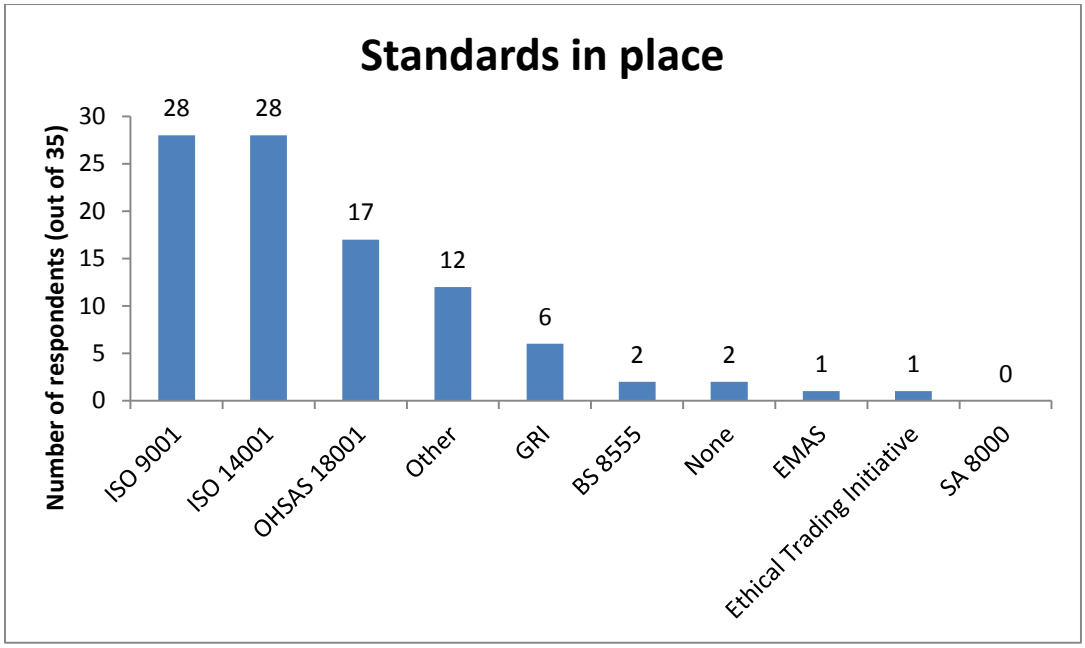


Figure 3.6: Graph highlighting the industry standards and certification schemes that organisations had implemented.

Of the 43% (12 out of 28) of respondents that listed 'Other' certification schemes, 18% (five people) stated that their organisation were BES 6001 certified. Other schemes listed here included BREEAM, LEED, CEEQUAL and FSC. However, these are regarded as assessment tools by which a performance level can be assessed against, rather than a standard that an organisation can be certified to. This is therefore suggestive of some confusion regarding the question or the certification schemes themselves.

3.3. Prior Knowledge of Responsible Sourcing

This next section considered the knowledge and awareness of conference delegates prior to attending the conference. Each question should therefore be preceded with *'Before you attended the 1st APRES conference…'*.

3.3.1. …to what extent were you familiar with the term 'responsible sourcing'?

35 delegates answered this question; of which 31 of these (88%) were either *'very'* familiar with responsible sourcing or that it was *'part of their day job'*.

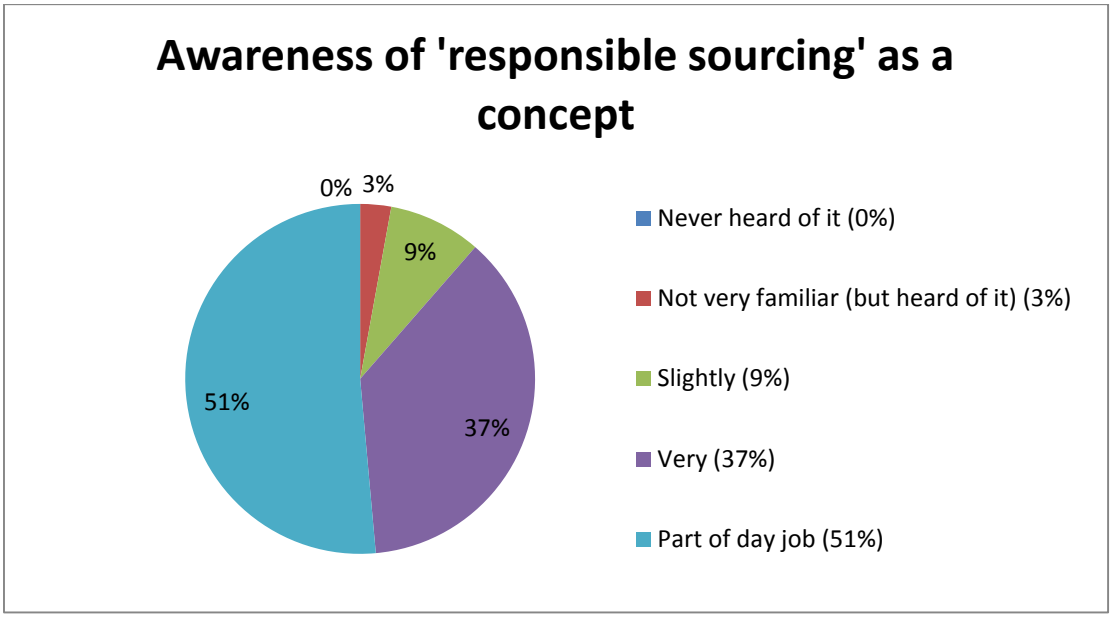


Figure 3.7: Chart indicating awareness of responsible sourcing prior to attendance at the conference.

3.3.2. …were you aware that, as part of these schemes, credits are available for specifiers when selecting goods from certified responsible sourcing schemes?

This question combines three questions from the survey, in which delegates were asked if they were aware that credits were available in BREEAM; the Code for Sustainable Homes; and CEEQUAL.

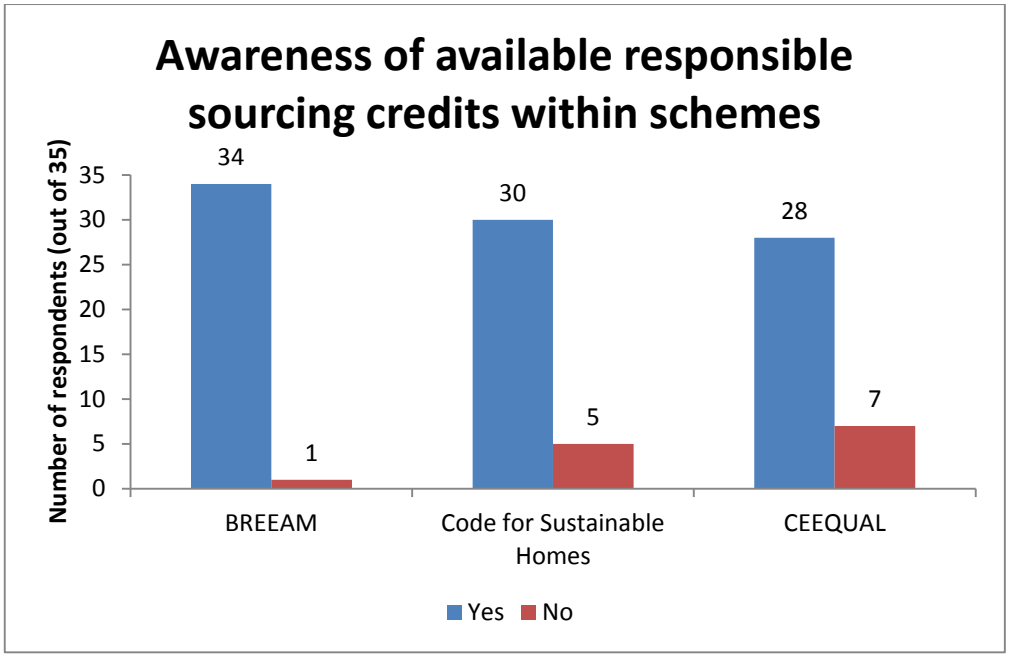


Figure 3.8: Awareness levels of respondents of the credits available in each of the above schemes for selecting responsibly sourced materials. This is suggestive that most delegates were from building firms, and not necessarily those in civil engineering, due to the higher awareness associated with BREEAM, for example.

35 respondents answered each of the three questions in the survey, with 34 of those (97%) stating they were aware that credits were available within BREEAM, 30 of those (86%) were aware that credits were available in the Code of Sustainable Homes, and 28 of those (80%) were aware that credits were available in CEEQUAL for the selection of goods from responsible sourcing schemes.

3.3.3. …were you aware that the UK government and industry had agreed a target that, by 2012, 25% of all construction products should be procured via responsible sourcing schemes?

This question was answered by 35 respondents. 77% of these (27 out of 35) were aware of this target (HM Government, 2008) before attending the conference.

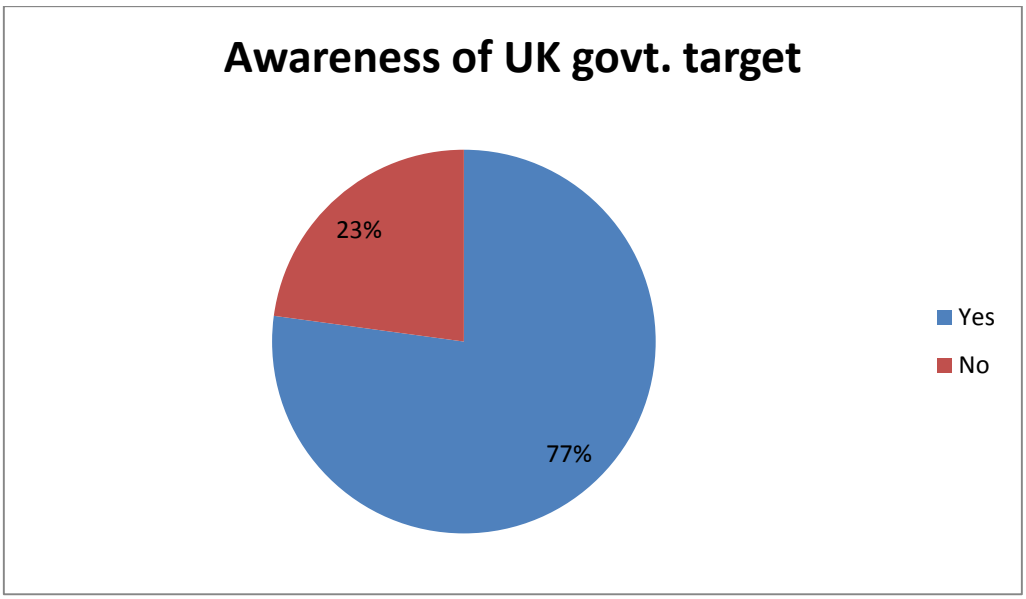


Figure 3.9: Chart highlighting that over three quarters of respondents were aware of the UK government targets to procure 25% of all construction products from responsible sourcing schemes.

3.3.4. …were you aware that the UK Contractors' Group had proposed a target that, by 2015, 100% of key construction products should be procured via responsible sourcing schemes?

This question was answered by all 35 respondents but the awareness of this target was considerably lower, at 37% (13 out of 35). However, it should be highlighted here that many of the respondents noted on their completed survey that they in fact though that the target was 75% and not 100%. The understanding here is that this target was never formally published, hence almost two thirds of respondents stating that they were unaware of this target.

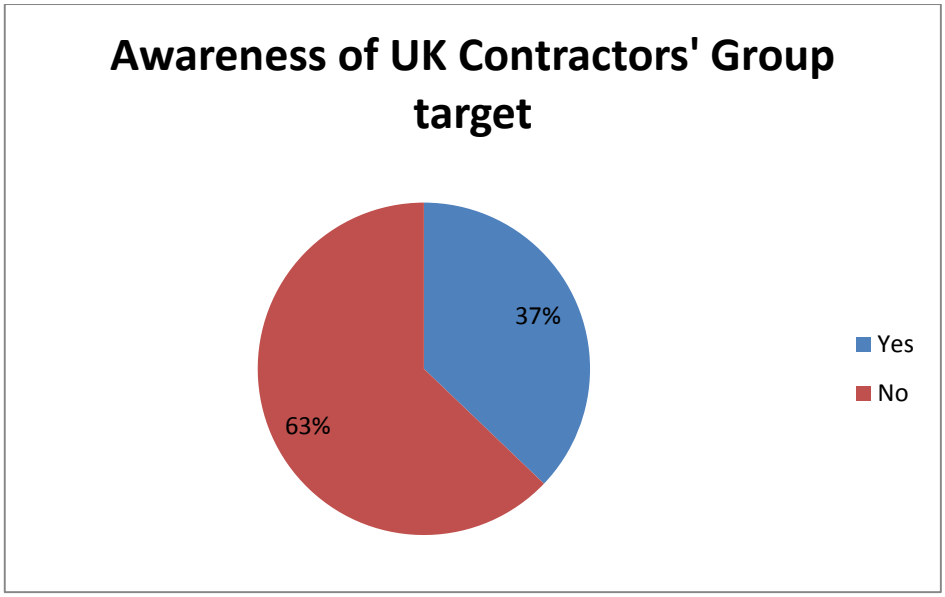


Figure 3.10: Chart highlighting that almost two thirds of respondents were unaware of the UK Contractors' Group (UKCG) target. Data highlight a degree of confusion over the stated target, so it could be suggested more people were aware of 'a UKCG target', but there is clearly some confusion over what the exact target was.

3.3.5. …had you heard of BES 6001 or BS 8902?

This question combines the final two questions of this section, which each sought to determine the awareness of the two responsible sourcing standards; BES 6001 and BS 8902.

All 35 respondents answered these two questions, with 32 of these (91%) stating that they had heard of BES 6001, the Framework Standard for the Responsible Sourcing of construction products, developed by BRE Global (BRE, 2009).

25 out of 35 respondents (71%) stated that they had heard of BS 8902, the responsible sourcing sector certification schemes for construction products specification, developed by BSI (BSi, 2009).

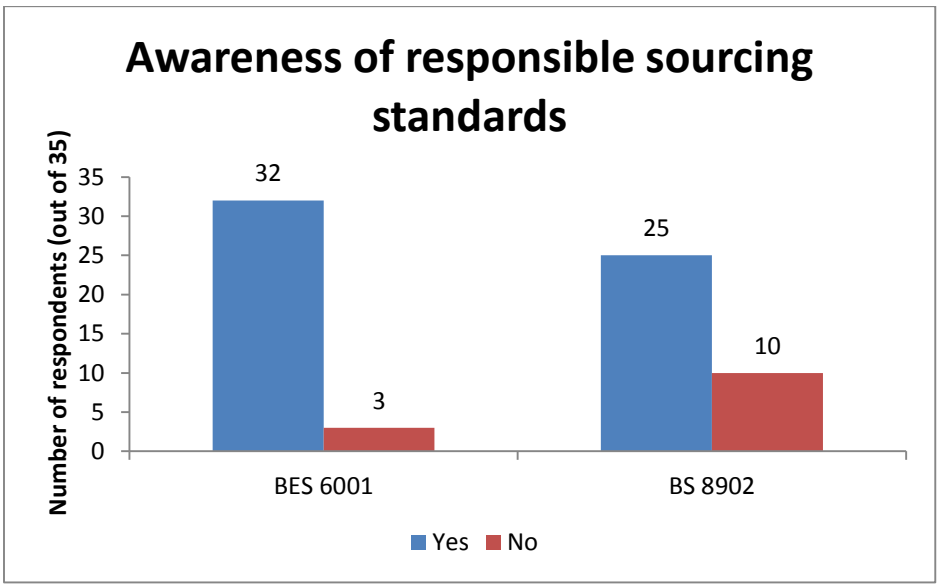


Figure 3.11: Awareness of respondents of the 'BES 6001: Framework standard for the responsible sourcing of construction products' and 'BS 8902: Responsible sourcing sector certification schemes for construction products – specification' standards.

3.4. Responsible Sourcing and Your Business

3.4.1. To what extent do you think responsible sourcing is relevant to your organisation?

This question was in two parts. The first part asked the above question and provided a number of options, whereas the second part of the question required some elaboration of the part of the respondent as to why they believed it to have that level of importance.

The first part was answered by all 35 respondents with 97% (34 out of 35) of these stating that they believed responsible sourcing was either *'very'* or *'completely'* relevant to their company.

The second part of this question was not completed by all respondents, with many having left it blank. However, the most frequently occurring reasons given were that is was important for progression; it could influence supply chains and CSR; procurement; ethics; market and business success; important for sustainability.

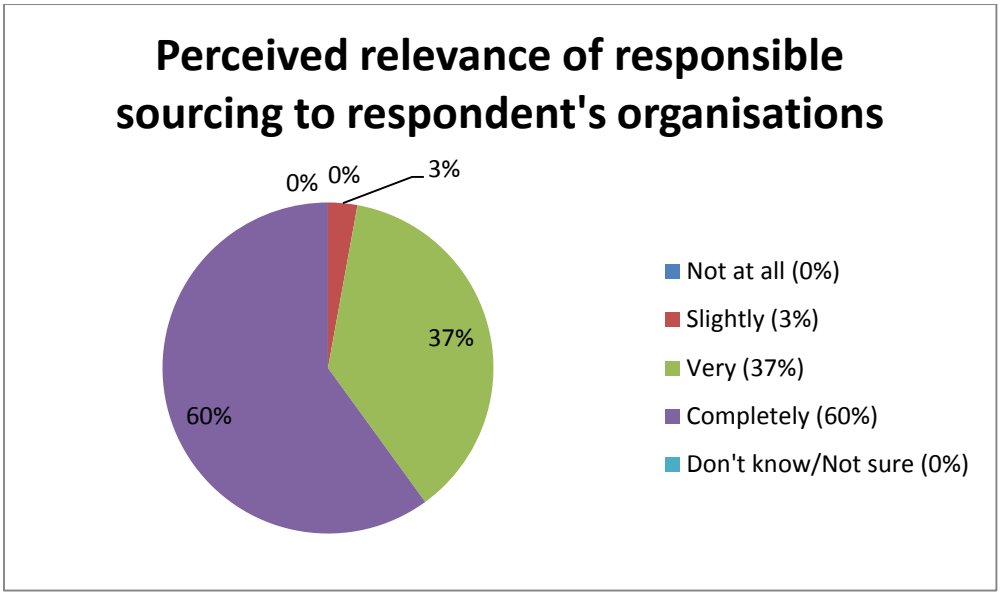


Figure 3.12: Chart highlighting the relevance of responsible sourcing to respondent's organisations. The majority perceive it to have major relevance to their organisation.

3.4.2. To what extent do you think responsible sourcing is relevant to your customers/clients?

Similarly to question 3.4.1, this question was in two parts with the second part of the question requiring some elaboration on the above question. The first part of the question was answered by all 35 respondents, with 83% (29 out of 35) people stating that responsible sourcing was either *'very'* or *'completely'* relevant to customers and clients.

The second part of the question, similarly to question 3.4.2, was answered less consistently. The most frequently occurring reasons given for responsible sourcing being very or completely relevant included reduced risk; improved reputation; inclusivity; CSR/market requirements; sustainability; increased competitiveness; improved business case.

The remaining 17% (six out of 35) stated that responsible sourcing was *'slightly'* relevant to customers/clients, with the reasons given including the need for improved marketing and education/awareness raising.

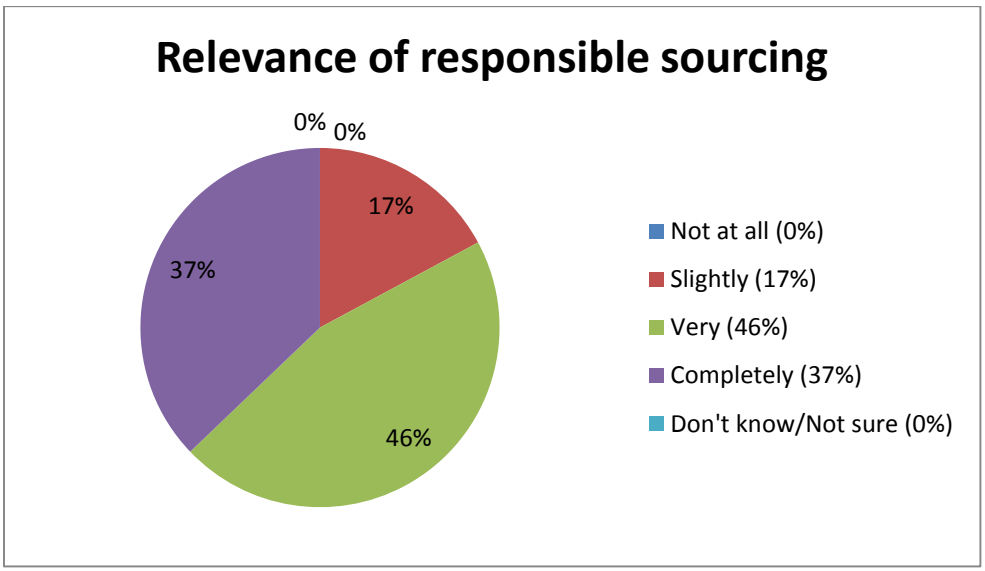


Figure 3.13: Perceived relevance of responsible sourcing to customers/ clients of responding organisations.

3.4.3. Who do you think should take responsibility for implementing 'responsible sourcing' practices in your business?

35 respondents answered this question. 37% (13 out of 35) of respondents stated that they believed the CEO/MD should take responsibility, with 23% believing it should be the purchasing or procurement manager. The remaining 40% selected *'other',* with 13 of these 14 stating that 'all of the above' should be responsible.

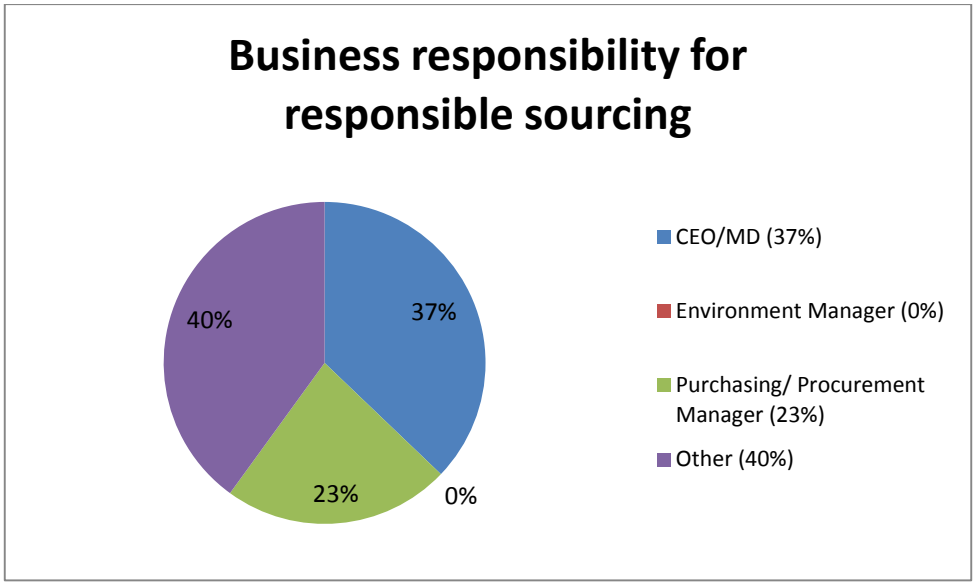


Figure 3.14: Perceived responsibility of respondents of responsible sourcing within the organisation.

3.4.4. Who do you think should take responsibility for implementing 'responsible sourcing' practices on a project?

In total, 42 answers were received to this question, as many of the 35 respondents selected more than one option. All answers were considered and it was found that 18 out of 42 (43%) stated that they believed that *'all of the above'* should take responsibility. Reasons given for this included improved buy in and facilitation of a collaborative approach. Many statements were given that alluded to the fact that the only way to truly achieve full buy in is to drive change through the whole organisation.

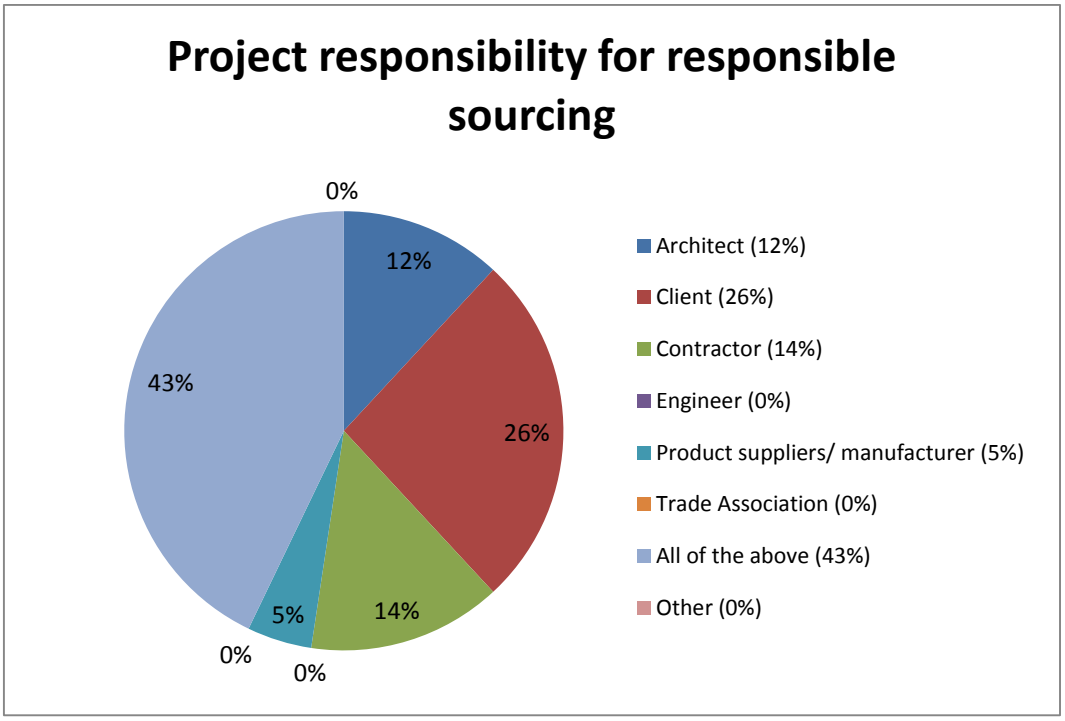


Figure 3.15: Perceived responsibility of respondents of responsible sourcing on the project.

The next most selected answer was the client, with 26% (11 out of 42) of responses. Reasons given for this mainly concerned their power to drive the implementation of responsible sourcing.

3.4.5. Have you ever supplied materials that are certified to BES 6001?

This question received 34 responses. 56% (19 out of 34) of respondents stated that they had never supplied BES 6001 certified materials with 35% (12 out of 34) stating that they had supplied materials certified to BES 6001. The remaining 9% stated that they were unsure.

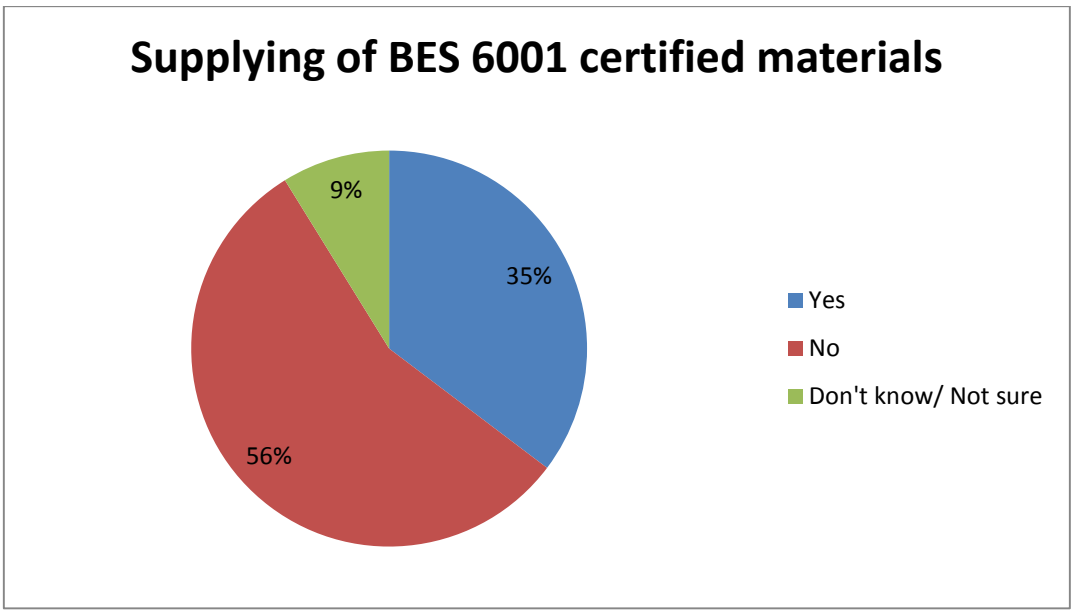


Figure 3.16: Number of organisations of respondents that have supplied BES 6001 certified materials.

Respondents were then asked to provide examples of the types of certified materials they had supplied; these included aggregates, steel, rebar, cement and concrete, asphalt, ready-mix concrete and bricks and blocks.

3.4.6. Have you ever specified materials that are certified to BES 6001?

This question received 34 responses, with only 21% (7 out of 34) of respondents stating that they had specified materials certified to this standard, with 74% stating that they had not. The remaining 6% were unsure.

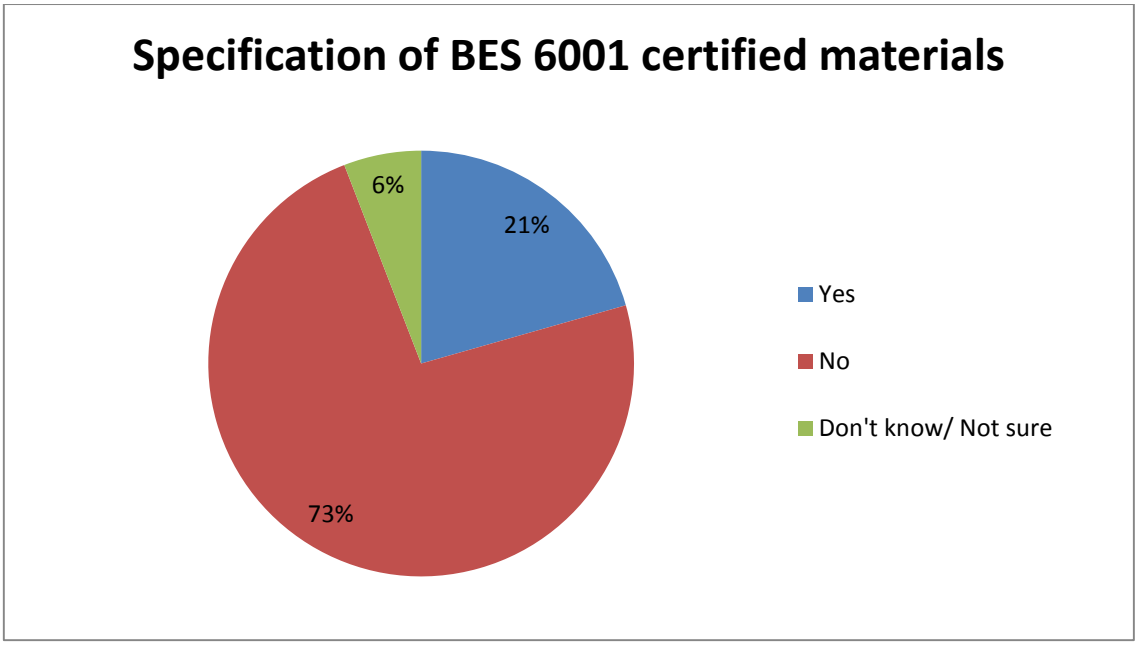


Figure 3.17: Number of organisations of respondents that had specified BES 6001 certified materials.

Similarly, respondents were asked to provide examples of those certified materials they had specified; these included cement and concrete, bitumen, steel, plasterboard, rebar and bricks and blocks.

3.5. The Future for Responsible Sourcing

3.5.1. In the future, how important do you imagine responsible sourcing will be?

This question was answered by all 35 respondents. 74% (26 out of 35) of these believed that responsible sourcing would be *'of utmost importance'* with 23% stating it would hold *'some importance'*. Of perhaps greatest significance was that none of the respondents believed it would hold no importance in the future, although this could be influenced by the fact that all respondents were attendees at a responsible sourcing conference.

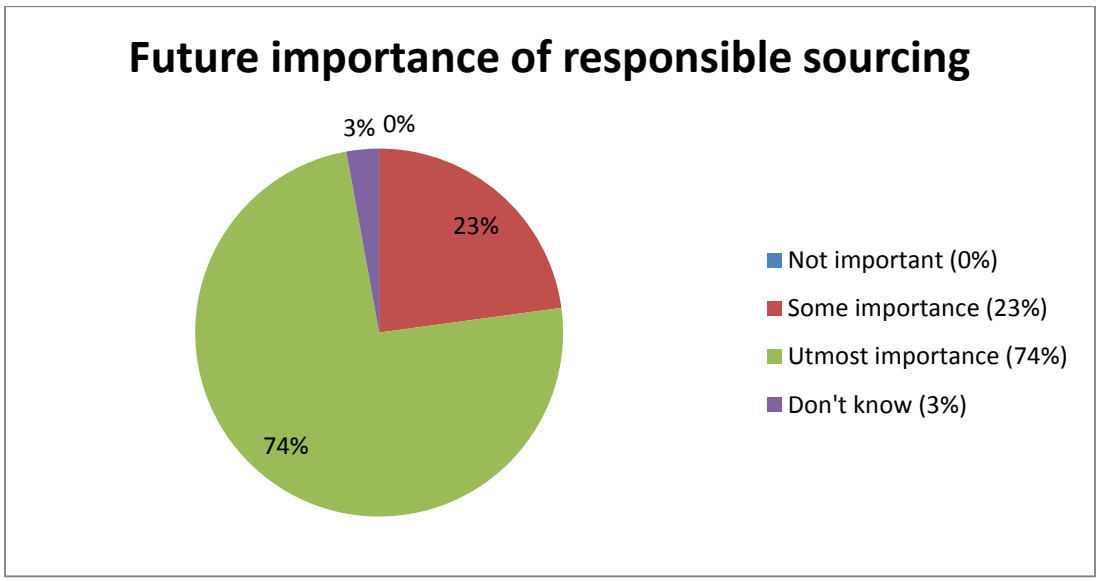


Figure 3.18: Perceived future importance for responsible sourcing of respondents.

3.5.2. Which of the following do you think will be the major drivers to encourage organisations to implement responsible sourcing practices?

This question aimed to determine the industry's thoughts on responsible sourcing moving forward. A relatively even distribution of results was achieved, with 28 out of 35 (80%) highlighting client requirements as a key driver. Other frequently selected options were customer/client requirements (77%); the need for organisations to keep up with their competitors (74%); legislation and regulation (71%) and to gain a market advantage (57%). *'Other'* reasons included assessment tools such as BREEAM and the Code for Sustainable Homes, probably due to the credits on offer in these schemes for responsible sourcing. Morality and risk management were also cited as possible future drivers.

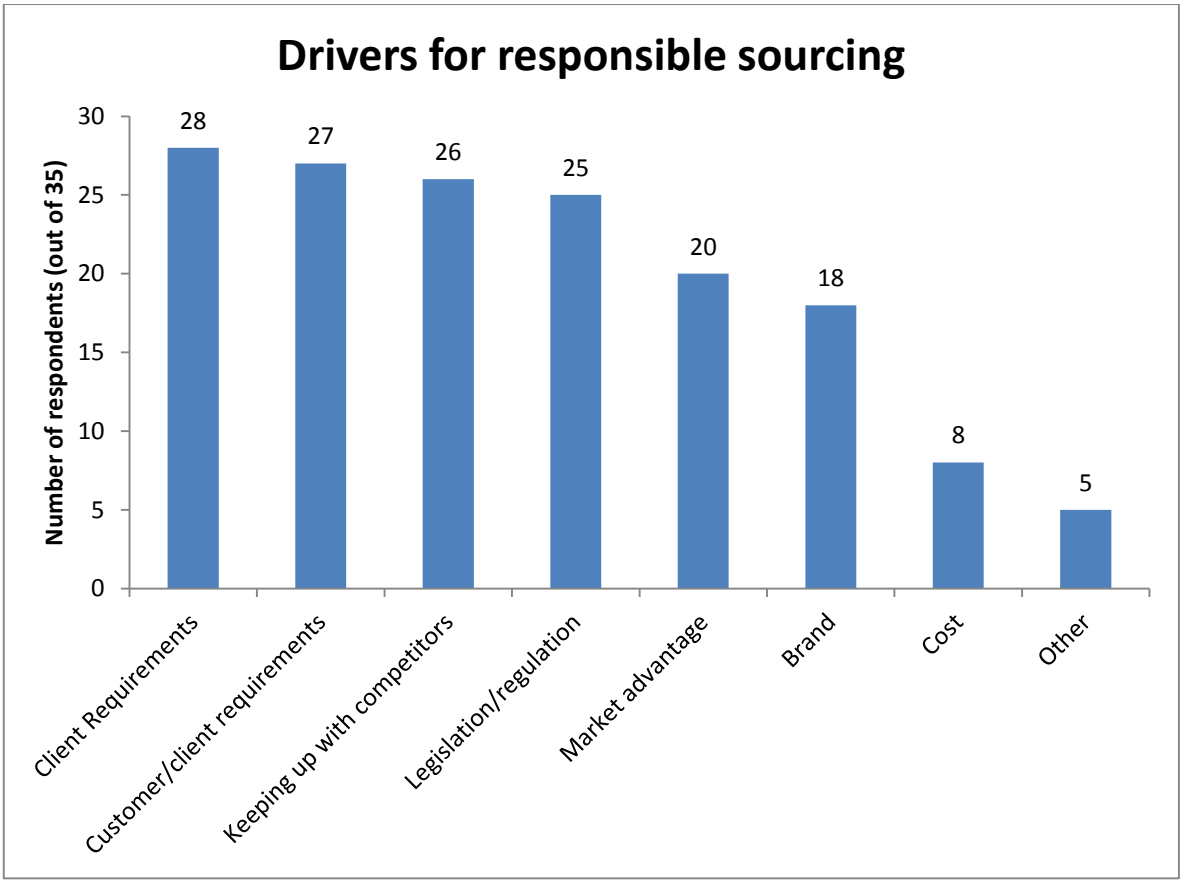


Figure 3.19: Identified drivers by respondents for pursuing with responsible sourcing in future years.

3.5.3. Which of the following do you think will be the major barriers to prevent organisations implementing responsible sourcing practices?

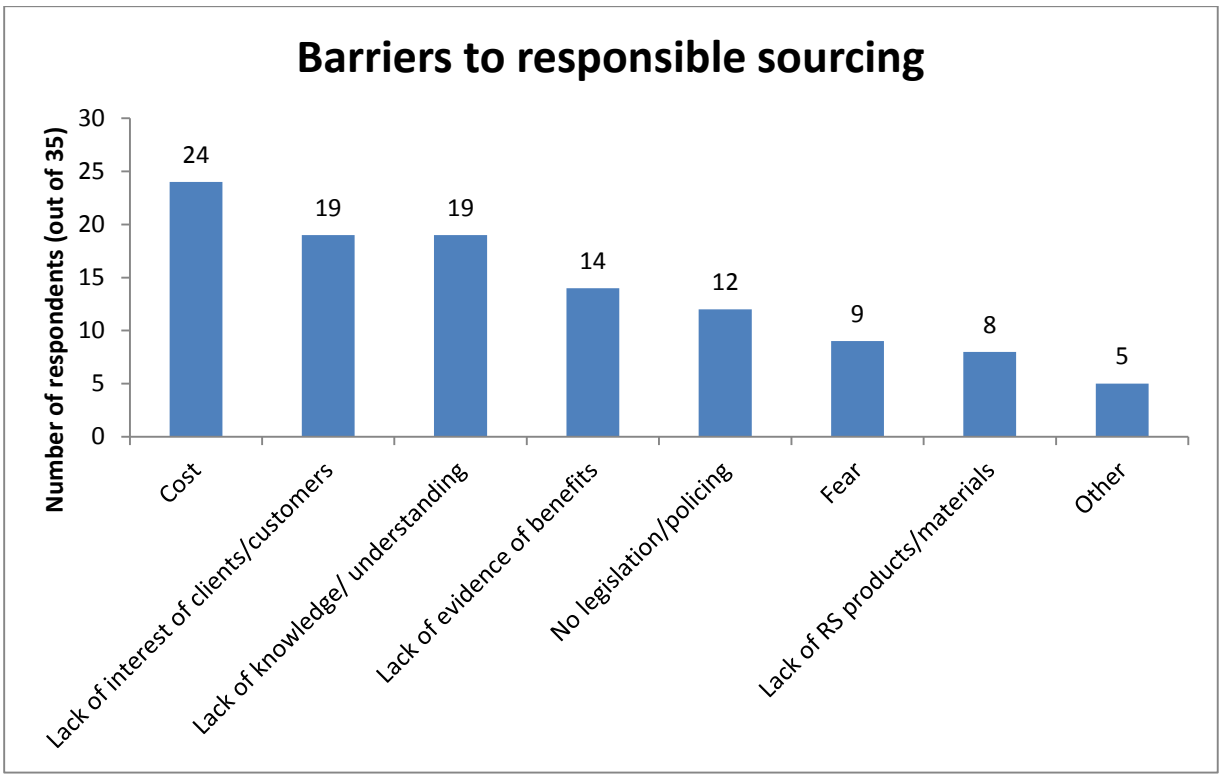


Figure 3.20: Identified barriers to implementation of responsible sourcing.

In addition to the drivers, it was also important to identify the industry's opinions on any barriers to implementation of responsible sourcing. There was a fairly even distribution, although the perceived cost of implementing such practices was identified as being the biggest barrier, with 24 out of 35 (69%) of respondents citing this as a major factor.

The next most widely selected options were a lack of interest from clients/customers and a lack of knowledge/understanding; both cited by 54% (19 out of 35) of respondents. A lack of evidence of the benefits (40%) was also relatively frequently selected. These results are supportive of the suggestion that more must be done in terms of awareness raising and education, which was one of the significant outcomes of the first conference.

3.5.4. Which of the following will be affected if responsible sourcing becomes more widely adopted?

The next question aimed to ascertain what would be affected if responsible sourcing is more widely adopted. There was a fairly even distribution, although 24 out of 35 (69%) of respondents stated that the procurement process would be affected; this was significantly higher than the other available options. Construction cost (49%) and product and material availability

(43%) were the next most frequently identified answers. *'Other'* reasons included that other industries may struggle to implement such measures and many respondents stated that none of the options would be affected, with two respondents adding that this was down to good procurement.

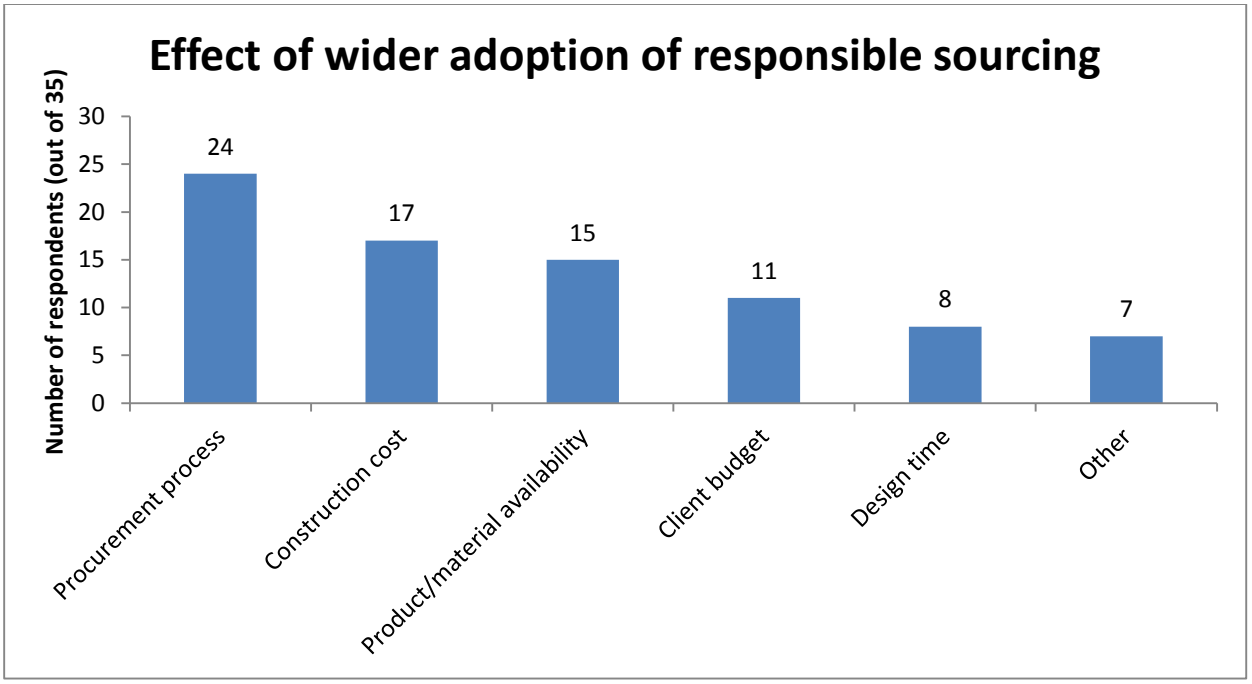


Figure 3.21: Factors that will be affected if responsible sourcing is more widely adopted by industry according to respondents from this survey.

3.5.5. What overall effect do you think responsible sourcing will have on your core business activity?

This question was answered by 35 respondents. 89% of these (31 out of 35) stated that they believed responsible sourcing would have a positive effect on the core activity of their business. The remaining 11% stated that it would have no difference, but importantly, no one that completed a survey believed that it would have a negative effect.

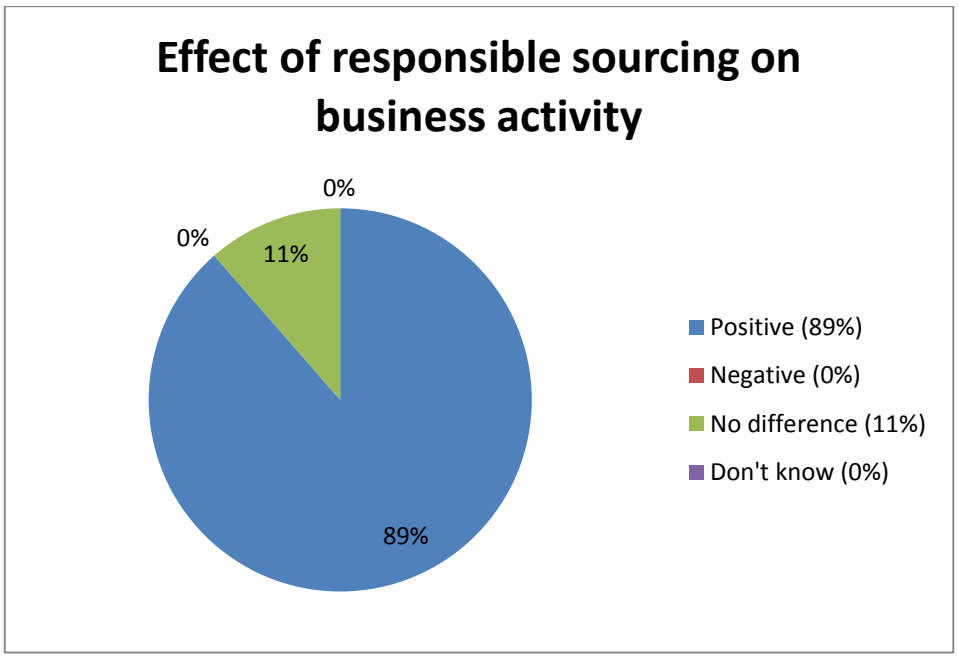


Figure 3.22: Respondents perceived effects on core business activity if responsible sourcing becomes more widely adopted.

3.5.6. Do you think that large companies will be more or less likely than small and medium enterprises (SMEs) to engage with the idea of responsible sourcing?

34 respondents answered this question, with 28 out of 34 (82%) stating that large companies are more likely to engage with responsible sourcing than SMEs. None of the respondents believed that large companies would be less likely to engage with responsible sourcing, with 6% stating that there would be no difference between SMEs and large firms, and 12% stating that they were unsure.

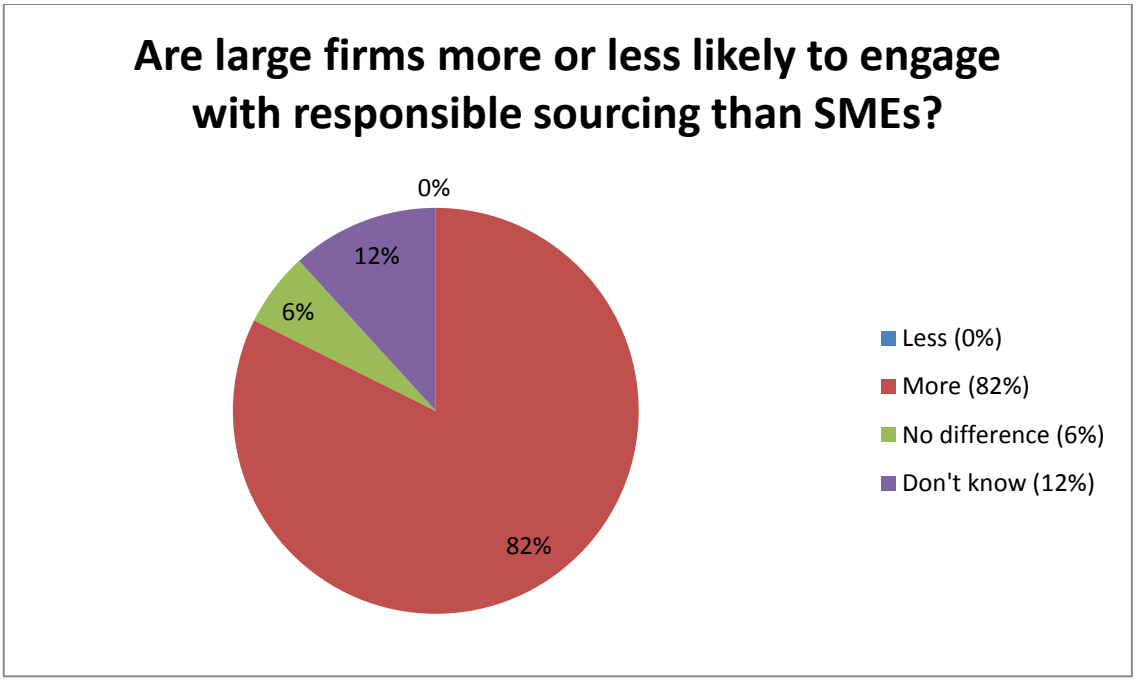


Figure 3.23: Respondent's indication as to whether large firms will be more or less likely to engage with responsible sourcing.

3.6. A Research Agenda on Responsible Sourcing

3.6.1. To what extent do you think more academic research on responsible sourcing is needed?

34 people answered this question, with 53% (18 out of 34) saying that more research is definitely needed and 41% (14 out of 34) stating that it *'maybe somewhat helpful'*. None of the respondents thought that there was no need to engage in more academic research, although two of the respondents stated that they were unsure whether this would be helpful.

In most cases the reasons provided by respondents to explain the extent to which a research agenda might be required cited education, awareness raising or understanding. People who selected *'maybe somewhat helpful'* also stated that it would improve transparency, aid development of standards and involve the supply chain. Those that selected *'Definitely helpful'* also cited that it would help to establish a link between academia and industry and that a research agenda might help to more clearly define responsible sourcing.

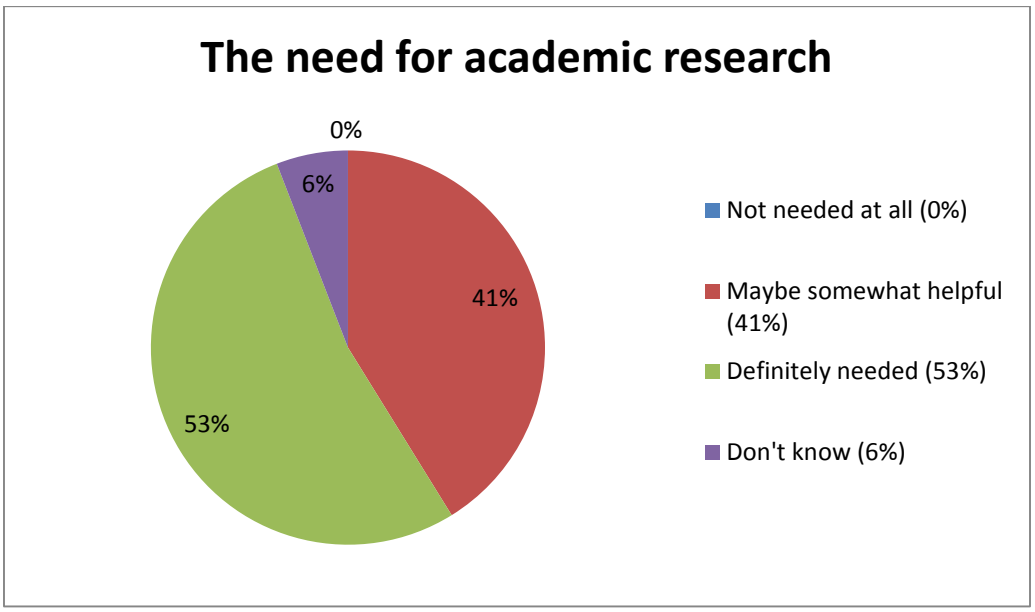


Figure 3.24: Respondent's thoughts on whether increased publicity and awareness raising of responsible sourcing is needed.

3.6.2. To what extent do you think more publicity and awareness-raising is needed?

35 people answered this question, with 94% of those (33 out of 35) stating that more publicity and awareness raising is '*definitely needed'* with most respondents highlighting a lack of awareness, with one delegate mentioning that one supply chain saw responsible sourcing as the next 'fad' that would be over in a relatively short space of time. Other reasons included that it will encourage participation and make the concept more mainstream, as the opinion was that it is not yet viewed in this way.[3]

3.7. Closing Questions

3.7.1. Prior to attending this conference, what did 'responsible sourcing' mean to you?

Of the 35 papers that were received, only 24 of those had answered this question. A number of answers were offered; some of which displayed a good level of understanding of responsible

[3] In addition to this question, delegates were asked for their opinions on which research and development activities would be most useful in encouraging organisations to implement responsible sourcing practices. Responses to this question are currently under review although initial analysis appears to indicate that integrating responsible sourcing with sustainable procurement; mapping the current and future potential scope for responsible sourcing in construction; supply chain mapping tools suitable for construction products; and a practical guidebook on responsible sourcing were the main activities being requested.

sourcing, whereas others displayed a lower level of understanding but a certain degree of awareness. Most of these answers mentioned the three pillars of sustainability; BES 6001, and the definition contained within the standard; the whole life of a product; procurement; and ethics.

Delegates were then asked, in the second part of this question, whether their understanding of responsible sourcing had changed as a result of the conference. 27 people answered this question; with 82% (22 out of 27) stating that it had not changed their understanding, indicating that prior knowledge was of a high level.

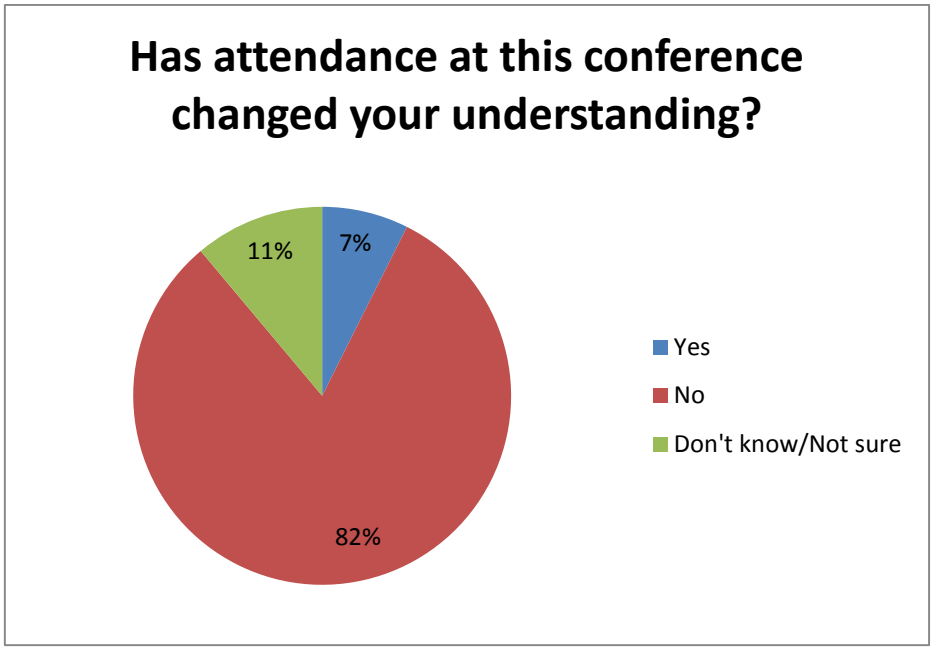


Figure 3.25: Chart indicating whether respondent's understanding of responsible sourcing had changed as a result of attending the conference.

The seven per cent that answered that their understanding had changed cited reasons including:

- Realised that people and products are very separate issues;
- Identified differences and infrastructure approach;
- Improved understanding but perception has not changed;
- Enables cost savings and drives improvements.

3.7.2. Overall, has this conference improved your personal understanding of responsible sourcing?

32 people answered this question. 44% of these (14 out of 32) stated that their understanding had been slightly improved, with 37% (12 out of 32) stating that it had been moderately improved. 16% (5 people) said that the conference had significantly improved their understanding, with only one delegate stating that it had not improved their understanding at all. However, this delegate also commented on the survey that the conference had provided an *'excellent insight into the very different views and understanding in the sector so* (was) *very worthwhile'.*

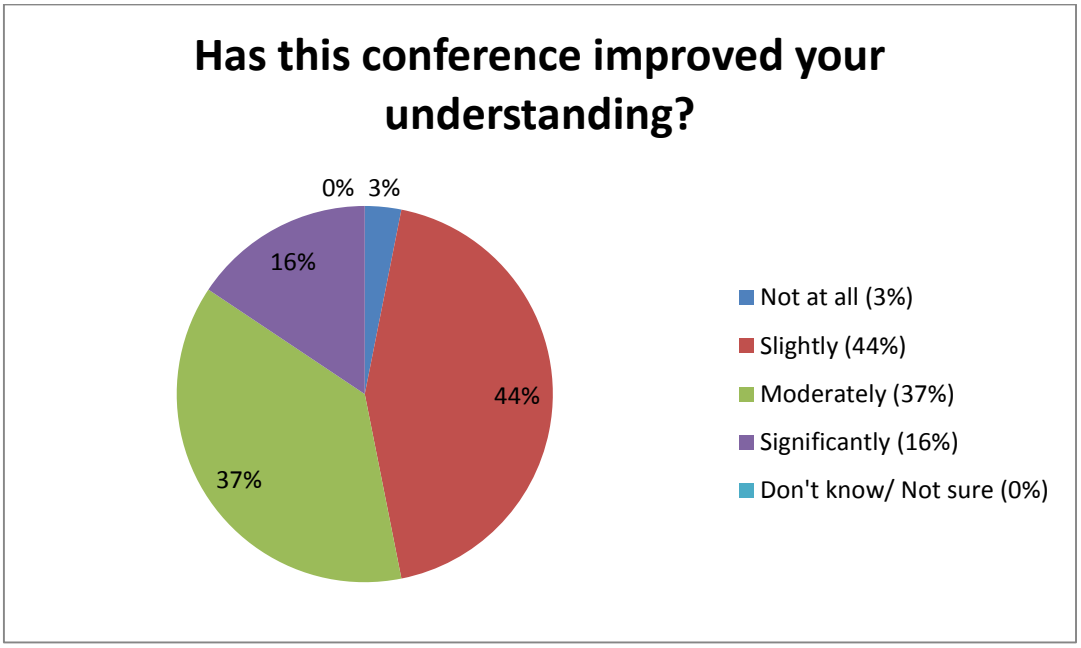


Figure 3.26: Pie chart indicating whether respondents felt that attendance at this conference had improved their personal understanding of responsible sourcing.

3.7.3. In comparison to your industry/sector peers, where would you say your organisation was in its understanding and implementation of responsible sourcing?

This question was answered by 35 people. 35% (11 people) said that they felt that their organisation was *'much further ahead'* than their peers with regard to responsible sourcing, with 26% (8 people) stating that they felt they were slightly ahead. Only one delegate said that they felt their organisation was very much lagging behind.

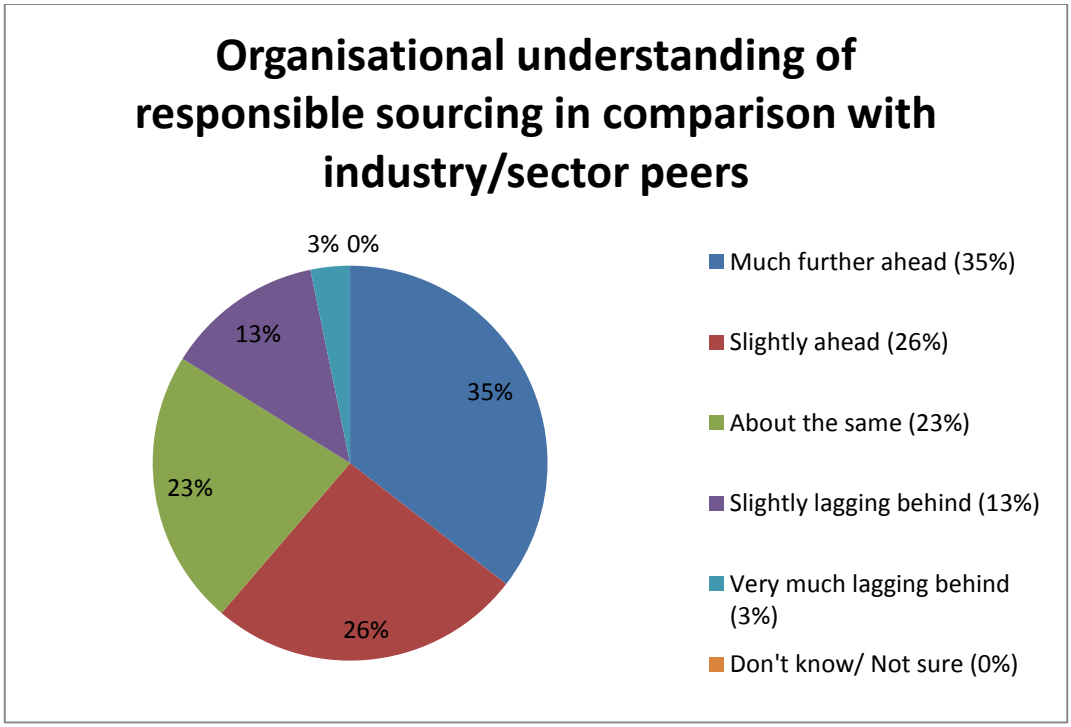


Figure 3.27: Individuals opinions on the position of their organisation in comparison to their industry/sector peers.

4. KEY FINDINGS AND SUMMARY

4.1. Key findings from the survey

Interpretation of the survey results led to some key conclusions that should be considered in order to continue to progress the responsible sourcing agenda in future years. Overall the findings suggest that the client is the key driver with regard to responsible sourcing, but the perceived cost of implementation and certification prohibits take up of it and that responsible sourcing has a significant impact upon procurement.

- Most participants were familiar with responsible sourcing of construction products.
- There was a very high awareness that credits were available in BREEAM, the Code for Sustainable Homes and CEEQUAL for responsible sourcing.
- Most people were aware of the government's 2012 target for responsible sourcing, although almost two thirds of respondents were not aware of the UK Contractors Group 100% target for 2015. Many stated that they believed this to be 75%.
- Most people had heard of BES 6001 and BS 8902, although awareness of BES 6001 was higher.
- The majority of respondents felt that responsible sourcing held great importance for their business and their customers/clients.
- Delegates believed that responsibility for implementing responsible sourcing practices in the business should come from the top level, although many also believed that all of those involved should take some responsibility.
- Most people believed the responsibility for implementing responsible sourcing practices on the project rests with the product suppliers/manufacturers with many also stating the client was responsible.
- Most people stated that their organisation had never supplied or specified products that were certified to BES 6001.
- Most people believe that responsible sourcing will be of great importance in the future.
- The most frequently selected drivers for responsible sourcing were client/customer requirements, the need to keep up with competitors and legislation/regulation.
- The barriers most frequently selected were the cost of implementing responsible sourcing, a lack of interest from clients and customers and a lack of understanding.

- Most people believed that if responsible sourcing becomes more widely adopted, that the procurement process, the cost of construction and the availability of products and materials will be affected.
- Most people think that responsible sourcing will have a positive effect on core business activity and that larger companies are more likely than SMEs to engage with responsible sourcing.
- It is believed that some extent of research on responsible sourcing would be helpful, with most people stating that awareness does need to improve. Also this will help to establish a link between academia and industry.
- Most people think that more publicity and awareness raising is needed due to a fundamental lack of awareness and to encourage participation in responsible sourcing.
- Prior to attending the conference, most people understood responsible sourcing to include or refer to BES 6001, the pillars of sustainability, whole life cycles, procurement and ethics.
- Most people had not improved their understanding by attendance at the conference but had stated that they felt that their organisation was further ahead than their industry/sector peers in terms of responsible sourcing implementation.

4.2. Summary

This report analysed 35 respondents from the first APRES conference held at Loughborough University on the 23-24 November 2011. It covered the responses to a paper based questionnaire which looked at:

- Company profile
- Awareness of responsible sourcing
- Responsible sourcing and the business
- The future for responsible sourcing
- Research agenda

Qualitative and quantitative findings were presented, along with some key findings which can be considered as the responsible sourcing agenda moves forward. The analysis has highlighted where industry as a whole feels the agenda should move in future years and indicates some interesting areas for future research or development.

This survey has highlighted some clear conclusions in respect of awareness, drivers and barriers and levels of participation, together with some useful suggestions for further work. The APRES Network will endeavour to address some of these in its forthcoming activities.

Readers who would like further support from APRES are welcome to contact the Network Manager, Dr Jacqui Glass on 01509 228738 (j.glass@lboro.ac.uk). Please bookmark the APRES website and join us at the next conference in November 2012.

References

BRE Building Research Establishment (2009). *Framework standard for the responsible sourcing of construction products.* BRE Global, Watford, BES 6001: Issue 2.0.

BSi British Standards (2009). *Responsible sourcing sector certification schemes for construction products – specification.* BSi, London, BS 8902: 2009.

Glass, J., Achour, N., Parry, T., Nicholson, I. (2011). The Role of Responsible Sourcing in Creating a Sustainable Construction Supply-Chain. CIB W65 Supply-Chain Integration Workshop, MISBE 2011, 20-23 June 2011, Amsterdam.

Glass, J., Achour, N., Parry, T., Nicholson, I., Upstill-Goddard, J. (2012). Responsible sourcing of construction products and materials – results from an industry survey. *Concrete, February 2012*, 47-49.

HM Government (2008). Strategy for sustainable construction. Department of Business, Enterprise and Regulatory Reform, London.

APPENDIX C BRE BES 6001 DATA ANALYSIS PROPOSAL

PROPOSAL

ANALYSIS OF RESPONSIBLE SOURCING PERFORMANCE DATA WITHIN BES6001 ASSESSMENTS/CERTIFICATES

Introduction

This proposal sets out the background, need and proposed arrangements for a research study to be carried out by a team from the School of Civil and Building Engineering at Loughborough University, with the cooperation and permission of the Building Research Establishment (BRE).

The purpose of the document is to:

- build confidence in this study as an important and timely means of significantly enhancing the depth and robustness of the ongoing consultation process to revise the responsible sourcing framework standard (BES 6001);
- set out clearly the benefits for each party;
- outline the roles/responsibilities of each party; and,
- enable Katie Livesey of BRE to obtain the necessary permissions and make practical arrangements, such that the research can be undertaken in first quarter 2013.

About the research

The overarching aim of this study is to extract valuable and as yet untapped knowledge about the current state of responsible sourcing practices from the BRE dataset of BES6001 certifications. This will be achieved through analysis of the quantitative and qualitative data within up to 80 BES6001 certificates[1].

A researcher with a suitable background and analytical skills from Loughborough University will be tasked to undertake this study, under the direction of Katie Livesey at BRE and Prof Jacqui Glass at Loughborough University. The study will deliver a data analysis report, contribute significantly to the current consultation on revisions to BES6001 and produce an academic journal paper, which will be submitted to a high-quality international journal.

[1] *In preparing this proposal, we presume that, for every BES6001 certificate to date, BRE holds full details of all scores, against all of the criteria in BES6001. If this is not the case, then the secondment period will be dependent on the number of full datasets that BRE does hold, since other certification bodies would need to be approached to obtain the outstanding datasets.*

Need for the research

There are a number of reasons why the proposed study is important, as outlined below:

- The BRE is currently undertaking a review of the BES6001 framework standard, so the output from this research will make a timely and detailed contribution to this process. The analysis would provide extremely valuable lessons and overarching guidance for those seeking responsible certification in the future and thus enable BRE to encourage and support more manufacturers and product sectors/supply-chains to obtain BES6001. It would identify the extent to which manufacturers are finding the various criteria within the standard easy or difficult to achieve.
- Since 2009 (when it was first introduced) the number of certifications to BES6001 has been growing steadily; at the end of 2012, there were about 80 certificates covering 40 different manufacturers, covering an ever-widening range of construction materials and products. Hence, there is now a sufficient dataset to carry out a comparative analysis of these certifications.
- While BRE staff have ready access to the dataset, they may not have the time or the statistical analysis skills to undertake such a study, so any potential trends or lessons in the data could remain unexploited if this study is not carried out.
- Such a study has not been undertaken to date, so it would be novel and is therefore eminently publishable in a world-class journal, albeit in a suitably anonymised format. The results might also form part of a high-profile visioning report which will form part of the conclusion from the APRES responsible sourcing project, also being led by Loughborough University (http://apres.lboro.ac.uk).

Benefits for BRE

The BRE would benefit from this study primarily by receiving a comprehensive analysis report of trends and lessons within the quantitative and qualitative data within the existing dataset of BES 6001 certifications. This would be beneficial commercially in helping it to revise the standard, but also through gaining a deeper understanding of how and where points are being scored – as such it would be able to offer enhanced guidance to those seeking certification in the future. Loughborough and BRE have a longstanding track record of joint working, so the BRE would also benefit from working with a team that is entirely sympathetic to the BRE's aims and ethos.

Benefits for Loughborough

Loughborough University is a research-led institution which prides itself on its extensive and longstanding relationships with industry. The proposed study is entirely congruent with the aims of the university and the School of Civil and Building Engineering, within which the Centre for Innovative and Collaborative Construction Engineering (CICE, http://www.lboro.ac.uk/cice) hosts our Engineering Doctorate researchers. The researcher who will undertake this study, James Upstill-Goddard, is an EngD student, sponsored by environmental consultancy Responsible Solutions (James' CV is appended to this document). James' work focuses on sustainability certification and so this study would be highly-beneficial to his research (which is being supervised by Prof J Glass and Prof A Dainty). The study would lead to a high-quality journal paper which would be of excellent benefit to the academics and researcher involved.

Logistics and practical arrangements

If this proposal is accepted and supported by BRE, it is proposed that the researcher spends up to four days at BRE Garston during the week commencing Monday 18 February 2013.

Katie Livesey has agreed to provide guidance on suitable local accommodation options; the cost of James' B&B accommodation and travel would be paid entirely by the University, from his annual training account. On arrival at BRE, it is expected that James would be given a full workplace, fire and health and safety induction, provided with a space to work and a nominated person responsible for his welfare. James will bring his own laptop to work on, but

would appreciate having access to Wi-Fi if that is available such that he can keep up to date with his email etc.

After the visit, James will analyse the data and, with guidance from his supervisors, prepare a written report that will be sent to BRE for comment and approval by end March 2013. Based on the previous collaborative study undertaken by Shamir Ghumra of BREEAM assessments, we estimate this report would be around 20 pages in length. The report would remain commercial-in-confidence to BRE and Loughborough University. Thereafter, a journal paper of around 5,000 words will be compiled and circulated to BRE for comment and approval, prior to submission to a suitable outlet. Please note that nothing arising from the results of this study shall be submitted for publication without permission from both parties and the contribution of both parties shall always be duly acknowledged.

Confidentiality and ethics

It is agreed the researcher will be expected to sign a confidentiality agreement prior to accessing any data at BRE. This will ensure that the commercial interests of BRE are protected and that the study is carried out in accordance with the Data Protection Act, such that it is not possible to attribute any data or findings to any specific individual, company or project. The researcher will also complete an ethical checklist prior to carrying out the study, which is a University requirement for all research – a copy of this will be made available to BRE.

Future collaboration

It is agreed that James Upstill-Goddard will continue to liaise with Katie Livesey after this study concludes, such that there is mutual learning and sharing of knowledge in relation to responsible sourcing, certification and the role of SMEs (which is of particular interest to James' EngD research). This opportunity is much appreciated. In addition, Loughborough University would welcome future collaborations of this type, where they represent mutual benefit to both parties.

Proposer

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APPENDIX D BRE REPORT

ANALYSIS OF RESPONSIBLE SOURCING PERFORMANCE DATA WITHIN BES 6001 ASSESSMENTS/CERTIFICATES

EXECUTIVE SUMMARY

This study analysed 126 BES 6001 initial assessment scores that were made available by BRE, BSI and CPC. Scores were analysed as a full data set, and then categorised into the award rating achieved (i.e. 'pass', 'good' etc.) and into seven product sectors identified from the analysis; namely aggregates, asphalt, brick, concrete, cement, roof tile and steel.

In total, data are held for six 'pass' certificates, 49 'good' certificates, 69 'very good' certificates and two 'excellent' certificates. Due to the low numbers of pass and excellent certificates, analysis of award ratings mostly considers 'good' and 'very good' certifications, although some discussion of 'pass' certificates is included.

The number of certifications within each product sector was varied with eight aggregate, seven asphalt, 46 brick, nine cement, 31 concrete, five roof tile and eight steel certification scores available. Other products that were not included in this analysis included, among others, sand (one certification held) and building materials (three certification scores held).

It was found that within section 3.3 of BES 6001, clauses 3.3.1 (material traceability in the supply chain) and 3.3.2 (environmental management systems in the supply chain) score very highly, with 97% and 84% respectively scoring credits for 75% or 90% traceability. Conversely, clause 3.3.3 (health and safety management systems in the supply chain) scores poorly, with only 25% of certifications scoring additional credits (i.e. demonstration of more than the compulsory requirements).

Within section 3.4 of the standard, it is found that clause 3.4.3 (resource use) is the best performing clause, with 75% (94 out of 126) certifications scoring maximum credits for this clause. The poorest scoring clause was life cycle assessment (clause 3.4.6) with 89 out of 126 certifications (71%) not scoring this clause at all. Of the 37 certifications that did score for this clause, 32 (86%; 25% of the total) scored the credits for development of a Type I or Type II environmental declaration. Scoring for the other non-compulsory clauses within this section

was fairly constant with the majority of certifications achieving credits equivalent to part (c) of these clauses.

ACKNOWLEDGEMENTS

The author would like to take this opportunity to thank several parties without whose involvement this study and subsequent generation of this report would not have been possible. First and foremost, thanks must go to Katie Livesey at BRE for facilitating and arranging the four-day period that the author spent with BRE in order to obtain these data. Secondly, thanks must also go to Derek Hughes at BRE for his contacting of the certification bodies to obtain data from them, and for spending time with the author to demonstrate how data should be extracted from the certification reports.

The author also wishes to thank those at the other certification bodies who provided data for input into this study. They are Tim Watts of CICS Global and Colin Head of CPC and their assistance is gratefully acknowledged.

1. INTRODUCTION

BES 6001, the framework standard for the responsible sourcing of construction products, was first published in its current form by the Building Research Establishment (BRE) in 2009. Responsible sourcing (RS) was a term that had been first used in the 2006 Code for Sustainable Homes, but use and awareness of the term considerably increased following the 2008 strategy for sustainable construction[4]. This strategy set targets around RS and due to this, and the increasing need for clients to score credits in BREEAM for RS, BRE published BES 6001 in response to the industry need to engage with this topic.

This study is a collaborative project between The Centre for Innovative and Collaborative Construction Engineering (CICE) based at Loughborough University and BRE, carried out in February 2013 by means of a four-day period being spent at BRE by a researcher from Loughborough University, under guidance from Katie Livesey at BRE. The aim of this study was to extract knowledge about the current state of responsible sourcing practices from the current datasets held by the four certification bodies currently conducting BES 6001 certifications, namely BRE, BSI, CICS and CPC.

Scores for 91 certificates have been collated, although due to some certifications holding multiple scores, data for 126 different sets of scores from three of the four certification bodies (BRE, CICS and CPC) are held. These data are scores for the initial certification only; i.e. annual verification data are not included within the scope of this analysis due to the absence of a complete data set. The data set are correct as of January 2013, and so any certifications that have been awarded since this date are not included within this analysis. Data held by BSI for BES 6001 assessment scores are not included in this report as these data were not made available in a sufficient timescale to be included within the analysis.

This report is presented in a 'clause-by clause' format that follows the structure of BES 6001. Under each clause, general trends are presented with some commentary around how different product sectors have performed. Seven product sectors were identified from the certifications awarded; aggregates, asphalt, brick, cement, concrete (including ready-mix), roof tile and steel. Other product certifications exist, but adequate data were not available to draw any robust

[4] HM Government (2008). Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15370/strategy-for-sustainable-construction.pdf

conclusions from. Therefore, this report will focus upon those product lines that are most commonly certified. This means that when considering the breakdown of product lines, n = 114. Whereas when considering overall performance and grading, n = 126.

It will also consider how clauses are scored by those certifications that score different grades. This enables the report to look at where points are typically picked up and dropped by certificates awarded a 'pass' grade, 'good' and 'very good'. Only two certificates are available in these data that scored an 'Excellent' grade. Any conclusions drawn from this are therefore insignificant due to the small data set available.

The three following tables display (n) values for each of the award ratings (table 1), each sector (table 2) and for those non-compulsory clauses within the standard (table 3).

Table 1: (n) for each score category

Rating	**n**
Pass	6
Good	49
Very Good	69
Excellent	2

Table 2: (n) for each of the product sectors

Product sector	**n**
Aggregates	8
Asphalt	7
Brick	46
Cement	9
Concrete and ready mix	31
Roof Tile	5
Steel	8

Table 3: Shows (n) totals for the number of sets of certification scores and individual certificates held. Also highlighted are the (n) values for those non-compulsory clauses (clause 3.4.4 onwards) when instances of non-scorers are taken into account. For example, for 'waste management', one of the 126 certifications did not score, so (n) is equal to 125 in this case. (n) values for compulsory clauses always equal 126.

	n
Certification score sets	126
Certificates	91
Waste Management	125
Water extraction	125
Lifecycle assessment	37
Transport impacts	114
Employment and skills	123
Local communities	116

2. ORGANISATIONAL MANAGEMENT REQUIREMENTS

This chapter will focus upon the scores awarded to certificated companies in section 3.2 of the standard. As the only clause of this section for which points can be awarded is clause 3.2.3 (Quality management system; the other clauses are compulsory clauses with no further points awarded), the other clauses will not be reported here.

92% (116/126) of awarded certification scores scored the additional point in this section for having a quality management system certified to ISO 9001:2008 by an independent third party. Only 10 awarded certificates scored only the compulsory points.

For most product sectors, 100% of certification scores awarded were certified to ISO 9001:2008. Aggregates (25%; 2/8), cement (11%; 1/9) and concrete (6%; 2/31) were those product sectors where certified organisations did not have certification to ISO 9001:2008.

3. SUPPLY CHAIN MANAGEMENT REQUIREMENTS

The below graph indicates the relative proportions of those certification scores that were awarded under the traceability sections of BES 6001. Discussion around each of these individual clauses is below.

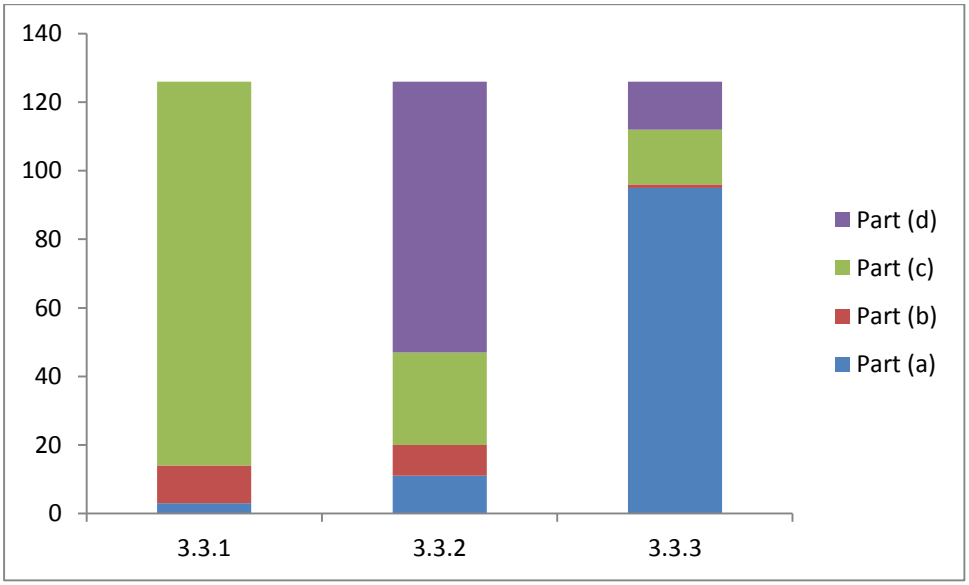

Figure 1: Relative proportions of awarded certifications scoring each level.

Clause 3.3.1 (material traceability through the supply chain) has three parts to it (i.e. parts a – c), of which part (a) is a compulsory credit (equal to 60% traceability of constituent materials), part (b) is equal to 75% traceability and part (c) is equal to 90% traceability. For clauses 3.3.2 (environmental management systems in the supply chain) and 3.3.3 (health and safety management systems in the supply chain), part (a) is awarded for traceability of constituent materials, part (b) is awarded for traceability of 60% of constituent materials, part (c) is awarded for 75% traceability, and part (d) for 90% traceability.

3.1 Material traceability through the supply chain

As can be seen from figure 1, the vast majority (89%) of certifications scored maximum points for this clause. Only three of the 126 certification score sets scored only the compulsory credits in this section.

For those organisations achieving a ‘pass’ grading, 3/6 (50%) of certification scores scored the maximum number of points in this section, 78% (38/49) scored the maximum for those organisations achieving a ‘good’ grading, and 100% scored the maximum number of points for those obtaining a ‘very good’ (69) or an ‘excellent’ (2) rating.

3.2 Environmental management systems in the supply chain

For environmental management systems in the supply chain, 63% (79/126) of awarded certificate scores scored maximum points in this section, 21% (27/126) scored two points (75% traceability) and 7% scored one point (60% traceability).

For those scores that achieved a 'pass' rating, 3/6 (50%) of organisations achieved the maximum number of credits for this section, with 33% (1/6) scoring only the compulsory credit. For those organisations scoring a 'good' rating, 47% (23/49) scored the maximum number of credits, with 18% (9/49) and 14% (7/49) scoring one and two credits respectively. For 'very good' certifications, 74% (51/69) scored the maximum number of credits, with 25% (17/69) scoring two credits, and for 'excellent' certifications, both products scored maximum points (there are only two products certified as 'excellent' in this data set).

The product sector that performed the best in this section was the roof tile sector, with 100% of certifications scoring the maximum number of points. Figure 2 indicates the percentage of organisations scoring each part of clause 3.3.2.

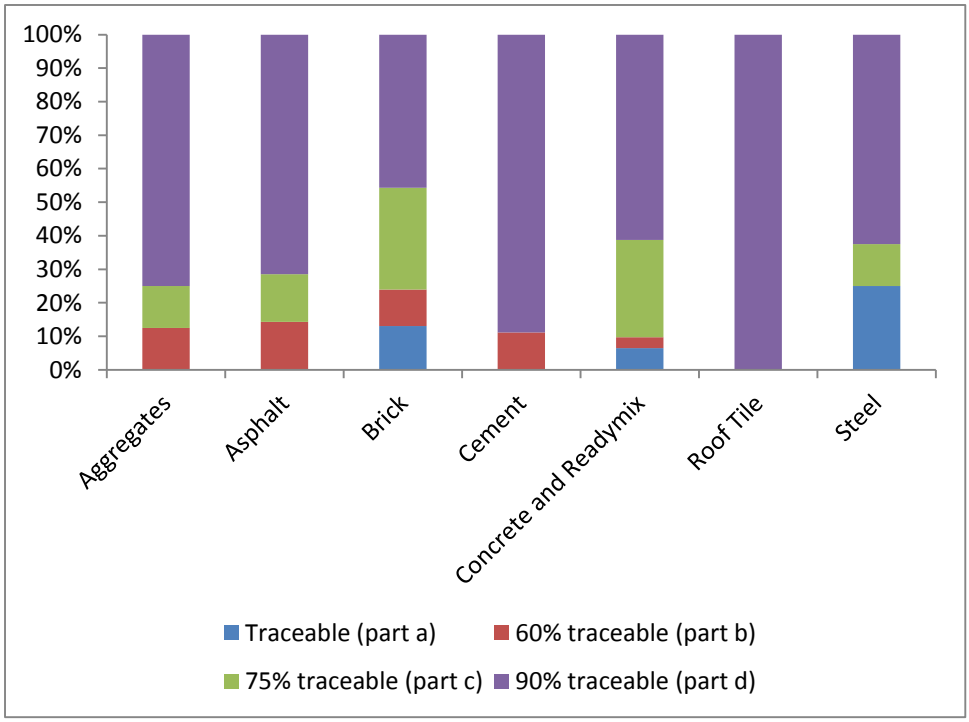

Figure 2: Environmental management system status in the supply chain of certified organisations by product type.

3.3 Health and safety management systems in the supply chain

For health and safety management systems in the supply chain, scoring varied considerably from that of environmental management systems in the supply chain. 75% (95/126) of certifications scored only the compulsory marks for this section, with 13% (16/126) and 11% (14/126) scoring two and three points respectively.

For those scores that achieved a 'pass' rating (six in total), 100% met the compulsory requirements only, 80% (39/49) of 'good' certifications met the compulsory requirements only and 72% (50/69) of 'very good' certifications met the compulsory requirements only. Interestingly, most of those certificates that could demonstrate meeting more than just the compulsory requirements demonstrated at least 75% traceability for this section (i.e. 18% (9/49) for 'good' and 28% (19/69) for 'very good').

Figure 3 highlights the performance of the different product sectors where data for a number of certificates are held. As can be seen from the figure, the best performing product sectors for this clause are cement (44% scoring maximum marks; 4/9 scores) and steel (38% scoring maximum marks; 3/8 scores).

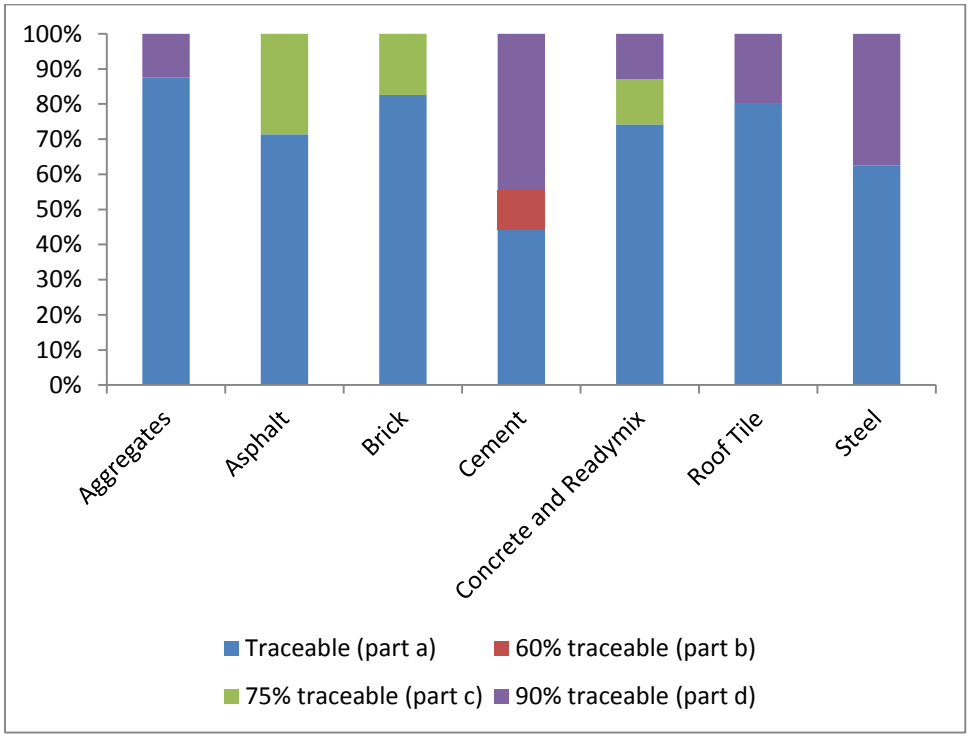

Figure 3: Health and safety management system status in the supply chain of certified organisations by product type.

4. ENVIRONMENTAL AND SOCIAL REQUIREMENTS

4.1 Clause 3.4.2: Greenhouse gas emissions

For this compulsory clause, 52% (65/126) of certifications scored the maximum number of available credits with 34% (43/126) scoring five credits and 11% (14/126) scoring three credits. Figure 4 shows the number of certifications awarded at each part of this clause.

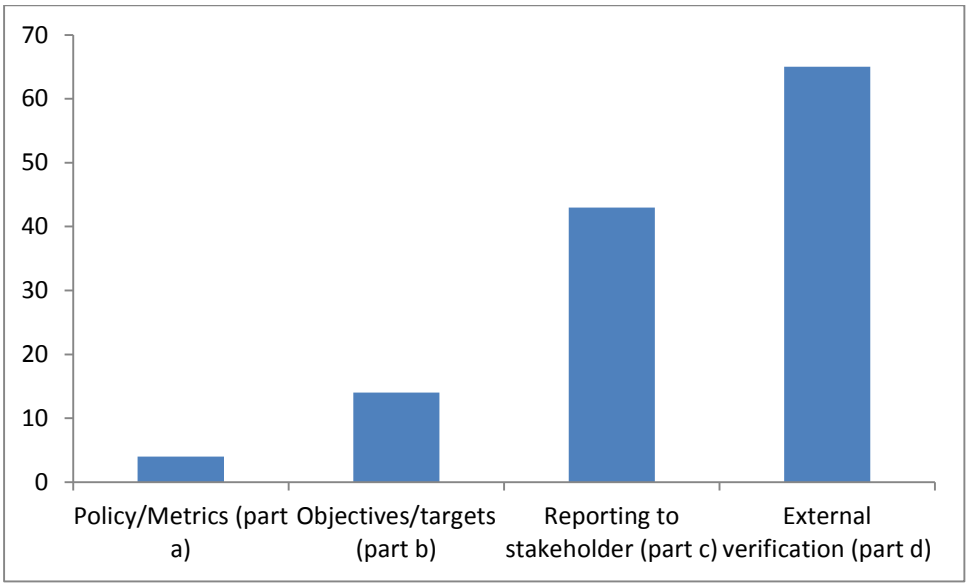

Figure 4: Number of BES 6001 certificates scoring points at each part of clause 3.4.2.

For those scores that achieved a 'pass' rating, 50% (3/6) scored the compulsory part only, but for 'good' certificates, 80% scored either five (53%; 26/49) or seven (27%; 13/49) credits and for 'very good' 95% scored either five (23%; 16/69) or seven (72%; 50/69) points.

Figure 5 highlights how well this clause was scored by different product sectors. As can be seen below, most product sectors were scoring the top marks (i.e. reporting to stakeholders and gaining verification of this data) for their greenhouse gas emissions. In the steel and roof tile product lines however, most certifications were only getting as far as part (b) – setting objectives and targets around performance.

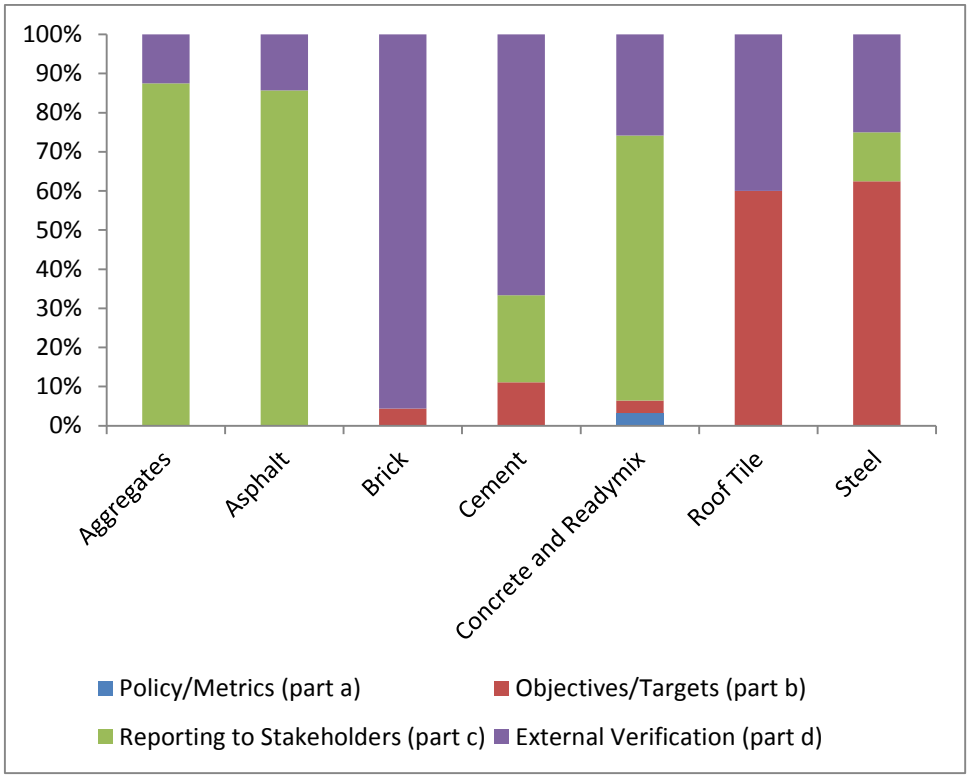

Figure 5: Percentage of certificates from different product sectors scoring each part of clause 3.4.2 of BES 6001.

4.2 Clause 3.4.3: Resource use

For this compulsory clause, 75% (94/126) of certifications scored the maximum number of points (seven) for this section, with another 14% (18/126) scoring five points, making it the best scored clause in the standard (in terms of proportion of certificates scoring the top marks). Figure 6 highlights the number of certifications awarded at each part of this clause.

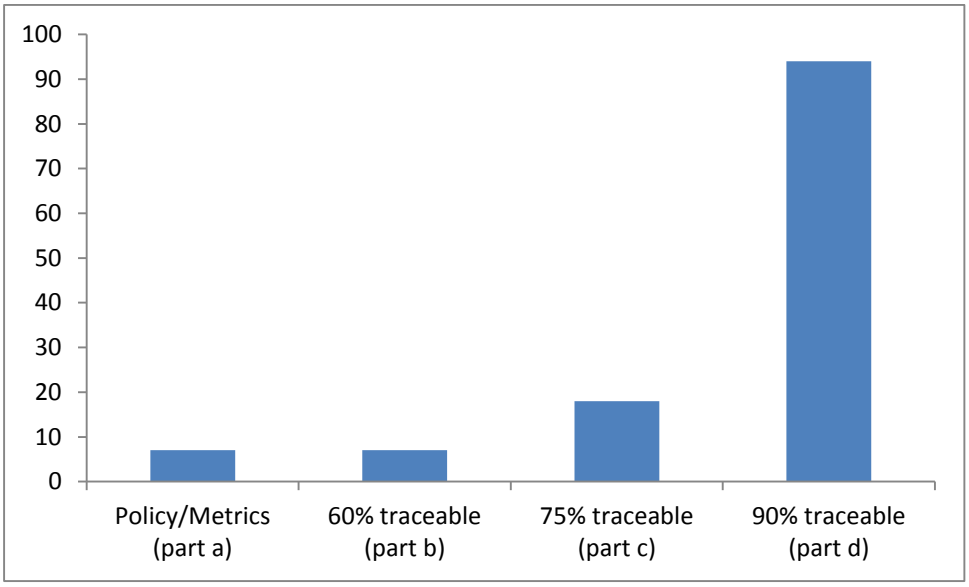

Figure 6: Number of certifications scoring to each part of clause 3.4.3 for resource use.

For those certifications that achieved a 'pass' rating (six in total), scores were fairly evenly distributed, with one third of the scores scoring the compulsory part only, another third scoring five points, and one sixth each scoring three and seven points. For those certifications awarded a 'good' rating, 59% (29/49) scored the top marks for this clause with 90% (62/69) of 'very good' certificates scoring the maximum number of points.

As in clause 3.3.2, the roof tile product line saw 100% of certifications score the maximum number of credits for this section. The concrete and ready-mix line of products was the sector with the lowest number (14/31; 45%) of certifications scoring the maximum number of credits and the highest number of certifications scoring clauses (a) or (b) only (5/31; 16%). This breakdown is illustrated in figure 7 below.

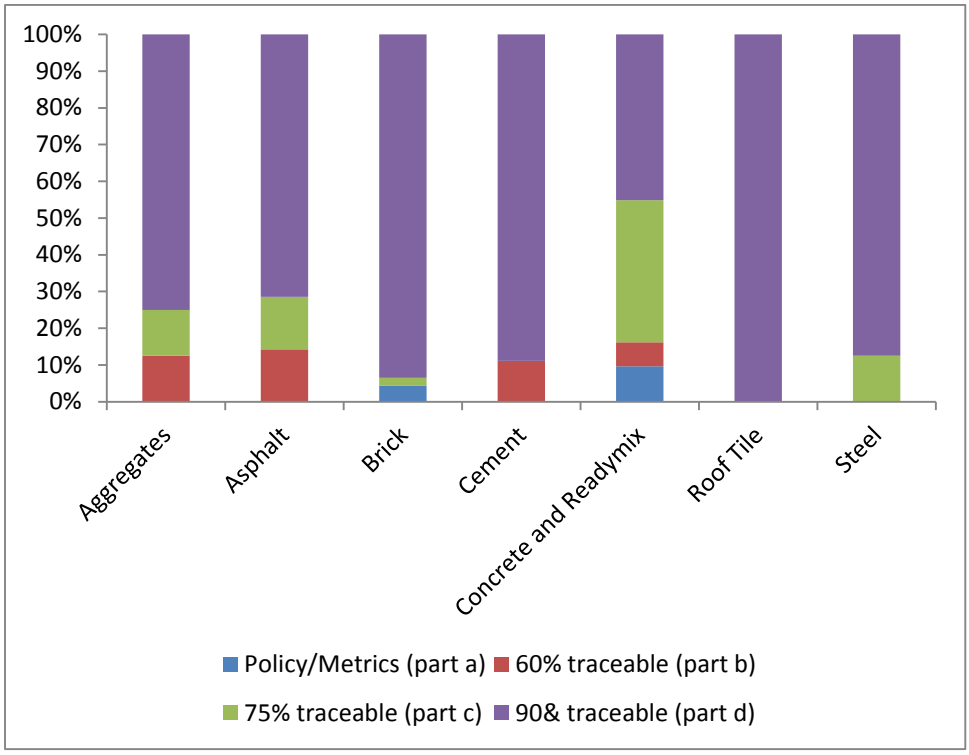

Figure 7: Percentage of certifications scoring at each part of clause 3.4.3 for resource use as defined by product sector

4.3 Clause 3.4.4: Waste management

This is a voluntary clause, yet only one score out of the 126 scores collated did not score at all on this section. 61/125 of the scoring certificates (49%) scored points for reporting to stakeholders and 39/125 (31%) scoring points for setting of objectives and targets on this section. Figure 8 highlights the number of certifications scoring each part of this clause.

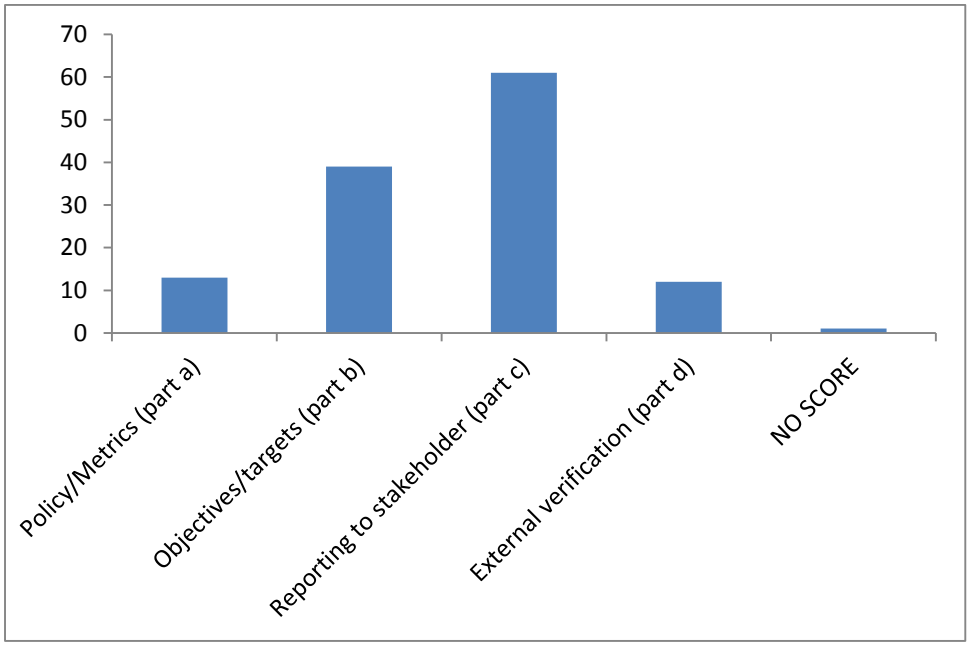

Figure 8: Number of certifications scoring to each part of clause 3.4.4 for waste management.

For those 'pass' level certifications, 4/6 (67%) scored credits for setting of objectives and targets, with 43% of 'good' certifications scoring credits for this. 33% (16/49) scored credits for reporting to stakeholders for the 'good' certifications while 64% (44/69) scored credits for this in the 'very good' certification set.

With regard to the product sectors, roof tile was again the best performing sector, with all (five) certifications awarded to this product sector scoring maximum points. Cement was the next best performing product sector, with 7/9 organisations scoring credits for reporting to stakeholders (three points) or for obtaining verification of data by a third party (four points). However, cement was also the only product sector where this section was not scored (one certificate out of nine did not score any points for this section). The percentage of certificates for each product group scoring points within each clause is highlighted below in figure 9.

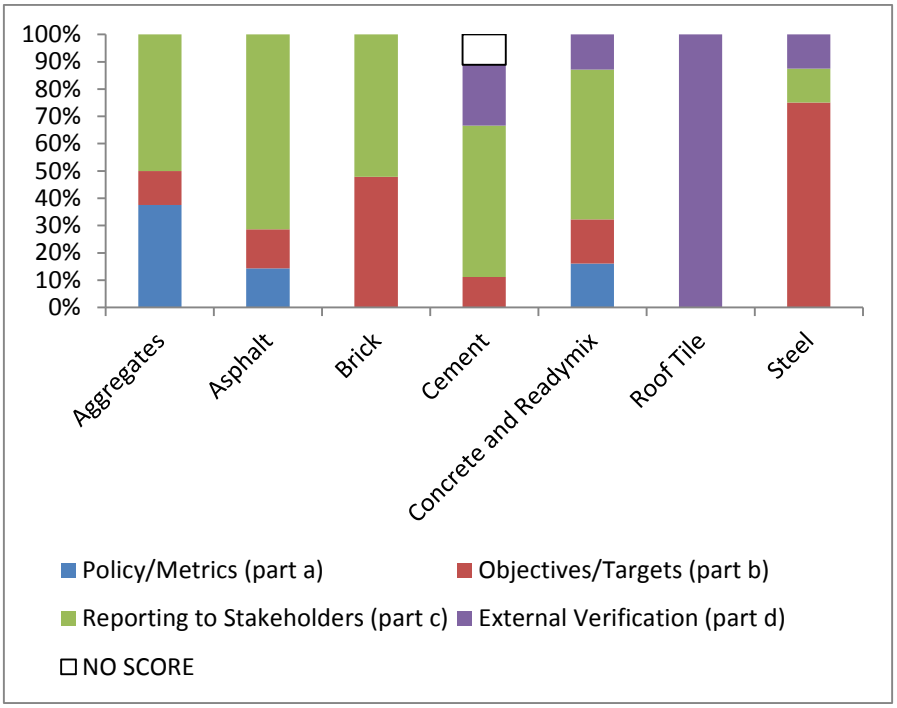

Figure 9: Percentage of certifications scoring at each part of clause 3.4.4 for waste management as defined by product sector.

4.4 Clause 3.4.5: Water extraction

As with the waste management clause discussed in the previous section, one of the certificates did not score on this section. Interestingly, this was the same product as did not score for waste management in the previous section. 59/125 (47%) of the certificates that scored for water extraction scored three out of the four credits available. 31% (39/125) scored two credits for setting of objectives and targets. The scoring of this clause is represented in figure 10 (below).

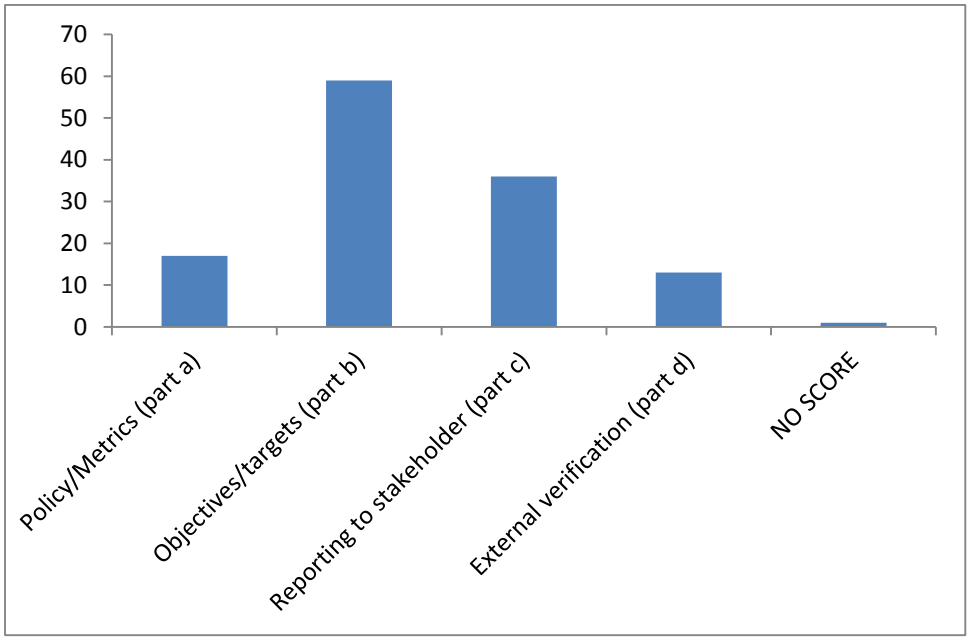

Figure 10: Number of certifications scoring to each part of clause 3.4.5 for water extraction.

For the six pass certificates that data are available for, three of these (50%) met the criteria under part (b) of this clause (setting of objectives and targets). Two of these only achieved part (a) and the remaining one met part (c). 98% (48/49) of certifications that scored a 'good' grade scored in this section, with 44% of these (21/48) scoring two credits. 33% (16/48) of the 'good' certifications scored three credits for this section. Interestingly, for 'very good' certifications, these figures are very similar, with 34/69 certificates (49%) scoring two credits and 23/69 (33%) scoring three credits. However, the proportion of certificates gaining third party verification of their reporting is, unsurprisingly, much higher for 'very good' certificates; 14% (10/69) as opposed to 1/49 (2%) for 'good' certificates.

With regard to the performance of different product sectors, roof tile was again the best performing sector, with all five certificates scoring the maximum number of credits in this section. Concrete and ready-mix was the next best performing sector with 74% (23/31) of certificates awarded three or four credits for this section. Although the asphalt sector had the highest percentage of certificates scoring only one or two credits (71%; 5/7), aggregates is the lowest performing sector due to its higher number of certificates only scoring one out of the four available credits; 50% (4/8) compared with 29% (2/7) for asphalt. However, due to the low sample sizes of these products, this effect can be assumed to be negligible. The

performance on this clause of the seven product sectors considered is shown below in figure 11.

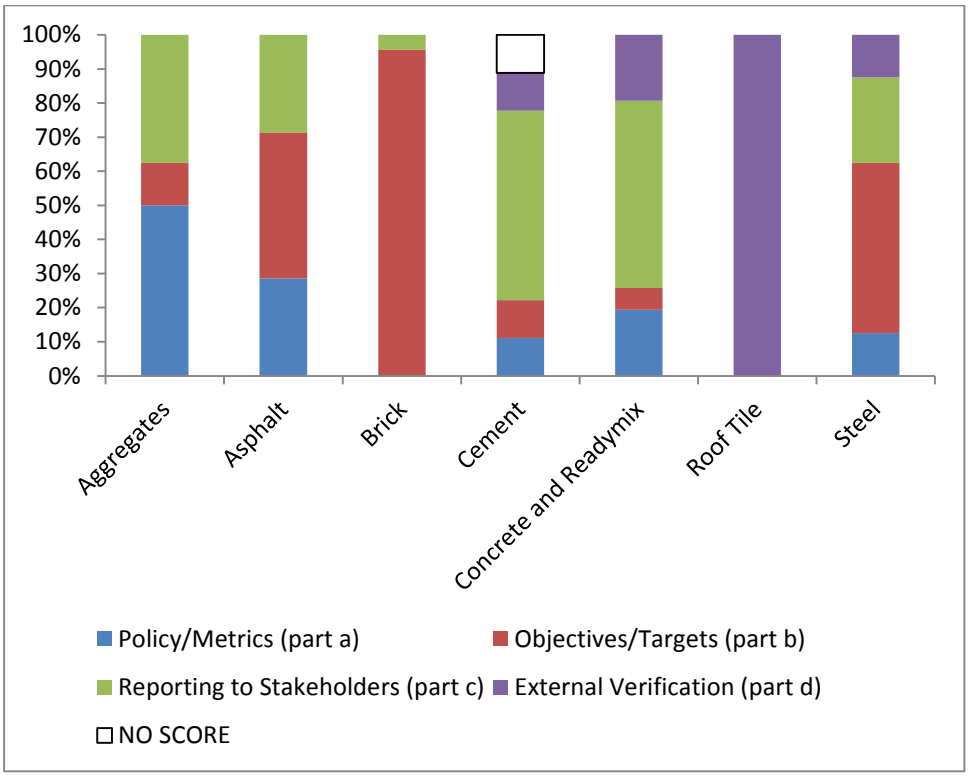

Figure 11: Percentage of certifications scoring at each part of clause 3.4.4 for water extraction as defined by product sector.

4.5 Clause 3.4.6: Life cycle assessment

The life cycle assessment clause is the most poorly scored clause within BES 6001, with 89/126 (71%) certificate scores that data are held for not scoring this clause. Of those certificates that did score this clause, only 14% (5/37) developed a full Type III Environmental Declaration, with only three of these reporting the results of this life cycle analysis to stakeholders. Figure 12 shows the number of certificates that scored this clause.

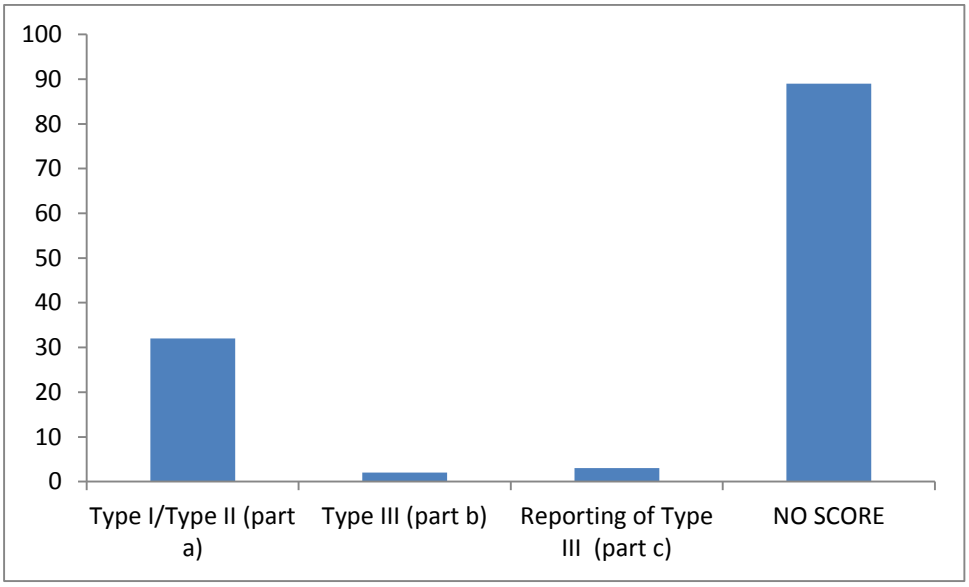

Figure 12: Number of certifications scoring to each part of clause 3.4.6 for lifecycle assessment.

Four out of the six (67%) pass certificates scored part (a) of this clause, with just 33% (two out of six not scoring the clause at all. Interestingly, 'good' certifications displayed a higher instance of not scoring the clause, with 32/49 (65%) of these not scoring. Further still, those 'very good' certificates had an instance of 80% (55/69) of certificates not scoring the clause. Only one of the 49 'good' certificates and three of the 69 'very good' certifications were awarded credits for a Type III Declaration; two of these 'very good' certifications reported to stakeholders on the lifecycle environmental impacts of their assessed product.

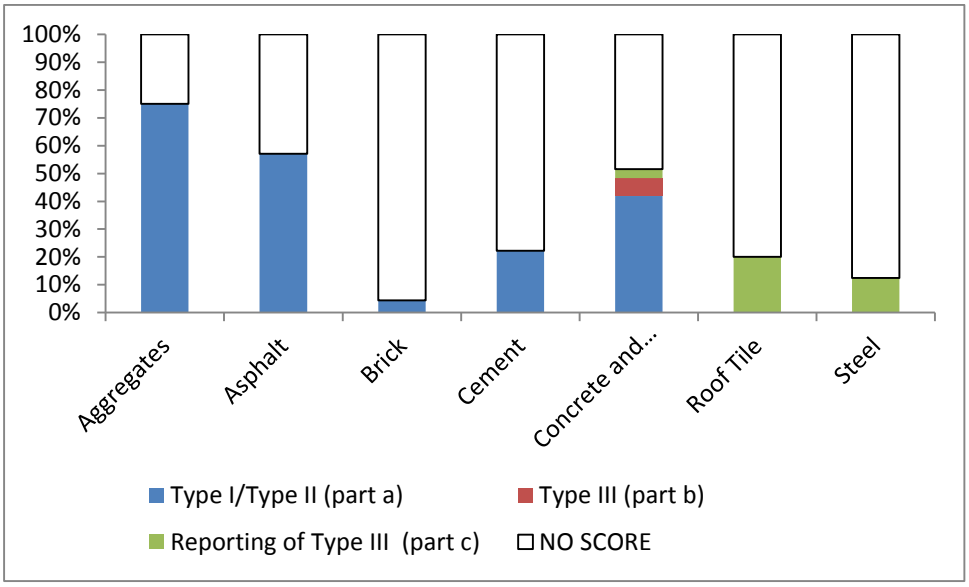

Figure 13: Percentage of certifications scoring at each part of clause 3.4.6 for lifecycle assessment as defined by product sector.

Figure 13 shows how each product sector fared in this clause and how well each of them scored. As can be seen, brick was the lowest performer, with only 2/46 (4%) certifications scoring, and these only scored part (a) of the clause. The concrete and ready-mix product sector is probably the best performer here. Although it has a lower percentage of certificates scoring this clause (52% compared with 75% and 57% for aggregates and asphalt respectively), due to its much larger data set (31 sets of scores compared with eight for aggregates and seven for asphalt) it has a higher number of certificates actually scoring the clause (16 certificates scoring the clause).

4.6 Clause 3.4.7: Transport impacts

This clause was scored by 90% (114/126) of certificates, with 61% of those (70/114) scoring two out of four credits for setting of objectives and targets. 28/114 certificates scored three points with 12 of the 126 certificates not scoring at all for this section. This is shown in figure 14.

Three out of the six pass certificates did not score for this clause, with one certificate scoring to each of part (a), part (b) and part (c). Five out of the 49 (10%) of the 'good' certificates did not score for this section, with 13 out of the remaining 44 that did (30%) scoring one out of four

credits, and 23 out of 44 (52%) scoring two credits. Four of the 69 (6%) 'very good' certification scores did not score for this section, but 69% (45/65) of those that did score this clause were awarded two out of four points, and 29% (19/45) were awarded three out of four points.

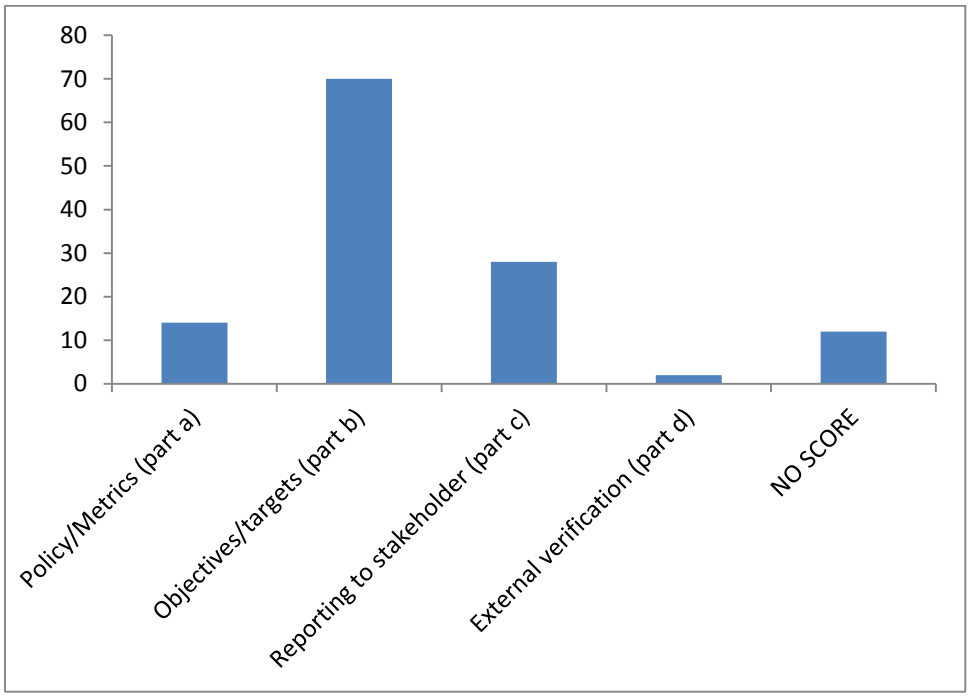

Figure 14: Number of certifications scoring to each part of clause 3.4.7 for transport impacts.

With regard to the performance of the different product sectors, it can be seen that a very small percentage of certificates (two out of the 114 certificates that scored on this clause scored four credits). The only product sectors that saw a certificate score the top marks were the cement and concrete sectors, with one certificate each. The best performing product sector was that of aggregates, as it was the only sector (apart from roof tile) that saw all its certifications score this section. The roof tile section, as can be seen below saw all certificates score under part (b) of this clause, and thus score two points out of four. Figure 15 highlights these data.

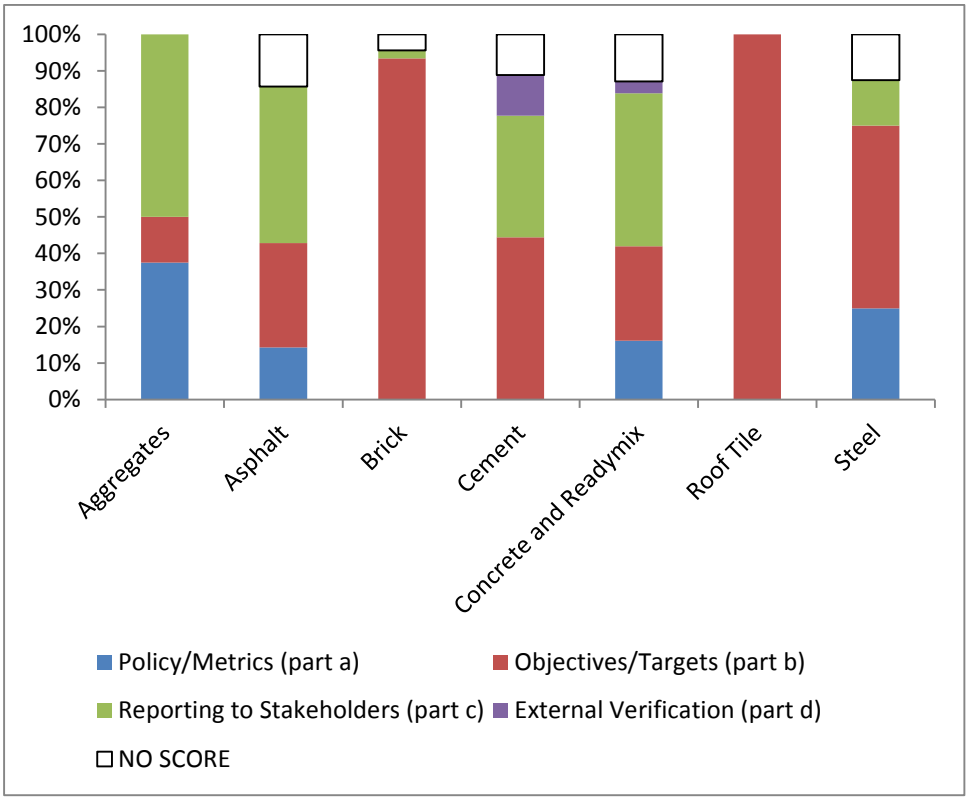

Figure 15: Percentage of certifications scoring at each part of clause 3.4.7 for transport impacts as defined by product sector.

4.7 Clause 3.4.8: Employment and skills

For this none compulsory clause, only three out of the 126 certifications that data are held for (2%) did not score this. Of the 123 that did score, 89 (72%) scored three out of four credits for reporting to stakeholders on performance on this clause. The number of organisations scoring credits at each part of the clause is indicated in figure 16.

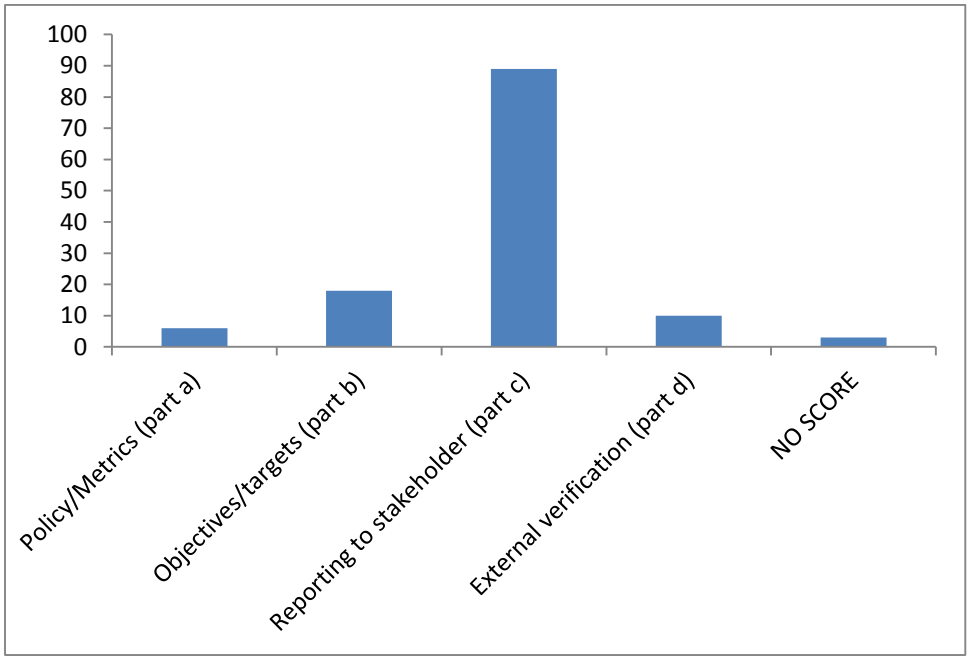

Figure 16: Number of certifications scoring to each part of clause 3.4.8 for employment and skills.

For the six certificates awarded a 'pass' rating, all of the certificates scored this clause to some degree, with two certificates scoring for setting of objectives and targets (two credits) and two certificates scoring for reporting to stakeholders on performance. For those certificates awarded a 'good' rating, two out of the 49 certificates did not score this section, with 30 out of the remaining 47 (64%) scoring three of the four available credits for reporting to stakeholders. For the 'very good' certifications, only one of the 69 certificates did not score with the majority (56/68; 82%) of those that did score this clause being awarded three credits for reporting performance to stakeholders. The number of certificates that obtained third party verification for their data in this area was low across the board (one out of six – 17% for 'pass'; three out of 47 – 6% for 'good'; and five out of 68 – 7% for 'very good').

With regard to product sectors, the only product to not score this section was concrete and ready-mix, with three out of the 31 scores (10%) not scoring this section. Figure 17 shows the performance of the different product sectors. Three out of the nine certifications (33%) scored maximum credits within the cement product sector, with another five of these (56%) scoring three out of four credits. Of the concrete and ready-mix sector that scored on this clause (28/31), 18/28 scored three credits (64%; 58% of the 31 certificates) and seven out of 28 that scored

credits scored the maximum (25%; 23% of the 31 certificates). For the roof tile product sector, 100% of certifications scored three out of the four credits available.

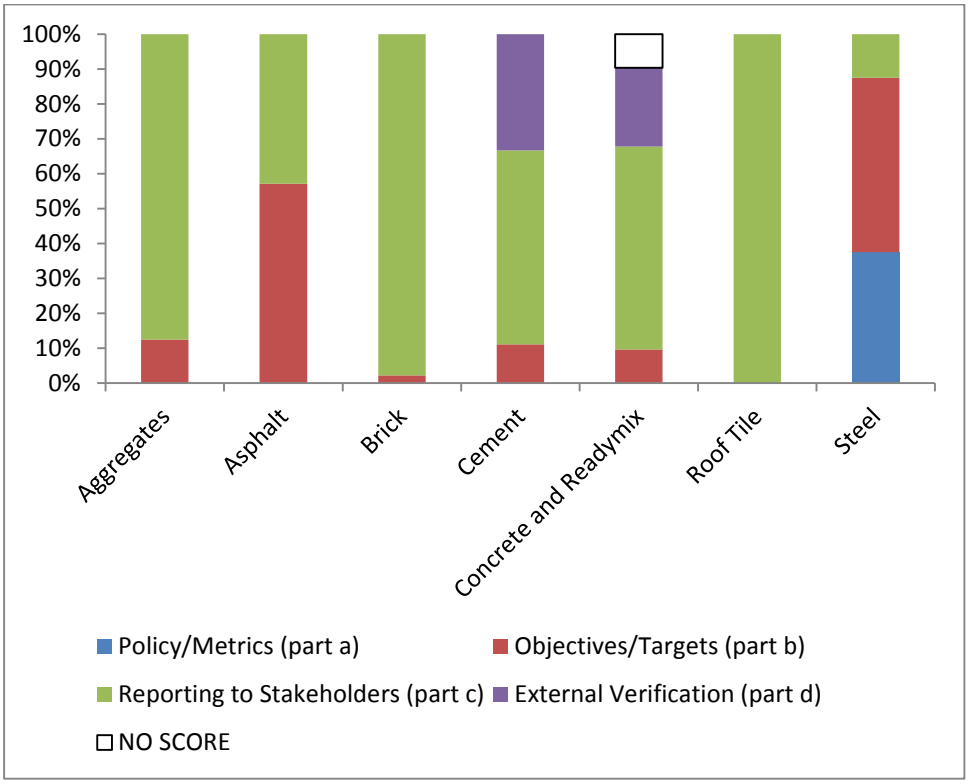

Figure 17: Percentage of certifications scoring at each part of clause 3.4.8 for employment and skills as defined by product sector.

4.8 Clause 3.4.9: Local communities

Ten out of the 126 certificates that data are held for did not score this section (8%) but out of those 116 that did, 77 (66%) scored three out of the four available credits. Figure 18 shows how this clause was scored by all the certificates that data are held for. As can be seen, scoring for the other parts of this clause was relatively similar.

Three out of the six pass certifications scored two out of four credits for setting of objectives and targets on this clause. For the 'good' certifications, eight out of 49 (16%) did not score this clause at all, with 21 of the remaining 41 that did score (51%) scoring three out of four credits for reporting performance to stakeholders. Ten out of 41 (24%) and nine out of 41 (22%) scored one and two credits respectively. All of the 'very good' certifications scored under this section,

with 55/69 (80%) scoring three out of four credits for reporting to stakeholders. Eight of these 69 (12%) obtained third party verification of this data reporting.

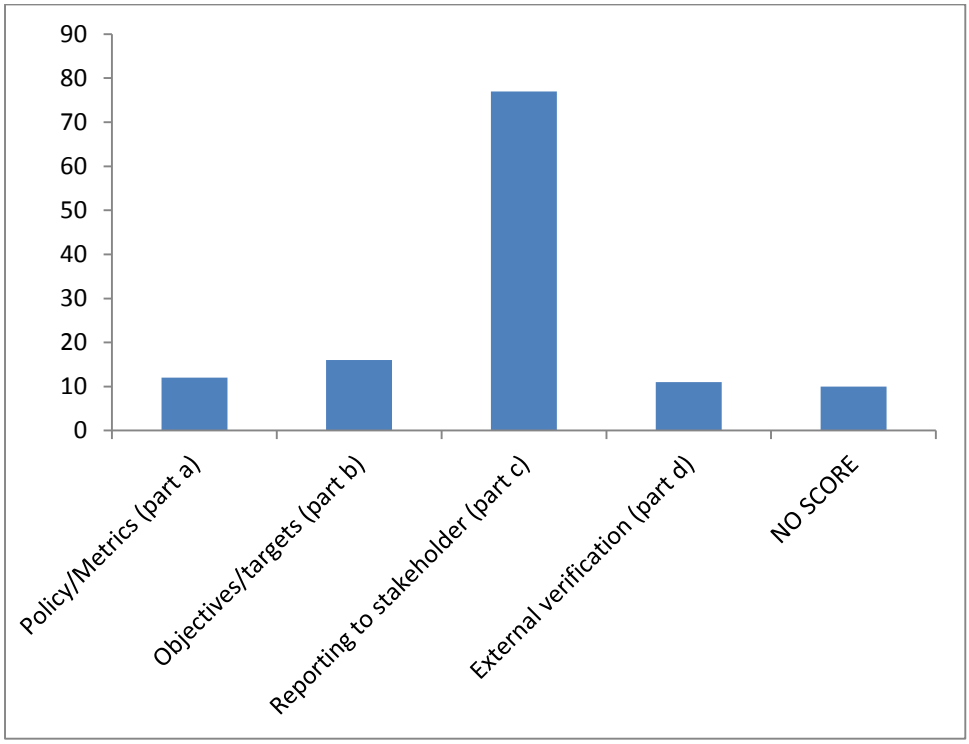

Figure 18: Number of certifications scoring to each part of clause 3.4.9 for local communities.

With regard to product sectors, roof tile was again the best performing sector, with 100% (five out of five) achieving maximum credits for this section. The cement and concrete product sectors were those in which some certificates did not score for this section; one out of nine and three out of 31 for cement and concrete respectively. For the brick sector, 96% (44 out of 46) of certifications scored three out of four credits with the majority of the aggregates product sector (five out of eight; 63%) also scoring part (c).

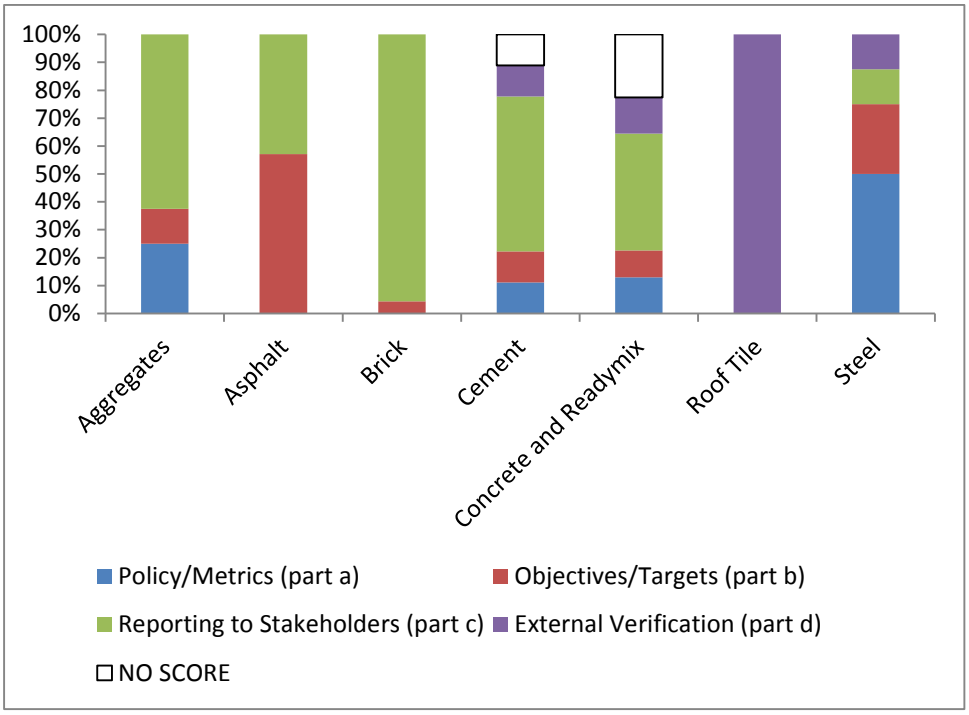

Figure 19: Percentage of certifications scoring at each part of clause 3.4.9 for local communities as defined by product sector.

5. CONCLUSIONS AND LIMITATIONS OF THIS STUDY

This report has presented the findings of some basic data analysis on scores that are held for 91 certificates and 126 different sets of scores. It has drawn conclusions for each of those clauses within the BES 6001 standard for which tiered scoring is available. This has been done by looking at the overall data set and breaking the data into categories of final assessment rating (i.e. pass, good, etc.) and into seven product sectors identified from the main data set for which a number of certifications had been carried out. Categorising the data in this way did result in some data loss when analysing by product sector, as for some products only a small amount of data were available (for example, only one certification was available in the data set for 'sand', and only three for 'building materials'.

This study has deduced that within section 3.3 of BES 6001, clauses 3.3.1 (material traceability in the supply chain) and 3.3.2 (environmental management systems in the supply chain) score very highly, with 97% and 84% respectively scoring credits for 75% or 90% traceability. Conversely, clause 3.3.3 (health and safety management systems in the supply chain) scores poorly, with 75% of certifications only scoring the compulsory credits.

Within section 3.4 of the standard, clause 3.4.3 (resource use) is the best performing clause, with 89% of certifications demonstrating either 75% or 90% traceability, of which 75% of these (94 out of 126) could demonstrate 90% traceability or better. Clause 3.4.3 is one of the compulsory clauses in the section of the standard, and perhaps unsurprisingly, the next best performing clause is clause 3.4.2 (greenhouse gas emissions; the other compulsory clause) with 86% (108 out of 126) of certifications scoring either five or seven credits. (The worst performing clause in this section was clause 3.4.6 (lifecycle assessment), with 71% (89 out of 126) not scoring at all. Employment and skills (clause 3.4.8) and Local communities (clause 3.4.9) also scored fairly well, with 79% (99 out of 126) and 70% (88 out of 126) respectively scoring either part (c) or part (d). Transport was the second most poorly scored clause, with 10% (12 out of 126) not scoring it at all and only 30 out of 126 (24%) scoring parts (c) or (d).

The bullet point list below contains some general trends relating to performance of the different product sectors and overall ratings:

- Certifications awarded a 'pass' rating generally scored best for setting of objectives and targets (part b) in section 3.4 of the standard.

- Certifications awarded a ‘good’ or a ‘very good’ rating generally scored best for reporting performance to stakeholders (part c) in section 3.4 of the standard.
- The aggregates, asphalt and concrete product sectors generally scored best on part (c) of section 3.4 for reporting performance to stakeholders. The average scores for all three of these sectors was six credits in the first part of the standard, and 25 credits in the second part of the standard, which is equivalent to a ‘good’ rating.
- The brick and cement product sectors generally scored best on part (b) of section 3.4 for setting of objectives and targets. On average, brick certifications scored five credits on the first part of the standard and 26 credits on the second part of the standard. Cement certificates scored on average seven credits and 26 credits on the two sections. Both of these are equivalent to a ‘very good’ rating.
- The roof tile product sector scored best on part (d) of section 3.4 for external verification of data reporting, scoring on average seven credits for the first part of the standard and 30 credits on the second part of the standard which is equivalent to a ‘very good’ rating.
- The steel product sector generally scored best on part (b) of section 3.4 for setting of objectives and targets. On average, steel scored six credits for the first part of the standard and 22 credits for the second part, which is equivalent to a ‘good’ rating.

This study however does have limitations with the data. The main issue is that some of the data sets for some of the product sectors are rather limited and so conclusions drawn from this part of the analysis must consider this. For example, the roof tile data set only contains five sets of scores and the asphalt data contains seven sets. Conversely, the brick product data set contains 46 sets of scores, although many of these scores are duplicates on the same certificate, which leads on to the next limitation of the study. Some of the certificates that data were received for had many different sets of scores on due to the scope of the product or site being certified. In the brick product data set, although there are 46 sets of scores, these are taken from a total of 15 certificates. Although not strictly a limitation, it should be taken into account when considering the implications of the results of the study. Finally, not all data were made available and some of the data contained within this analysis are old data (i.e. the three-year certification cycle has passed and companies have re-certified in some cases). It was not possible to include BSI data within this report as these were not made available in the necessary timescale to warrant their inclusion. Future work should look to ensure that all data are included in order to provide maximum benefit both industry and academia.

This report has highlighted the basic trends within BES 6001 certification scores that are held for three of the four certification bodies that offer certification to BES 6001. These findings indicate the areas of the standard where strong performance can be observed and also those areas of the standard where typically organisations struggle to score credits. It is hoped these data will feed into the BES 6001 consultation process, and hope to provide objective views about improvements that should be made to the standard.

APPENDIX E CASE STUDY PROTOCOL

1. Introduction

This case study protocol provides a framework for data collection and analysis for a comparative case study looking at two construction SMEs (small and medium sized businesses). Specifically, this protocol will introduce the aims of the research design including the research questions that the study will aim to answer, the theoretical framework for the case study and will provide guidance for reporting of the results.

This case study protocol will aim to guide the case study and will be developed and amended as the research project progresses where necessary. A record of amendments is indicated in table 1.

Amendment	Date	Reason for amendment
Edit of conceptual framework diagram	19/12/2012	Previous diagram flawed – updated 'force field analysis' diagram included as more germane to study.
General updates/amendments to text	19/12/2012	Reviewed by JG and AD; comments taken on board and incorporated into protocol.
Adding of more information from Dubois and Gadde (2002)	25/03/2013	Discussion to base paper on the Dubois and Gadde (2002) framework held with JG and AD.
Adding of information regarding validity	24/04/2013	Noted that protocol was lacking this.

Table 1: Record of amendments

1.1 Objectives

The aim of this study is to ascertain the challenges faced by an SME in obtaining certification to the responsible sourcing framework standard, BES 6001 (BRE, 2009), and how these play

out. Such challenges could be in the form of operational issues, such as current procedures or systems that may need to be changed in order to accommodate the principles of responsible sourcing. However, these challenges may be a more intangible form, such as allocation of time and financial resources to carry out any changes to systems or procedures. This study will therefore aim to determine the applicability of the standard to two very different construction SMEs both with relatively simple supply chains by considering the interaction of staff with the requirements of the standard. This interaction can be either direct, through carrying out activities according to procedures or principles, or indirect through developing documents, maintaining systems or carrying out training

In order to meet these aims, the study will aim to:

- Understand what benefits organisations get from compliance with sustainability standards;
- Understand the pre-existing motivations within each company to strive for sustainability and specifically towards responsible sourcing;
- Define which specific clauses of the standard were straightforward/challenging to meet and why this was the case;
- Determine how specific challenges were overcome;
- Determine how past challenges arising through management system implementation have been overcome;
- Assess the requirement of the need for both organisational and individual level learning in implementing the standard and how these requirements affect the implementation of the standard;
- Further understand the applicability of the current version of the BES 6001 standard to an SME.

Through meeting these aims, the study will hope to contribute to the literature by setting the scene with regard to BES 6001 (BRE, 2009) implementation, particularly at the SME level. It will also aim to highlight any issues with the applicability of the standard, and consequently the next steps for industry if responsible sourcing is to be fully embraced by all construction companies.

2. Research Process

2.1 Research Design

Yin (2009) states that a research design is a logic linking the data that needs to be collected to the conclusions that will be drawn to the initial questions of the study. This linking of the study research questions with the data is facilitated by a case study approach, which can enhance understanding of a complex issue and supplement previously understood theories (Dooley, 2002). Use of this type of research will reflect a 'real world' problem and will enable to application of theory and literature to real practice of a firm. In this case study, a particularly under-theorised concept will be considered 'in practice' and aim to draw conclusions to link industry with academia and define a future research agenda. Conducting a case study is an intensive process, yet will escape the 'ideal conditions' of laboratory or structured fieldwork. Dooley (2002) also highlights the potential of case study research to offer a mixed methodology for research, in that it enables observation of the phenomenon from multiple perspectives. Bell (1999) advocates the use of the case study method for individual researchers due to its ability to enable one particular aspect of a problem to be studied in depth within a limited time scale.

Furthermore, Dubois and Gadde (2002) state that conducting a case study provides a unique means of theory development, in that they consider in-depth insights of empirical phenomena and their contexts. They proceed to infer that case studies should not be treated as a linear process; rather that they should exploit the opportunities provided by them to employ means of intertwined research processes. An abductive approach to case study research requires an integrated approach due to the interrelatedness of the various characteristics of the research (Dubois and Gadde, 2002). By constantly switching between empirical observations and theory, it is possible to develop a greater understanding of both the empirical phenomena and theory (Dubois and Gadde, 2002). For these reasons, the BES 6001 implementation case study will use the Dubois and Gadde framework of systematic combining to shape the methodology of the study.

There are different case study designs that can be followed; single and multiple case studies and these can follow a holistic (single unit of analysis) or embedded (multiple units of analysis) design. Single case studies focus on one single 'case' occurring in some bounded context, with either a single unit of multiple units of analysis. Multiple case studies focus on two or more 'cases' which each either have a single unit or multiple units of analysis. Criticisms of single case designs tend to concern the uniqueness or artefactual conditions of the case which may

then cause scepticism about the ability to do empirical work beyond this single case study (Yin, 2009). This research project considered a multiple case design (two construction product manufacturers classed as SMEs) with a single unit of analysis (how sustainability certification is driven by the absorptive capacity of the firm).

2.2 Theoretical Framework

In conducting a case study, Yin (2009) states that it is important to firstly develop the theory as part of the design phase that the study will either test or develop upon. The 'case' can be defined as a phenomenon that occurs in some bounded context, which is essentially the unit of analysis for the study (Miles and Huberman, 1994). Furthermore, Dubois and Gadde (2002) suggest that the interaction between a phenomenon and its context is best understood through detailed case studies and that these will provide a unique way to develop theory by utilising detailed insights of empirical phenomena and their contexts. Case studies typically combine different data collection methods such as analysis of document archives, interviews of relevant personnel, questionnaires and observation (Eisenhardt, 1989). As such, they can offer a pragmatic research approach that utilises mixed methods, which fits in with the overall research methodology for the broader EngD.

For this study, sustainability is the key overarching theme. Many view sustainability as a form of environmental good practice and while this is partly true, it must not consider environmental issues in isolation, but must also equally consider the economy and society. In particular, sustainability certification among organisations is viewed as being the most tangible means through which a company can demonstrate its commitment to sustainability issues. In developing theory around organisational drivers for sustainability certification, the social structures within each organisation must be determined. Eisenhardt (1989) states that developing theory is a central activity in organisational research, but that there is also a lack of clarity around the process of actually building theory from cases.

This study will draw on current sustainability literature, much of which has linked certification with current corporate social responsibility debates. It will also consider the literature on absorptive capacity, which can be defined as the organisational capacity for learning and using new knowledge. It is important to consider this in tandem with the sustainability literature as a firm's absorptive capacity will to a certain extent dictate the ability of the firm to implement and manage new knowledge. Absorptive capacity includes a firm's overall capacity for

learning, implementation and internal dissemination of new knowledge and making use of new resources, including new technologies (Gray, 2010). Cepeda-Carrion *et al.* (2012) highlight that absorptive capacity is important for developing a company's innovation potential; sustainability certification can be seen as an innovation activity.

Absorptive capacity can be split into two different types; realised and potential. Realised absorptive capacity refers to a firm's ability to transform and exploit knowledge (Gray, 2010) and reflects the efficiency of leveraging externally absorbed knowledge (Cepeda-Carrion *et al.*, 2012). Potential absorptive capacity however, refers to a firm's ability to acquire and assimilate knowledge and involves the personal internal processes such as reflection, intuition and interpretation (Cepeda-Carrion *et al.*, 2012). Potential absorptive capacity is a concept that has received relatively little empirical attention when compared with relative absorptive capacity. Potential absorptive capacity requires change, flexibility and creativity (Cepeda-Carrion *et al.*, 2012) and so the extent to which a firm can acquire and assimilate knowledge will influence the extent to which that organisation is flexible and creative and can undergo change. In the context of this study, the implementation process at each company requires a certain degree of flexibility and creativity in order to adopt new systems or procedures to accommodate principles set out within the standard.

Miles and Huberman (1994) advocate that theory building, identifying categories of different events and/or behaviours, setting these out to determine the relative importance of each and the interrelationships between them will enable a conceptual framework to be established. A conceptual framework is important to build in this instance as there are a number of different constructs to understand within this study. Understanding the interrelationships between these is complex to envisage without graphical representation, thus accentuating the need to develop such a framework. However, Eisenhardt (1989) stresses the importance of avoiding giving too much consideration to specific relationships between variables and theories as much as possible in the initial stages of the study development.

For this reason, a preliminary framework has been developed below which indicates the relationships present and illustrates how these are likely to occur and interact with one another.

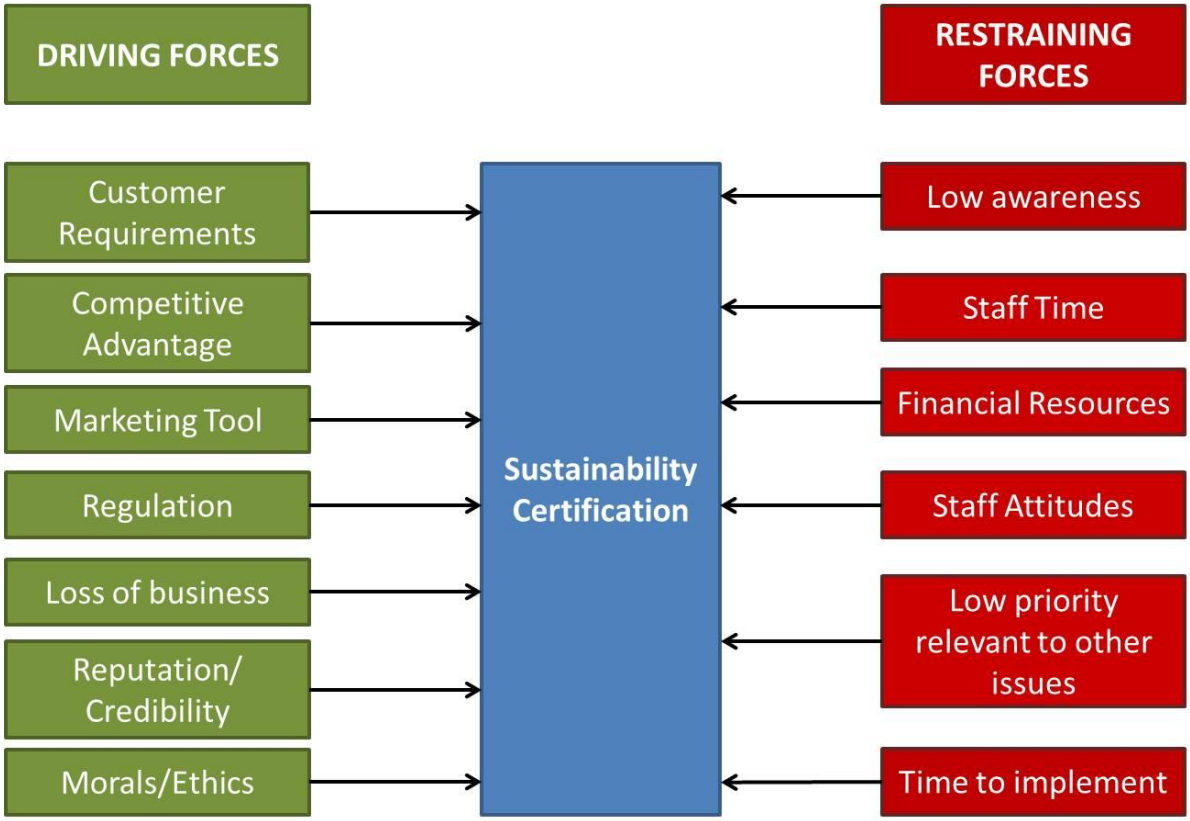

Figure 1: Conceptual Framework

This framework acts to depict how the key issues interlink with one another. This (figure 1) is a very simplified framework; many other issues interact with and between the issues highlighted in the figure. In simple terms, the figure highlights that responsible sourcing certification can only be achieved by an organisation if an appropriate level of organisational learning has been obtained. Organisational learning is only obtained once there is collective individual learning, and this cannot be achieved unless appropriate resources are provided. This serves to highlight the main topic for investigation in this case study – individual learning and hence absorptive capacity are key drivers for sustainability certification.

2.3 Ensuring Design Quality

Much of the following subsection is adapted from Yin (2009), who provides detailed coverage of each of the following issues.

Central to conducting a case study, and indeed any form of social research, is ensuring that the research design follows a logical method. Yin (2009) postulates that the quality of a research

design can be judged by applying logical tests to the research framework. He continues to introduce four tests that have been commonplace in establishing the quality of empirical social research, including case studies; construct validity, internal validity, external validity and reliability. Each of these four tests are important to consider for this case study, as a detailed consideration of each of the tactics proposed by Yin (2009) under each of these tests will ensure a robust case study methodology is obtained.

The construct validity test will ensure that the correct operational measures for the concept being studied; in this case sustainability certification within the organisation and the behaviours that this provokes, are identified. Essentially, this test aims to eliminate any potential for subjective judgements of the researcher that may influence the conclusions drawn from data collection. Yin (2009) argues, through use of an example, that in the absence of a prior specification of the significant operational events that constitute 'change', readers of the study are unable to verify whether the claims made by the researcher genuinely reflect what happens or whether they are subjective impressions only. To ensure that the construct validity test is met, two steps must be carried out by the researcher; define operational measures in terms of specific concepts and relate them to the original objectives of the study, and identify those operational measures that match the concepts of the study. In this study, the success of implementing sustainability certification in the company will be studied by using staff attitudes to change within the organisation as the measure. The construct validity of this case study will be further increased by collecting data from employees of two construction organisations and by establishing a chain of evidence – both tactics that are suggested by Yin (2009). Finally, case study reports will be developed for each organisation and will be provided to the Managing Director of each company (both key interviewees) for review.

The internal validity test will ensure that that a causal relationship is established, and will distinguish these from more spurious relationships (Yin, 2009). Internal validity is a main concern for case studies where the researcher is looking to establish how and why a certain event causes another to occur, such as in this study. Here, this study is looking to determine how and why differing staff attitudes and behaviours influence the success of implementing sustainability certification. Yin (2009) recognises the difficulties in identifying tactics to ensure that threats to internal validity are overcome and do not pose problems for the research design. Case studies will involve some degree of making inferences, but the broader concern of whether this inference can be considered correct or whether it has considered alternative explanations

or possibilities sufficiently must also be reflected upon to maintain a robust research design. Yin (2009) suggests that a researcher should employ tactics such as pattern matching (a comparison of an empirically based pattern with a predicted one or with several alternative predictions), explanation building (analysing the collected data by building an explanation about the case), addressing rival explanations and use of logic models to address internal validity.

The third test, external validity, concerns how generalizable the conclusions from the case study are beyond that particular study (Yin, 2009) and he continues to highlight that these pose significant problems when conducting case studies. Case studies rely on analytical generalisation, where the investigator is striving to generalise a particular set of results to some broader theory (Yin, 2009). This theory should be tested by replicating the findings in an additional case, where theory specifies that the same results should occur. Where direct replications occur, the results could then be accepted as providing strong support for the theory (Yin, 2009).

The final test concerns ensuring that if a later investigator were to repeat the methods of a particular case study and essentially repeat the study, that the same findings and conclusions would be drawn from the repeat study as the initial study. Yin (2009) suggests that documentation of the procedures in a case study protocol (such as this) and by developing a case study database will help to ensure that the case study method could be repeated in future.

2.4 Case Selection

The companies used as the case studies for this study are largely dictated to by the 'industrial' work that is on-going as part of the Doctor of Engineering (EngD) qualification. The sponsoring company in this case had already commenced working towards BES 6001 (BRE, 2009) certification with each of the companies that are the subject of this study. Therefore, although there was no 'pre-selection' process used to assess the suitability of each company as a subject for the research study, the use of these two companies presents a 'real world' issue in that the application of this research framework will provide an insight into sustainability certification in practice. In a study such as this, it is highlighted by Bryman (2009) that the organisation is the unit of analysis. It is expected that as SMEs are being studied in this case, the findings of the study would be germane to other SMEs.

Both companies are utilising the sponsoring company as a consultant for the certification process. Both companies in question are construction SMEs; a concrete block manufacturer with 34 employees and a natural stone producer with around 67 employees.

2.5 Research Questions

Following on from the development of a conceptual framework are the research questions (Miles and Huberman, 1994), although they also highlight that the formulation of these questions may also precede the development of a conceptual framework. Eisenhardt (1989) highlights that at least a broad initial definition of the research question is important in building theory from case-based research and that investigators should formulate a research problem and possibly specify some potentially important variables. The development of these questions will aim to address the key issues from these specific variables and the relationships highlighted within the framework.

Research questions are primarily developed in order to fulfil three main roles: they make the theoretical assumptions more explicit; they highlight what should be determined initially; and they provisionally set some boundaries for analysis (Miles and Huberman, 1994). Miles and Huberman (1994) also state that such research questions that operationalise the conceptual framework indicate a deductive model. Deductive models draw inferences from rules in which the consequences follow in a logical order from ideas (Urchs, 1997). Inductive models on the other hand, in simple terms, enable theory to be generated from the observations of the study. In empirical research such as this, observations made within each company or within interviews have considerable potential to build theory. It is, however, possible that both inductive and deductive approaches could be used. Dubois and Gadde (2002) suggest that such an approach is possible, through using a 'systematic combining' model, or an abductive approach. In this case, there is continuous movement between an empirical and a model world through this systematic combining (Dubois and Gadde, 2002). This enables the theoretical framework, empirical fieldwork and case analysis to evolve simultaneously. At the centre of this study are the main overarching research questions which determine what the study will aim to answer.

RQ1: What effect do staff attitudes and behaviour have on the success of implementing sustainability standards?

RQ2: How do the learning processes of SMEs overcome barriers to implementation?

3. Data Collection

3.1 Data Collection Methods

3.1.1 Documentation Review

Due to the nature of the work involved with the sponsoring company for the EngD, the implementation process has involved the researcher in the consultancy process. As much of this has centred around management systems present on site, meetings with each company to discuss any changes to existing documentation or the development of new documentation have been held. This has been a source of data collection in its own right.

In many ways, this stage acts as the 'desk study' phase, in that compiling data and producing documents will to an extent help with understanding internal procedures. This also provides the researcher with an opportunity to review documents and assess from existing documented procedures those staff members that would be pertinent to interview.

3.1.2 Observation

Through being involved on each of the company's sites, there have been opportunities to observe some of the production process and how the organisational culture defines individual behaviours. This data has been obtained by attending meetings with staff members on site (participatory observation) and site tours (non-participatory observation). In addition to this, due to one of the companies undergoing significant struggles with resourcing to facilitate implementation of the management systems, several days have been spent on site with one of the companies. This work consisted of acting as an employee of that company by completing work for them on site and holding meetings and informal discussions with staff members from across the organisation. Again, although not a formalised and consistent data collection process, it has provided important data that can be used to supplement the main data collection process, which is covered in a later section (chapter 3.1.4) of this protocol.

3.1.3 Selecting Participants

The research design requires that data be collected from individuals, of which interviews will be the main method of obtaining data. Two supplementary forms of data collection have already been discussed but data collection through interviews will provide a more structured means of generating data. Interviewing itself is a form of sampling, and selection of interview participants will be carried out by use of purposive sampling.

This form of sampling will involve looking at organograms of the two organisations involved in the study and selecting the most appropriate interviewees. In order to capture a representative sample of the case, it is important to interview employees from across the organisation. Therefore, participants will be selected and invited to interview from differing job roles. That said, it is important to note that data will be compared systematically across the cases.

3.1.4 Interviews

The primary means of data collection will be through holding interviews with different staff across the organisation. The profile and structure of each company can be split into three categories of staff from which data will be drawn; 'top level' management and directors; other office staff involved in sales process; and 'ground' staff working in the factory/quarry. The data collection process will aim to interview 2-3 staff members from within each of the categories per company, thus giving results from 12-18 interviews to analyse. Eisenhardt (1989) suggest that with fewer than four cases, it may be difficult to generate theory with any complexity and that the empirical grounding may be unconvincing, unless the case study contains 'mini-cases' within it. However, Yin (2009) argues that having at least two cases in a case study design should be the goal, and that in a situation where a single case study is being conducted a strong justification for using one case should be provided. Criticisms of single case designs tend to concern the uniqueness or artefactual conditions of the case which may then cause scepticism about the ability to do empirical work beyond this single case study (Yin, 2009). Yin (2009) continues to point out that two cases will reduce such fears and that the more cases, the stronger the effect on reducing criticism and scepticism. Dubois and Gadde (2002), on the other hand, state that attitudes towards taking preference over multiple case studies are *'relics of the times'* and suggest that any advantages gained by increasing the number of cases are countered by certain disadvantages (Dubois and Gadde, 2002). They suggest that researching a greater number of cases with the same resources will mean a greater breadth but less depth of analysis.

It is envisaged that interviews will need to be structured differently depending upon which type of staff are being interviewed. Yin (2009) postulates that the information must be interpreted as it is collected in order to address any contradictions in the data which may require further investigation. For this reason, all interviews will assume a semi-structured format, which enables the interview direction to be somewhat dictated to by those theoretical concepts that are perceived as important and the answers and points drawn upon by the interviewee.

Due to the data collection that has occurred to date through observation and through meetings at each company, it has been observed that within each company there is a very definite divide between top level management and the rest of the staff (other office staff and 'ground' staff) with regards to awareness of the implementation of the sustainability standards. The structure of the interview will have to take account of this as some questions and discussion relating to 'in-depth' detail of the implementation process may not be appropriate for some staff depending upon the level of interaction they have had with the standards. However, a key dimension of this study is to determine why this is the case, so interview questions will also have to consider this and attempt to uncover the reasons behind this divide.

3.2 Resources

All interviews will take place at the Head Offices of each company and will require recording and note taking equipment. Interviews will be held in the office of each staff member where possible so that the interviewees feel at ease and any documentation or access to computer systems is at hand. During data collection, each interview will be recorded where appropriate and supplemented with notes which will aim to capture data that is not obtainable by simply recording the interview, i.e. the interviewees' mannerisms, behaviour and body language.

A waterproof A4 folder will also be taken to interviews at each company and each one marked with the name of each. This will be used to store any interview transcripts or documentary evidence provided by each company. It is also likely that the research will require access to existing management systems documentation, or any procedures currently in operation within each company. The importance of such documents may become apparent through observation and work with the sponsoring company to assist each company in its implementation, but interviewees may highlight specific documentation that may be important to view. For this reason, a USB drive will also be taken to interviews so electronic copies of documents can be taken if required.

3.3 Ethical Clearance

In line with Loughborough University's ethical codes of practice, all interview participants will be provided with an information sheet which will detail the purpose of the study, the researcher's details and what will be required from each participant. All participants will be

informed of their right to withdraw from the study or interview at any time by contacting the researcher. Participants will be required to sign consent forms which will state that they agree to their interview transcripts being used as a data source and prior to recording any interviews, participants will be asked for their consent for this to be carried out.

3.4 Confidentiality

Due to the sensitive nature of personal information, no company or individual's names will be released or discussed in any outputs from this study. This will render identification of study participants or the companies involved impossible and this will be made clear to all participants prior to commencing data collection.

3.5 Schedule of data collection

It is envisaged that the formal data collection (conducting interviews) at each company will take place over one or two days spent on site. Collection of the supplementary data (observation, meeting participation and liaising on documentation development) has been ongoing since November 2011 with one of the companies, and since February 2012 with the other. As previously highlighted, this data consists mostly of notes taken during meetings in the form of remarks made by individuals or observations that the researcher has made, either in meetings or through site visits or walk rounds. At present, the timescale for completion of this study is aiming for completion of the cases by early 2013 with paper submission by March 2013. Although this appears to suggest tight timescales, given the volume of data already collected and the extent of data collection that is currently outstanding, this is an achievable target provided that the target dates for interviews are convenient for each of the companies.

4. Data Analysis

4.1 Coding Results

An important part of case study research is coding the results of interviews and other qualitative data so that conclusions can be drawn. It is a way of transforming data so that it can be used for analysis. Miles and Huberman (1994) suggest that the conceptual framework for the study should suggest a preliminary list of codes that can be used for the study.

In this study therefore, data could potentially be coded into that which pertains to the organisation and the certification scheme (those boxes enclosed by the 'organisational data' circle in figure 1) and those which pertain to organisational learning, individual learning and the availability of staff resources (the key resource being time).

All interview transcripts, recordings and documentation will be coded for each case. Data will be coded by use of the computer software NVivo, which will allow a comprehensive analysis of the data obtained. Use of such software will enable the researcher to primarily save time, but also use of such packages enables subtle differences that may not necessarily be obvious through manual analysis to be picked up.

4.2 Chronology

As case based approaches reflect theory in a single study in a single point in time, they can be used to trace events over time (Yin, 2009). Dubois and Gadde (2002) also suggest that findings from case studies become unstable over time. Chronologies have a significant analytical purpose – they can be used to investigate presumed causal events, because a causal event must precede an effect (Yin, 2009). In this particular study chronologies will consist of key decisions made in the certification process, key events (such as new training programmes) and the interactions of staff and their behavioural patterns. This study will aim to reflect those causal events that have occurred during the consultancy work that has been provided from the sponsoring company (as work has been on-going with each company for at least one year in each case) and the effects that these events have had on each company's current position with regard to the certification process.

4.3 Case Reports

Each company must be treated during the analysis stage as a single case, as stated by Dooley (2002). Conclusions that are drawn from each case can be considered in light of multiple-case phenomenon but each must be considered on its own. For this reason, the findings drawn from each case within this study will be communicated initially in a case report. This short report will introduce each case, explain the findings within each organisation and highlight the main conclusions from each case. These short reports will act as initial outputs for this study and will help to define the scope of the main output of this study – a full journal paper.

These short case reports contain the questions asked by the researcher and a summary of findings from the interviews. The reports will also cover the data collected, any problems or issues encountered and any other relevant data that may contribute towards the final output. These reports will consolidate all collected data together and will be used as an intermediate step to organise all data according to each case. This will then make a comparative study an easier task as all data will be in similar format across cases.

Once these case reports have been completed, a cross-case synthesis will be carried out (Yin, 2009). A cross-case synthesis is carried out in studies where there are at least two cases and can be carried out whether individual case studies have been conducted as independent studies or, such as in this study, as a predesigned part of the same study (Yin, 2009).

5. Interview Questions

The interview questions used for this study are detailed below. The interviews are structured into five sections comprising opening questions, challenges for the company, implementing change within the company, introduction of new procedures within the company and communication of change. A number of prompts were also used during the interviews; these are also included here.

Section 1: Opening Questions

- Describe your role within the company.
- How long have you worked for your company?
- * Have you always held the same position within your company?
    - What was your previous role?

Section 2: What are the main challenges facing your company?

- Are there any challenges emanating from the supply chain?
- How do economic or financial pressures affect projects?
- Tell me about the local community; do they create challenges or problems for the company?

- What is the impact of internal pressures on the company?
- Are there any industry or sector specific requirements that may pose a challenge for your company?

Section 3: How is change implemented within your company?

- Tell me about a time when something changed within the company.
  - What changed?
  - How were employees involved in this?
  - What were the drivers for introducing this change?
  - What barriers or challenges were faced in implementing this?
  - Did this change require any specialised training or skills?
  - Were any new responsibilities created as a result of this?
  - Were any new staff taken on or contracted to help introduce this change?
  - How did current staff react to the introduction of this change?
  - How well did it work?
  - Could anything have been improved about the process of introducing this change?
- * Were you aware that the company are working towards the BES 6001 standard for responsible sourcing?
  - How did you know about this?
  - What do you know about the BES 6001 standard?
  - Why has your company decided to work towards this certification?
  - Are you involved with implementing this at all?
  - To what extent has this affected your workload or priorities?

Section 4: Why are new initiatives or procedures implemented in your company?

- What impact do stakeholders have?
- * Is your company a member of a trade association?
    - Are any initiatives introduced because of the pressures of a trade association?
- What impact do the practices of competitors have on introducing new initiatives?
    - If a competitor does something, is your company likely to follow?
- What effect does cost have on implementing a new initiative?
    - Is cost the sole driver or are other factors considered?
- How do staff react to the introduction of new initiatives or procedures?
    - To what extent do problems arise when implementing change?
    - How does the company overcome these?

Section 5: How are these new initiatives communicated to employees?

- What channels of communication are used within the company?
- How effective are these?
- To what extent are communication channels in place between office based staff and workshop/factory based staff?
- How are staff educated about new initiatives?
- How often are staff provided with training?
- To what extent are opportunities to enrol on training events taken advantage of?

* If question is answered with 'no', move on to next question and do not ask sub-questions.

Prompts

- Responsible sourcing/BES 6001
- Environmental Management tools/ISO 14001
- Sustainability
- Ethics

- Attitudes
- Innovation
- Learning of new technology/procedures
- Internal communication
- Communication with stakeholders
- Training

6. References

Bell, J. (1999). Doing your research project: A guide for first-time researchers in education and social science, third edition. Open University Press, Buckingham, UK.

BRE Building Research Establishment (2009). Framework standard for the responsible sourcing of construction products. BRE, Watford, UK, BES 6001: Issue 2.0.

Bryman, A. (2009). Social Research Methods. Fourth Edition. Oxford. Oxford University Press.

Cepeda-Carrion, G., J. G. Cegarra-Navarro, D. Jimenez-Jimenez (2012). The Effect of Absorptive Capacity on Innovativeness: Context and Information Systems Capability as Catalysts. *British Journal of Management* **23**, 110-129.

Dooley, L. M. (2002). Case Study Research and Theory Building. *Advances in Developing Human Resources,* **4**(3), 335-354. Copyright 2002 Sage Publications.

Dubois, A., L. E. Gadde (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research* **55**, 553-560.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review,* **14**(4), 532-550.

Gray, C. (2010). Absorptive capacity, knowledge, management and innovation in entrepreneurial small firms. *International Journal of Entrepreneurial Behaviour and Research* **12**(6), 345-360.

Miles, M. B. and Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. London. Sage Publications.

Urchs, M. (1997). Deductive Models and Practical Reasoning. *Logic and Logical Philosophy* **5**, 149-165.

Yin, R. K. (2009). Case Study Research: Design and Methods. Fourth Edition. London. Sage Publications.

APPENDIX F PAPER 1: INTEGRATING RESPONSIBLE SOURCING IN THE CONSTRUCTION SUPPLY CHAIN

Full Reference

Upstill-Goddard, J, Glass, J, Dainty, A R J and Nicholson, I (2012). Integrating responsible sourcing in the construction supply chain. *In:* Smith, S. (2012) (ed). *Proceedings of the 28th Annual ARCOM Conference,* Edinburgh, 3-5 September 2012, 1311-1319.

Abstract

Certification to industry standards is the most tangible means for a company to prove its commitment to sustainability issues. The construction sector is of particular interest, due to the huge impacts of its operations. Many companies operating within the sector have implemented environmental management systems in line with ISO 14001 although recently the industry has become focused on the concept of responsible sourcing (RS); the ethical management of sustainability issues associated with products and materials in the construction supply chain. An adoption of this concept can be evidenced by certification to BES 6001, the framework standard for responsible sourcing. Despite this, the number of accreditations is relatively low and knowledge and awareness of RS is still limited. This review paper explores the reasons behind the under-emphasis of RS within the industry, despite a continually increasing knowledge of the Corporate Social Responsibility (CSR) agenda. Currently, opinion is divided on whether CSR and RS represent a form of corporate philanthropy or a channel by which revenue can be increased. The issue is further complicated by the presence of engineered-to-order (ETO) products, which creates barriers to the enactment of RS and CSR principles. These are explored and possible explanations for their absence from supply chain management issues offered. Furthermore, the potential to extend the interpretation and application of the ISO 14001 framework to demonstrate the consideration of these principles is presented. Other

certification schemes of particular significance to the industry and the problems for companies to achieve certification are also discussed; in particular, access to financial and other resources are identified as a key barrier to certification, especially for SMEs. Recommendations are made to for future research that might enable SMEs to achieve sustainability certification more readily and to help the industry embrace the concept of RS more broadly.

Keywords – corporate social responsibility, engineer-to-order, responsible sourcing, supply chain, sustainability certification

Paper type – Conference

1 INTRODUCTION

Construction has a significant impact upon the environment, economy and society, due to the large impacts of its operations and its consumption of vast amount of resources and energy (Czarnecki *et al.* 2010; Dixit *et al.* 2010; Sev, 2009). However, recent studies have indicated that in terms of being sustainability driven, the sector is somewhat lagging behind other sectors (Glass, 2011). In addition to this, the industry has a major impact upon society across the life cycle of its operations (Murray and Dainty, 2009), accounting for around half of all greenhouse gas (GHG) emissions (Greenwood *et al.* 2011). It is clear that, for the sector as a whole, there is scope for improvement and by aiming to work towards international standards, organisations can begin to manage their sustainability performance more effectively and hence observe reduced impacts. There does however, appear to be no clear definition of what constitutes sustainable construction or any consensus regarding sustainability measurement, despite a growing field of new technologies which aim to minimise negative environmental impacts (Wallhagen and Glaumann, 2011). Certification to industry standards is the most tangible means for a company to demonstrate its commitment to sustainability issues. The concept of 'sustainable development' has been increasingly viewed as being at the forefront of business agenda, and global acceptance of this term has resulted in a heavy focus, both from industry and policy makers, to address the issue of depleting resources and climate change. It has frequently become the focus of standardisation (Schwartz and Tilling, 2009) and hence a number of national and international certification bodies now exist, and widespread adoption of the increasing number of published standards has been observed.

This paper presents a literature synthesis which clarifies the current position of the industry, the effectiveness of implementation of sustainability certification and the challenges confronting the sector in moving forward. A number of issues are explored to unravel these challenges; in particular, the corporate social responsibility (CSR) agenda is considered in tandem with responsible sourcing (RS), and the effect that engineered-to-order products have upon it. However, RS is neither mandatory nor embraced outside of the UK (Glass, 2012), so the potential flexibility of ISO 14001 (BSI, 2004) standard for environmental management is also examined to determine whether this might offer an alternative route for RS implementation to yield greater adoption of the concept. Sources from academic research, industry and advisory bodies and government agencies are drawn upon to indicate the challenges in obtaining

certification, particularly for those companies classed as small and medium sized enterprises (SMEs). The conclusion is that the answers may be found in research which examines the interfaces between current standards, supply chain behaviours and societal expectations on construction.

2 SUSTAINABILITY AND CSR PRACTICES IN CONSTRUCTION

CSR is key to both international and sustainable development and although there are an increasing number of publications on the subject from a variety of different perspectives, the lack of a commonly accepted definition for CSR is still apparent (Aßlander, 2011). Indeed, given the social, economic and environmental impacts of the construction industry and its significance as an employer through the provision of work, it has been argued that that it is the area where perhaps the greatest level of attention should be devoted (Murray and Dainty, 2009). Many large firms, including those within the construction industry, have begun to compile annual reports on their sustainability performance (Glass, 2012), but the extent to which these address the three aspects of sustainability however, has been questioned. For example, Lozano and Huisingh (2011) find that in a sample of reports each aspect of sustainability is being addressed in a compartmentalised way. They argue that a more holistic approach should be adopted and that this should be integrated into corporate decision making. Similarly, Manetti (2011) finds that stakeholders are not engaged effectively in the decision making process of organisations, despite a number of international standards and reporting guidelines prescribing this stakeholder engagement as imperative (e.g. ISO 26000; BSI, 2010). Currently, debates on CSR see it as either a form of corporate philanthropy, or as a revenue opportunity, but much of the argument for CSR centres on morality and legitimacy; businesses should engage with it as it is seen as 'the right thing to do'. Yet Green (2009) states that neither profitability nor economic performance can be linked conclusively to CSR, which begs the question: why do organisations pursue with CSR policies when they do not appear to affect performance in a positive way? A fundamentally similar problem can be identified in the literature around environmental management; Heras-Saizarbitoria *et al.* (2011) find no evidence to suggest that financial performance is linked to EMS certification, but there is sufficient argument to suggest that the

widespread uptake of the ISO 14001 (BSI, 2004) standard occurred due to a common belief that it was morally correct to take a proactive approach to environmental issues. However, it is also true that the expectation of customers and employees is that organisations will possess CSR policies. Hence, there is potential value in considering the role of standards (i.e. certification and management system standards), both established and emergent as a novel lens through which CSR in construction can be viewed.

3 AN INCOMPLETE TRIO OF SUSTAINABILITY STANDARDS

Industrial sectors began to realise the impact of their operations in the early 1990s; the response was the development of a number of environmental assessment tools and certification schemes, such as the International ISO 14001 (BSI, 2004) standard for environmental management. ISO 14001 (BSI, 2004) has, since its inception in 1996, become one of the most widely used certification standards, with close to a quarter of a million certifications globally (Marsden, 2011). Indeed this widespread uptake is indicative of a general consensus among global businesses that an ISO 14001 (BSI, 2004) certification is particularly coveted; the generic nature of its structure renders it applicable to any organisation. ISO 14001 (BSI, 2004) is recognised as a robust standard for proving environmental pro-activity; its core aim is to ensure that the EMS is integrated with business goals, but Curkovic and Sroufe (2011) also note that should an organisation be convicted of an environmental non-compliance, proof that an EMS was in place at the time of the incident can lead to reduced penalties. So, it could be argued that such an approach provides an 'insurance policy' for that organisation, but can it do more?

An environmental management system (EMS) compliant with ISO 14001 (BSI, 2004) makes up one third, along with ISO 9001, the quality management system standard and OHSAS 18001, the occupational health and safety standard, of a trio of sustainability standards that are now widely required, strived for and legitimised in industry. For many years, certification to these three standards was generally viewed as adopting a sustainable approach to business, with the framework provided by EMS implementation seen as taking a proactive attitude to improving environmental performance. Importantly, ISO 14001 (BSI, 2004) does not cover all aspects of sustainability, so in isolation does not completely address sustainability as a concept,

but has potential for extending to consider social issues. The framework enables an organisation to reduce its negative impact on the environment by ensuring compliance with all relevant legislation, minimising pollution risks and committing to continually improve environmental performance (NB: there is considerable overlap between ISO 14001 and section 3.4 of BES 6001 (BRE, 2009) which also covers a number of environmental requirements required ISO 14001 (BSI, 2004), such as emissions of greenhouse gases, use of resources, and waste management among others). However, it is the consideration of social issues which appears to be missing from both ISO 14001 and the other standards in the aforementioned 'trio'. This gap is clear to see; Henriques (2012) explains that, despite its not being a certification or a management system standard, in a bid to demonstrate social responsibility, many companies are claiming compliance with the recently created standard, ISO 26000 (BSI, 2010), even though it is not possible to do so. A recent focus upon ethical and social issues, accentuated by media interest in a number of high profile cases, has certainly caused organisations to be more scrupulous regarding transparency of their operations and traceability of their products and services, particularly for those operating within construction. Although OHSAS 18001 covers some social attributes, there is a notable absence of issues such as fair labour standards and working conditions (outside of ISO 26000), and industry has begun to require that this subject area is addressed. For instance, within responsible sourcing (RS), certification to a framework standard; BES 6001 (BRE, 2009), developed by BRE Global, can prove traceability and transparency in a product supply chain, demonstrate a proactive approach to sustainability and provide a means for a company to enhance its reputation (Robinson *et al.* 2011), as discussed in the next section.

4 RESPONSIBLE SOURCING: FIVE PROBLEMS

Good corporate citizenship is of significant benefit to an organisation's reputation, which itself will act to increase turnover (Green, 2009). From a supply chain management perspective, engaging in CSR and certification to standards has become particularly important, as demand for supplier traceability information has increased. This is particularly true of the construction sector, where many materials are imported from regions where corruption and poor working conditions and standards are still widespread. Responsible Sourcing (RS) concerns the

management of sustainability issues within the supply chain, often considering ethical issues in detail (Glass *et al.* 2011) and has become a recent focus due to the published government target of 25% of all construction products to be sourced from RS schemes by 2012 (HM Government, 2008). Moreover, it is likely however that in future years, increasing numbers of building owners will demand RS certification in order to improve their confidence that their construction materials have been sourced with low ethical or legality risks (Glass, 2012). This can be linked to the CSR debate concerning the 'right thing to do' and given the number of high profile cases exposing large companies for using suppliers employing child labour and poor working practices, it seems rather apparent that adopting the RS framework set out in BES 6001 (BRE, 2009) should alleviate such fears and act as an additional method of risk-mitigation. RS thus appears to hold many benefits for organisations, yet the relatively low uptake of BES 6001 (BRE, 2009) is suggestive of the fact that there are potentially a number of issues with the standard.

First, RS has been somewhat under-emphasised and there has been very little research into RS as a concept; the absence of a focused research agenda has resulted in very little guidance for those operating within the sector and so evidence to suggest that this relatively unchartered territory has any benefits is scarce. At present, there is a developing body of research focusing explicitly on RS and its reception within the industry. The Action Programme for Responsible Sourcing (APRES) network (see Glass *et al.* 2011) is a research council funded project which aims to develop a knowledge base on RS and create new research ideas that will provide the construction sector with guidance on meeting both government and industry targets.

Secondly, as a result, many industry professionals, although aware of it, are yet to become familiar with the concept. Clearly, there is a real need to develop knowledge and awareness in this subject. Given that the target year has now been reached and widely varying ideas of what RS actually is still remain, it seems unlikely that this target will be met. This is caused by the lack of purchase of RS within the industry, which has led to a poor level of awareness; further exacerbated by the rather sporadic research and education on the subject. Glass *et al.* (2012) report that 94% of respondents to a survey felt that further publicity and awareness raising on RS was required. Awareness of the importance of RS is a prerequisite to adoption of the concept and hence certification to BES 6001 (BRE, 2009). Without this, construction companies are unlikely to engage with a concept that will just appear at the outset to be a rather costly and time-consuming process.

Thirdly, corporate decisions of whether to engage with RS are also influenced to some extent by the perceived risk associated within the supply chain; CSR is seen by many as a risk-mitigation strategy to offset the likelihood of customers boycotting products (Green, 2009). However, companies whose products have a low risk of negative exposure through the supply chain are arguably less likely to engage with the concept than those whose products are sourced from countries where there is a poor record of fair working conditions and corruption, for example. All this is undoubtedly true of a large multi-national corporation, who are often much more focused in the media spotlight than SMEs, which brings us to the fourth problem, that of asymmetry. This works the other way for an SME; the financial and other resources that are required to gain certification may be perceived as taking a large risk, as it is likely that this strain upon staff resources may result in diminished attention being given to other work. Such resource issues are likely to be the main barriers to take up of the standard for SMEs. Results of a recent survey (Glass *et al.* 2012) indicate that in addition to the cost associated with certification to BES 6001 (BRE, 2009), a lack of interest and understanding from clients and customers forms a major barrier to its uptake, creating participation asymmetry.

Finally, there is a problem of going 'beyond philanthropy'. As a moral issue, exploitation of child labour, poor working conditions and corruption are deemed as problems that are important to tackle. However, it is rather alarming that the results of a recent survey (Glass *et al.* 2012) should suggest that moral concern only extends as far philanthropic values, and does not hold significant influence within the business. Furthermore, it could be argued that at the organisational level, idealised notions of how to enact CSR will be very difficult to realise in practice - for this reason, issues such as RS are commonly relegated to a secondary priority until they are demanded by clients.

5 THE ISSUE OF ENGINEERED TO ORDER PRODUCTS

A number of problems have been outlined which create barriers to the uptake of RS as a mechanism to enact CSR in construction. However, adoption of RS is further complicated by the presence of engineer-to-order (ETO) products, which are rather noticeably absent from supply chain management debates, so here we consider ETOs in greater detail. Similarly to RS,

there is a great deal of confusion and uncertainty surrounding the definition and strategy for the ETO sector (Gosling and Naim, 2009). The ETO supply chain is typically regarded as one where the decoupling point is located at the design-stage (Gosling and Naim, 2009). It is particularly relevant to this debate, as it tends to be associated with large scale projects in sectors such as construction. It is considered as a complex and time-consuming process due to the number of stages that must be completed after the product design stage, and often there is a necessity to source suppliers to co-develop the product (Amrani *et al.* 2010). Product designers are often under pressure to develop a broad range of design solutions to address customer-specific requirements, and as these variants tend to be individually developed on a project-to-project basis (Brière-Côté *et al.* 2009) they become a complex issue to manage. Finally, the high levels of customisation associated with ETO products leads to increased costs, higher risks and long lead times (Hicks *et al.* 2000) and Cheng *et al.* (2010) indicate the complex nature of construction supply chains and that they are typically made up of a wide range of participants. Indeed, such complexities are identified in Gosling and Naim (2009) as a root cause for the relative lack of research attention to ETO supply chains, when compared with those in the high volume, standardised supply chains, such as that of the make-to-stock (MTS) chain. As customers can specify customised options within ETO product lines, there are potentially a number of different sources that such custom products could be sourced which complicates the application of an RS framework, such as that of BES 6001 (BRE, 2009). It is thus significant that all the products that have been certified under BES 6001 (BRE, 2009) to date are from MTS supply chains; none are from ETOs which again indicates a further problem of asymmetry.

6 DISCUSSION

Robinson *et al.* (2011) suggest that engaging in sustainable practices is no longer viewed as complementary to a firm's corporate image or activities, but is seen as an increasingly integral part of doing business. Indeed, this supports the premise that CSR provides an increased revenue opportunity for organisations. In addition to this however, it is also true that the wider social good caused by the actions of an organisation can only ever be incidental to the interest in making

profit, as companies are legally bound to maximise profits for shareholders. Two major points of departure have emerged thus far, which are set out here in the context of the SME.

First, in the case of SMEs, raising the initial financial resources to gain certification often represent a significant proportion of an SME's turnover and hence becomes rather a significant barrier. As a result, the number of SME certifications to key standards remains very low and those who do so are motivated because they feel pressure to do so from companies higher up the supply chain; they feel that financial benefits will be gained indirectly through maintaining the business links with larger corporations further up the supply chain. Interestingly, both RS and ETO supply chains have been found to be subjects with a great deal of uncertainty and neither has had adequate exposure and research. It is important to determine what creates supply chain buy-in in MTS and ETO scenarios; with regard to RS, an organisation can only be as 'responsible' as its weakest link in the supply chain. This is a particularly difficult trajectory for SMEs operating within the ETO sector; such is the variation of projects that they engage in and therefore variety of constituent materials.

Secondly, an extension of ISO 14001 (BSI, 2004) could render BES 6001 certification more straightforward; compartmentalisation of the aspects of sustainability is an issue that must be addressed and broadening such tools is the most appropriate mechanism to address this. This may be particularly relevant to an SME due to the resource issues they face coupled with reliance on informal procedures, rather than by adoption of a formal management system (Marsden, 2011). This is an example of a more social barrier; accreditation and quasi-accreditation are only part of the issue and may not overcome inertia in this area (e.g. a lack of adoption of such standards will not be completely resolved by making certification a more cost-effective process). Glass (2012) notes some fundamental problems with broadening the application of such tools to consider a more holistic approach, nevertheless, further research should be conducted to explore such opportunities (particularly given the informal adoption of ISO 26000 in practice).

7 CONCLUSIONS AND RECOMMENDATION

Although the corporate social responsibility (CSR) agenda has been adopted in construction, the adoption of the RS framework standard BES 6001 has been very low, particularly among small and medium sized firms (SMEs), despite there being strong links between CSR and RS.

Responsible sourcing is a particularly marginalised issue within the wider CSR agenda; it is yet to be embraced as a concept, thus it becomes a particularly interesting and important research topic. If improving image is becoming integral to the way in which business operates, then there is a particularly strong case to be had in engaging with the supply chain and integrating RS into common CSR practices.

Engineer-to-order (ETO) products have been presented as being of particular relevance to this debate, particularly as the construction industry tends to deal with a high proportion of ETO products. None of the BES 6001 (BRE, 2009) certified products fall into the ETO category, further accentuating the need for research, particularly given that the construction industry is becoming increasingly focused upon ETOs.

SMEs struggle to gain certification to standards and overall, there appears to be a reluctance of the construction industry to embrace and enact CSR for anything other than commercial reasons. This makes it problematic for standards such as BES 6001 (BRE, 2009) to have any real purchase within the industry. This, coupled with its apparent marginalisation has resulted in a poor rate of uptake.

Most fundamentally perhaps however, is to improve the current level of awareness of RS as this can almost be considered a prerequisite for adoption of RS as a concept. Extending the ISO 14001 (BSI, 2004) framework may be a solution to this, particularly for SMEs, as 'combining' these standards may enable easier certification for SMEs and may render certification more attractive.

We maintain that a new research nexus can be developed at the interface of current sustainability standards, emergent supply chain (moral) behaviours and broader, societal expectations on construction; this could lead to fascinating new insights for CSR and supply chain scholars.

8 ACKNOWLEDGEMENT

This research forms part of an Engineering Doctorate (EngD) programme, sponsored by Responsible Solutions and the Engineering and Physical Sciences Research Council (EPSRC), which is managed through the Centre for Innovative and Collaborative Construction

Engineering, based at the School of Civil and Building Engineering at Loughborough University. The support of all those parties is gratefully acknowledged.

9 REFERENCES

Amrani, A., Zouggar, S., Zolghadri, M., Girard, P. (2010). Towards a collaborative approach to sustain engineer-to-order manufacturing [Online]. Available at: http://www.ami-communities.eu/pub/bscw.cgi/d573353/Towards%20a%20collaborative%20approach%20to%20sustain%20engineer-to-order%20manufacturing.pdf [Accessed 20/04/2012].

Aßlander, M. S. (2011). Corporate Social Responsibility as Subsidiary Co-Responsibility: A Macroeconomic Perspective. Journal of Business Ethics, **99**, 115-128.

BRE Building Research Establishment (2009). Framework standard for the responsible sourcing of construction products. BRE, Watford, UK, BES 6001: Issue 2.0.

Brière-Côté, A., Rivest, L., Desrochers, A. (2009). Adaptive generic product structure modelling for design reuse in engineer-to-order products. Computers in Industry, **61**, 53-65.

BSI British Standards (2004). Environmental management systems. Requirements with guidance for use. BSI, London, BS EN ISO 14001: 2004.

BSI British Standards (2010). Guidance on social responsibility. BSI, London, BS EN ISO 26000: 2010.

Cheng, J. C. P., Law, K. H., Bjornsson, H., Jones, A., Sriram, R. D. (2010). Modeling and monitoring of construction supply chains. Advanced Engineering Informatics, **24**, 435-455.

Curkovic, S., R. Sroufe (2011). Using ISO 14001 to Promote a Sustainable Supply Chain Strategy. Business Strategy and the Environment, **20**, 77-93.

Czarnecki, L., Kaproti, M., Van Gernert, D. (2010). Sustainable Construction: Challenges, Contribution of Polymers, Researches Arena. Second International Conference on Sustainable Construction Materials and Technologies, 28th-30th June 2010.

Dixit, M. K., Fernández-Solís, J. L., Lavy, S., Culp, C. H. (2010). Identification of parameters for embodied energy measurement: A literature review. Energy and Buildings, **42**, 1238-1247.

Glass, J. (2011). The state of sustainability reporting in the construction sector. International Journal of the Smart and Sustainable Built Environment, **1**(1), forthcoming.

Glass, J. (2012). Extending the concept and validity of responsible sourcing certification through environmental product declarations, 1st Building Sustainability Assessment Conference, BSA 2012, 23-25 May, Porto, Portugal.

Glass, J., Achour, N., Parry, T., Nicholson, I. (2011) The role of responsible sourcing in creating a sustainable construction supply-chain, CIB W65 Supply-chain integration workshop, MISBE 2011, 20-23 June 2011, Amsterdam.

Glass, J., Achour, N., Parry, T., Nicholson, I., Upstill-Goddard, J. (2012). Responsible Sourcing of Construction Products and Materials: Results from an industry survey. Concrete, February 2012, 47-49.

Gosling, J., Naim, M. M. (2009). Engineer-to-order supply chain management: A literature review and research agenda. International Journal of Production Economics, **122**, 741-754.

Green, S. (2009). The evolution of corporate social responsibility in construction: Defining the parameters. In Murray, M. and Dainty, A (eds.), Corporate Social Responsibility in the Construction Industry, 24-53, Taylor and Francis Group.

Greenwood, D., Alwan, Z., Hudson, G., Siddall, M., Walker, P. (2011). A process model for sustainable design of buildings — towards an adaptable 'route map' for green code compliance. Built and Natural Environment Research Papers, **4**(1), 11-19.

Haapio, A., Viitaniemi, P. (2008). A critical review of building environmental assessment tools. Environmental Impact Assessment Review, **28**, 469-482.

Henriques, A. (2012). Standards for change?: ISO 26000 and sustainable development. International Institute for Environment and Development, London.

Heras-Saizarbitoria, I., J. F. Molina-Azorín, G. P. M. Dick (2011). ISO 14001 certification and financial performance: selection-effect versus treatment-effect. Journal of Cleaner Production, **19**, 1-12.

Hicks, C., McGovern, T., Earl, C. F. (2000). Supply chain management: A strategic issue in engineer to order manufacturing. International Journal of Production Economics, **65**, 179-190.

HM Government (2008). Strategy for sustainable construction. Department of Business, Enterprise and Regulatory Reform, London.

Lozano, R., Huisingh, D. (2011). Inter-linking issues and dimensions in sustainability reporting. Journal of Cleaner Production, **19**, 99-107.

Manetti, G. (2011). The Quality of Stakeholder Engagement in Sustainability Reporting: Empirical Evidence and Critical Points. Corporate Social Responsibility and Environmental Management 18, 110-122.

Marsden, J. (2011). 14001: 15 years of progress? IEMA: The Environmentalist (July 2011 edition). LexisNexis, Surrey. 18-22.

Murray, M., Dainty, A. (2009) (eds.). Corporate Social Responsibility in the Construction Industry. Taylor and Francis Group.

Robinson, M., A. Kleffner, S. Bertels (2011). Signaling Sustainability Leadership: Empirical Evidence of the Value of DJSI Membership. Journal of Business Ethics, **101**, 493505.

Schwartz, B., Tilling, K. (2009). 'ISO-lating' Corporate Social Responsibility in the Organizational Context: A Dissenting Interpretation of ISO 26000. Corporate Social Responsibility and Environmental Management, **16**, 289-299.

Wallhagen, M., Glaumann, M. (2011). Design consequences of differences in building assessment tools: a case study. Building Research & Information, **39**(1), 16-33.

APPENDIX G PAPER 2: CHARACTERISING THE RELATIONSHIP BETWEEN RESPONSIBLE SOURCING AND ORGANISATIONAL REPUTATION IN CONSTRUCTION FIRMS

Full Reference

Upstill-Goddard, J, Glass, J, Dainty, A R J and Nicholson, I (2013). Characterising the relationship between responsible sourcing and organisational reputation in construction firms. *In: Proceedings of the Sustainable Building and Construction Conference,* Coventry, 3-5 July 2013, 215-224.

Abstract

Responsible Sourcing (RS), the ethical management of sustainability issues through the construction supply chain, first achieved national prominence in the UK 2008 Strategy for Sustainable Construction. This set a target for 25% of all construction products to be sourced from schemes recognized for RS by 2012. The Building Research Establishment (BRE) published a framework standard, BES 6001, in 2009 to enable construction firms to certify their products as responsibly sourced to help achieve this target; since then, 80 BES 6001 certificates have been issued to around 40 companies in the UK. RS has its roots in the corporate social responsibility (CSR) agenda and, although it has become a distinct focus within procurement and sustainability management practices in some firms, it is still an under-theorised concept; understanding the role it plays in relation to an organisation's reputation is a subject area that is noticeably absent from the literature. Although it has been suggested that robust links between the broader CSR agenda and corporate reputation are yet to be established, there is evidence that reputational protection is a key driver for an organisation to engage with RS. Based on a critical review of the literature, this paper aims to stimulate debate on the characteristics of organisational reputation in construction firms and understand the relationship

between RS and reputation. It takes into account internal and external stakeholders' perspectives and the extent to which focussing on protecting reputation can or should take precedence over bottom-line benefits.

Keywords – Corporate social responsibility; reputation; responsible sourcing; risk

Paper type – Conference

1 INTRODUCTION

Sustainability has, in recent years, become a core focus of the construction industry. When compared with other sectors however, the industry has struggled to implement sustainability principles (Glass 2011). Furthermore, the industry has been identified as one of particularly high social and environmental impact, given the life-cycle of its operations (Murray and Dainty, 2009), its high proportion of greenhouse gas (GHG) emissions (Greenwood *et al.* 2011) and its role in providing employment for c.3million people in the UK (Equality and Human Rights Commission, 2010). As a result, Sev (2009) and Hawkins and McKittrick (2012) have suggested that construction is important in the context of the three pillars of sustainability; i.e. environmental impacts, impacts upon society and its economic significance.

Following recognition that the sustainability performance of the sector was wanting, the Strategy for Sustainable Construction (HM Government, 2008) was developed to bridge the gap between actual and desired industry performance. Within the strategy, a number of commitments were agreed between industry and government, with overarching targets. One of these targets, under the Materials heading, was for the industry to source 25% of materials from schemes recognised for responsible sourcing (RS) by 2012. However, understanding and awareness of responsible sourcing is somewhat lacking (Glass *et al.* 2012).

Many construction organisations have already achieved certification to the Building Research Establishment (BRE) developed framework standard for responsible sourcing, BES 6001 (BRE, 2009). Furthermore, the BRE Environmental Assessment Method (BREEAM) awards credits under the Materials section for RS, which obliges some construction organisations to engage with RS, in response to clients' demands to achieve these credits. Similarly, credits for RS of materials are also available in the Code for Sustainable Homes, and the Civil Engineering Environmental Quality Assessment Scheme, CEEQUAL. RS has its roots in the broad and ever-growing corporate social responsibility (CSR) agenda, within which current debates consider CSR to be a form of corporate philanthropy, or a means of generating revenue (Murray and Dainty, 2009). Currently, opinion is rather divided on this and this debate can be similarly attributed to RS. Although there is an expanding body of research on RS, mainly through the Action Programme for Responsible Sourcing (APRES; APRES, 2013) network, an Engineering and Physical Sciences Research Council (EPSRC) funded research project, there is a noticeable absence of literature which considers RS as representing corporate philanthropy; one of the key agendas being the link with corporate reputation. RS is inexorably linked to reputational theory,

given that one dimension of organisational behaviour is striving to be seen to have a positive impact upon society and the environment and hence good relationships with stakeholders. Ensuring that they also maintain a good reputation is seen as key to their success as a business, and given the current widespread focus on sustainability issues, engaging with sustainability and showing a proactive approach to it is seen as a key means of maintaining a positive reputation.

This paper critically reviews the concepts of reputational theory and behaviour, and through a thorough review of the literature and by use of examples, the links between reputation and CSR will be discussed. Furthermore, this link will be considered in the context of the RS agenda, given its focus upon ethical issues, as well as those affecting the environment and society. This is a timely contribution to the literature, given that the RS agenda is becoming increasingly important for the construction industry and strong links between RS and CSR have already been established (Upstill-Goddard *et al.* 2012).

2 ORGANISATIONAL BEHAVIOUR: A MORAL ISSUE?

Organisational behaviour and the relative importance of reputation within a company are arguably influenced by the individuals that make up the organisation. Successful introduction of sustainability principles – which can be considered as an organisational innovation –depends on employees' attitudes and support. This point is made by Thomas and Lamm (2012) who also suggest that organisational efforts to develop strategies to support sustainability would benefit from an increased understanding of attitudes that contribute to the legitimacy of sustainability. Large and multinational organisations are often found in the public spotlight and operations are scrutinised by consumers, competitors and the media; ensuring that they only appear in the public eye for the right reasons has become a key part of doing business. Previous research (Freeman 1984; Orlitzky *et al.* 2003; Porter and Kramer 2003) has established that stakeholders value sustainability; while this may resonate with the attitudes of the organisation, it does not always translate into practice. Traditional methods of engaging with sustainability have focused upon environmental issues, such as reducing waste or energy, whereas organisations should take a broader view of sustainability, addressing economic and social aspects holistically. It could be argued that many companies are engaged with environmental issues due to heightened public awareness. For example, many companies are reporting carbon

footprints at organisational and product level. The major societal focus on carbon in recent years is a key driver behind this; many individuals and companies have some awareness of carbon and how it contributes to climate change. Essentially, this comes down to the organisation's perception of risk, and what it considers high and low risk issues. For instance, it could be suggested that the carbon issue has become one of higher risk and so therefore organisations are more likely to identify it as a high risk issue affecting the business. Many of the aforementioned issues however, such as waste, carbon and energy, largely concern environmental impacts. Of equal importance, but of much less frequent consideration are social issues, such as ensuring fair labour practices and the effect that organisations have on local communities. Maintaining high social standards is a key risk issue as consumers and customers are increasingly considering ethics when making purchasing decisions.

There have been numerous examples of this company exposure in other sectors; Nike were exposed in the mid-1990's for use of child labour and sweatshops in Asian manufacturing sites, and Primark were exposed in the UK press as recently as 2009 for alleged use of illegal immigrants and poor working conditions at one of its UK suppliers (McDougall, 2009). This links directly to the concept of reputation; in the case of Nike, sales were reported to have fallen by 8% from 1998 to 1999 and stock fell by 15% (Wazir, 2001). Such exposure affects a significant number of consumers; Nike-branded apparel is popular on a global scale and linking the production of this to unethical treatment of workers and low levels of pay can cause consumers to deem ownership of such apparel as a statement of support or lack of care for such situations; they then seek out alternative companies to avoid being linked with such unethical practices. The underlying premise is that transparency should be key; an open, honest approach to how a company conducts its operations is more likely to resonate in a positive way with society. Doorey (2011) suggests that transparency can provoke learning and positive change within the organisation and that introducing some form of mandatory reporting for organisations might cause management within the company to focus on improving performance in areas such as ethics, thus reducing the likelihood of being exposed in the way that Nike and Primark were. Further to this, a high level of corporate social and environmental performance is often regarded as a potential source of competitive advantage (Thomas and Lamm, 2012). Similarly, a recent documentary looked at the human rights and ethical issues associated with the mining of coltan and cassiterite in the Democratic Republic of Congo (DRC). These metals are used in the production of mobile phones. The issues raised in this documentary should resonate with the vast majority of consumers, given that in 2011, global mobile phone

subscriptions reportedly rose to c.6bn (McQueeney, 2012). The documentary highlighted that ownership of a mobile phone, and sustained consumer demand for the latest upgrades and models is funding a war in DRC. There is currently relatively low awareness around these 'conflict minerals' however, and, unlike the case with Nike, it is unlikely that mobile phone companies will see a fall in consumer demand for new mobile phones. Worryingly, the documentary found little evidence that mobile phone companies were taking any action.

Of comparably low awareness are ethical issues within the construction supply chain. Many raw materials, such as natural stone or sand from quarries for example, have been found to be of high risk for exhibiting similar human rights and ethical issues. Vee and Skitmore (2003) find that 84% of respondents to a survey consider good ethical practice as a key organisational goal, and that 93% agree that organisational ethics should be driven by personal ethics. Clearly, the construction industry has a degree of ethical behaviour in place, but due to the high social risk that many construction materials exhibit, it is interesting to determine whether incidents of poor ethical behaviour exist. Ciliberti *et al.* (2008) find that companies in the developed world use various different strategies and tools to address CSR issues within their supply chains, such as management strategies for compliance and awareness-raising. For example, one of the major UK natural stone suppliers discovered on a routine visit to its suppliers' sites in Asia that, nearby, young children were actively working on site with no use of personal protective equipment (PPE). In this case, the company worked with local agencies to raise awareness and provide new PPE. Although the company addressed this issue largely due to morals, there is an argument that the company could have walked away from that particular supplier and opted to source its materials from elsewhere. While working and health and safety conditions were clearly in need of improvement, it is valid to suggest that without the UK company's custom, the supplier would suffer reduced business or not remain in business, which could impact in other negative ways, such as through causing employees to lose their jobs. Although in developed countries working conditions such as these would be deemed unethical, in many developing countries where poverty is commonplace, working in such conditions is actually preferable as it still provides a basic income, whereas the alternative may be a life of poverty in large cities.

It follows that companies that experience such 'success stories' would strive to publish such issues through case study reporting; a suitable means of which could be through corporate sustainability reporting. Indeed this form of disclosure arises from the social theory that the

organisation owes a duty to society (Reynolds and Yuthas, 2007). A recent survey (Kiron *et al.* 2012) reported that 70% of respondents felt that sustainability is important to their organisation and that it is necessary in order to appear competitive. The same survey also found that on the management agenda, sustainability ranks only eighth in importance. Morality and legitimacy can be linked to reputation, as high morals on the part of the organisation should have a positive effect on corporate image. Deephouse and Carter (2005) suggest organisational legitimacy is emphasised by social acceptance that results from adherence to social norms and expectations. In other words, legitimacy can be linked to ethical and moral norms, as these are influenced by society. They also infer that organisational reputation is a relative measure, as it considers a comparison between two or more organisations. This would appear to suggest that engaging with sustainability could increase an organisation's legitimacy, but an organisation's reputation would only increase provided that competitors of that company did not engage with the same level of sustainability. This would also imply that an organisation cannot have a reputation in the absence of other organisations, but can be seen as being a legitimate organisation. Perhaps, in that case, it should be argued that sustainability increases an organisation's legitimacy, as it enables the firm to be seen to be taking a positive approach to eradicating environmental and social issues within the supply chain. Society creates pressures for organisations to adopt sustainability practices (Caprar and Neville, 2012) and so an organisation that does not actively engage with sustainability may well be viewed as being less legitimate, and hence, may suffer a poorer reputation as other organisations and competitors do so.

However, despite this apparent link, corporate reputation is often considered as a particularly key intangible asset of organisations (Roberts and Dowling, 2002; Hillenbrand and Money, 2009). Linking to the work by Deephouse and Carter (2005), Bromley (2002) indicates that reputation is a concept 'held in the minds of stakeholders'. Previous studies have considered the stakeholder dimension as being entirely homogenous with regard to corporate responsibility expectations (Hillenbrand and Money, 2009), which presents a number of issues when considering corporate reputation, particularly in the context of Bromley's (2002) indication. Stakeholders cannot be regarded simply as homogenous entities due to the variety of complex social interactions that they experience which influence individuals' perceptions of an organisation. Thus morals and perceptions of social good are individual-level considerations and should be considered as such when considering reputation. This perhaps highlights the reason why a number of researchers have struggled to link CSR and reputation.

3 RESPONSIBLE SOURCING: A REPUTATIONAL INSURANCE POLICY?

3.1 Responsible sourcing and corporate social responsibility

Responsible sourcing (RS) of materials is the management of sustainability issues through the construction supply chain, often from an ethical perspective (Glass *et al.* 2011). It has become a defined area of interest in the construction industry since the Strategy for Sustainable Construction (HM Government, 2008) was published in 2008, which set a target for 25% of construction materials to come from schemes recognised for RS by 2012. The commitment to such a target led to the publication of the Building Research Establishment (BRE) standard BES 6001 (BRE, 2009), which provides a framework for construction organisations to gain RS certification for product(s). At the time of writing, around 80 certificates had been awarded to 40 companies. The standard covers many issues, grouped into three main sections: organisational management requirements, supply chain management requirements and environmental and social requirements. Certification to BES 6001 (BRE, 2009) is particularly sought after, as it provides a company with the knowledge that constituent materials have been sourced from suppliers where traceability and transparency can be proved. It not only evidences proactive consideration of the ethical issues in its supply chain, but also that it is tackling the wider sustainable agenda through implementation of suitable quality, environmental and health and safety management systems.

However, Glass *et al.* (2011) highlighted that knowledge and awareness of RS is relatively low and hence there is an absence of a focused research agenda. Furthermore, RS is neither mandatory nor embraced outside of the UK (Glass, 2012) and so there has been little to no consideration of the agenda on an international scale, which further impedes its uptake due to the international nature of many supply chains. Furthermore, Upstill-Goddard *et al.*, (2012) suggest that five key problems exist within the RS agenda, namely its under-emphasis within the construction industry, low levels of awareness and understanding, the issue of risk with regard to a company's products, asymmetry and its potential to be considered as a form of corporate philanthropy. This final point often leads to its relegation to a secondary priority until it is demanded by clients. Klassen and Vereecke (2012) do, however, indicate that many multinational companies are beginning to actively monitor ethical issues in their supply chains and so it appears that at least some of the principles of RS are being applied. RS is part of the

broader corporate social responsibility (CSR) agenda, which lends itself to many different interpretations due to a lack of a commonly accepted definition for CSR. It has been argued that the construction sector is one to which the greatest level of attention should be devoted, due to the significance of its operations and as a provider of employment (Murray and Dainty, 2009). Currently, CSR is seen from two key perspectives; as a revenue opportunity, or a form of corporate philanthropy. Much of the CSR literature considers morality and legitimacy; Upstill-Goddard *et al.* (2012) suggest that businesses should engage with it for moral reasons alone. Indeed certification to BES 6001 could be seen as philanthropy, as it shows the organisation possesses high morals and ethical values. Likewise, it can also be seen as a means of increasing revenue, as society is more likely to purchase products from companies with higher ethical values. It is also true that often, construction supply chains are relatively straightforward, and so enacting RS principles throughout these supply chains should be a relatively easy process, when compared with other high-technology sectors, for example. However, the construction supply chain still relies on sourcing some material from outside the UK, and as such, construction organisations can become part of global networks, and hence depend upon other members of the same network for knowledge and resources (Christopher and Gaudenzi, 2009).

It appears therefore that there are a number of benefits for an organisation in engaging with the sustainability agenda, although Caprar and Neville (2012) highlight that, despite the fact that these organisations are often subject to the same institutional pressures, some organisations implement sustainability in their activities, yet others do not.

3.2 Linking responsible sourcing to reputation

It has already been established that the responsible sourcing (RS) agenda sits within the corporate social responsibility (CSR) movement (Upstill-Goddard *et al.* 2012). Many past studies have sought, but struggled, to link CSR with high level of reputation (Hillenbrand and Money, 2009). Good reputation management is of high importance for organisations due to the increasing complexity of the social environments in which they operate where ever-more demanding standards are used to evaluate organisational performance (Bahr *et al.* 2010). As discussed, poor handling of social, ethical and environmental issues can have detrimental effects on corporate reputation. The examples given are just a few of the incidents that have occurred and have or could result in a reduced corporate reputation. Linking RS to reputation

thus becomes complex due to its relatively recent emergence as a concept. Glass *et al.* (2012) present findings from two industrial surveys which considered, among others, the current scope of RS, drivers, benefits and barriers for engaging, and the future for RS within the construction industry. Within this survey, 50% of respondents believed that RS is important for the company brand; a key driver for influencing stakeholder perceptions of that firm. Furthermore, 67% of respondents stated that adopting a proactive approach to implementing RS would have a positive effect on the company. Fundamentally, RS introduces a high degree of transparency and traceability with regard to materials; the Global Reporting Initiative (GRI; 2010) highlight the importance of transparency in gaining customer trust. The degree of customer and stakeholder trust determines the legitimacy of an organisation, and hence can impact significantly upon corporate reputation. For instance, CSR has been defined as 'reputation insurance' (Unerman, 2008) so being able to evidence that the firm is involved with the CSR agenda can act as a means of suppressing issues that may arise. In the case of an organisation that operates an environmental management system (EMS), for example, it may be eligible to have reduced fines if it can prove that an EMS was in operation at the time of an environmental incident. This could be argued to derive directly from an improved reputation that that firm may have received due to the environmental commitment that an EMS evidences. Similarly, engaging with RS should act as a form of insurance, if the organisation is subjected to ethical or social exposés, as certification should demonstrate organisational commitment to ethics and transparency. For example, Marks and Spencer's Plan A programme (Marks and Spencer, 2010) have set a number of targets round many of the principles of RS, such as reducing energy consumption, committing to zero operational and construction waste to landfill and embedding social equality in its supply chain by helping clothing suppliers pay a fair living wage in manufacturing countries, such as Bangladesh and India. Such targets are applicable to both Marks and Spencer's retail and property programmes and the recently constructed Cheshire Oaks Eco Store has won awards for its sustainability, with the store recognised as one of the largest sustainable retail stores globally (Marks and Spencer, 2013). This example highlights a client with RS well embedded in its processes and the reputational benefits that can flow from such an approach.

3.3 Reputation in the context of business priorities

Managing reputation has been suggested in preceding sections to be important for the firm, and for construction organisations, the RS agenda provides a means for them to demonstrate the importance that is given to social and environmental issues. However, it must also be considered that certification to the RS framework standard BES 6001 (BRE, 2009) can cost an organisation thousands of pounds. This may represent a significant challenge for smaller companies, which often struggle to provide adequate financial and other resources to implementation (Upstill-Goddard *et al.* 2012). Often, legislative demands take precedence over the corporate social responsibility (CSR) agenda as many CSR activities remain voluntary. It is also significant to add that many small and medium sized firms (SME) require a short-term pay back on investments, but large investments in sustainability certification schemes may be 'paid back' over a period of years. It therefore becomes considerably more difficult for an SME to manage its reputation, as the priority for any business is to make profit, especially so for an SME, given its limited resources. In the case of larger organisations however, there are considerably more resources available to devote to CSR schemes, and hence, there may be more scope to devote resources to reputation management. CSR activities such as publishing sustainability reports increase the reputation of the firm, as they directly report to stakeholders the actions that a firm is taking, to ensure that it is seen to be a considerate organisation. Working to improve corporate reputation by engaging in CSR should in the long term increase profits; indeed Du *et al.* (2010) argue that engaging in CSR can generate positive attitudes among stakeholders and in the long term improve corporate image and relationships with stakeholders. Yet the relatively low awareness of CSR among stakeholders impedes the realisation of the business benefits, which would suggest that there is currently a mismatch between CSR and gaining a return on the investment in these activities. This, however, is an area that warrants further research.

4 CONCLUSIONS

This review paper has demonstrated that an inherent relationship exists between corporate reputation and responsible sourcing (RS). The move of the construction industry towards considering RS on projects and in sourcing of materials for manufacture of construction products is a relatively recent development, and as such we have highlighted that a focused

research agenda is lacking; although the APRES network (APRES, 2013) has sought to address this and has hosted to date two successful conferences aiming to stimulate debate and thinking on an RS agenda. Given the past experiences of a number of organisations from other sectors, the construction industry can learn much from the results of the exposés of companies such as Nike. Construction is a sector of high social and environmental impact and thus it is important that construction organisations 'insure' themselves against unethical or irresponsible practices being unearthed in their supply chains. Specifically, due to the traceability requirements within BES 6001 (BRE, 2009), organisations can be assured that constituent materials are sourced from locations where the environment, the supply chain and health and safety have all been assessed and deemed satisfactory. However, RS does not presently make provisions for chain of custody (especially important for more complex supply chains) or materials that are procured by the organisation, but do not form part of the final product, such as personal protective equipment (PPE).

Reputation management, however, requires time and financial resources to enact within the firm, much like the CSR agenda. Implementation and documentation of RS principles within the organisation, such that they are of an appropriate standard to enable certification, is a time and cost intensive process. However, given the argument that a firm's reputation is dependent upon the presence of other firms, engaging with RS may not necessarily improve a firm's reputation, but it will improve its legitimacy because transparency and accountability has increased. A legitimate organisation can stand alone, as the literature has suggested, but the degree of this is influenced by the social acceptance that results from adherence to social norms and expectations (Deephouse and Carter, 2005). Equally, reputation is a relative measure and so engaging with RS would only improve the reputation of that firm should its direct competitors not achieve certification. It has been derived from this review, that although very little literature considers the link between CSR and reputation, there is a clear relationship between them, and future research should explore this in greater detail.

5 ACKNOWLEDGEMENTS

This research forms part of an Engineering Doctorate (EngD) programme, sponsored by Responsible Solutions Ltd and the Engineering and Physical Sciences Research Council (EPSRC), which is managed through the Centre for Innovative and Collaborative Construction

Engineering (CICE), based at the School of Civil and Building Engineering at Loughborough University. The support of all these parties is gratefully acknowledged.

6 REFERENCES

APRES (2013). *Action Programme for Responsible Sourcing.* Available online at: http://apres.lboro.ac.uk/

M. Bahr, J. Warburton, Y. van Gellecum and M. Shapiro, "Stakeholder perspectives of organisational reputation". *In "R. E. Hicks (Ed.), Personality and individual differences: Current directions"*, Bowen Hills: Australian Academic Press, 214-224 (2010).

Building Research Establishment (BRE), *BES 6001: Framework standard for the responsible sourcing of construction products*, Building Research Establishment, Watford (2009).

D. Bromley, "Comparing corporate reputations: league tables, quotients, benchmarks or case studies?" *Corporate Reputation Review*, **5** (1), 35-50.

D. V. Caprar and B. A. Neville, "'Norming' and 'Conforming': Integrating Cultural and Institutional Explanations for Sustainability Adoption in Business", *Journal of Business Ethics*, **110**, 231-245 (2012).

M. Christopher and B. Gaudenzi, "Exploiting knowledge across networks through reputation management", *Industrial Marketing Management*, **38**, 191-197 (2009).

F. Ciliberti, P. Pontrandolfo, B. Scozzi, "Investigating corporate responsibility in supply chains: a SME perspective", *Journal of Cleaner Production*, **16**, 1579-1588 (2008).

D. L. Deephouse and S. M. Carter, "An Examination of Differences Between Organizational Legitimacy and Organizational Reputation", *Journal of Management Studies*, **42** (2), 329-360 (2005).

D. J. Doorey, "The Transparent Supply Chain: from Resistance to Implementation at Nike and Levi Strauss", *Journal of Business Ethics*, **103**, 587-603 (2011).

S. Du, C. B. Bhattacharya and S. Sen, "Maximizing Business Returns to Corporate Social Responsibility (CSR): The Role of CSR Communication", *International Journal of Management Reviews*, **12** (1), 8-19 (2010).

Equality and Human Rights Commission (2010). *Inquiry into Race Discrimination in the*

Construction Industry: Action Plan. Available online at: http://www.equalityhumanrights.com/uploaded_files/action_plan_v3.pdf

R. E. Freeman, "Strategic management: A stakeholder approach", Boston: Pitman (1984).

J. Glass, "Extending the concept and validity of responsible sourcing certification through environmental product declarations", *1st Building Sustainability Assessment Conference,* Porto, Portugal (2012a).

J. Glass, "The state of sustainability reporting in the UK construction industry", *International Journal of the Smart and Sustainable Built Environment*, **1** (1), 87-104 (2012b).

J. Glass, N. Achour, T. Parry and I. Nicholson, "The role of responsible sourcing in creating a sustainable construction supply chain, CIB W65 Supply Chain integration workshop, Amsterdam, Netherlands (2011).

J. Glass, N. Achour, T. Parry, I. Nicholson and J. Upstill-Goddard, "Responsible sourcing of construction products and materials – results from an industry survey", *Concrete,* February 2012, 47-49 (2012).

Global Reporting Initiative (GRI), "The Transparent Economy – Six Tigers Stalk the Global Economy and How to Tame Them", *Global Reporting Initiative, Amsterdam* (2010).

D. Greenwood, Z. Alwan, G. Hudson, M. Siddall, P. Walker, "A process model for sustainable design of buildings – towards an adaptable 'route map' for green code compliance", *Built and Natural Environment Research Papers,* **4** (1), 11-19 (2011).

J. Hawkins and B. McKittrick, "Construction Sector Transparency Initiative: making construction more accountable", *Proceedings of the Institution of Civil Engineers, Civil Engineering*, **162** (CE2), 82-88 (2012).

C. Hillenbrand and K. Money, "Segmenting stakeholders in terms of Corporate Responsibility: Implications for Reputation Management", *Australasian Marketing Journal*, **17**, 99-105 (2009).

H M Government, *Strategy for sustainable construction*, Department of Business, Enterprise and Regulatory Reform, London (2008).

D. Kiron, N. Kruschwitz, K. Haanaes and I. von StrengVelken, "Sustainability nears a tipping point", *MIT Sloan Management Review*, **53** (2), 69-74 (2012).

R.D. Klassen and A. Vereecke, "Social issues in supply chains: Capabilities link

responsibility, risk (opportunity) and performance", International *Journal of Production Economics*, **140** (1), 103-115 (2012).

D. McDougall, "Primark in storm over conditions at UK supplier", *The Observer*, Sunday 11th January 2009. Available online at: http://www.guardian.co.uk/business/2009/jan/11/primark-ethical-business-living

K. McQueeney, "Disconnected: One Billion people still don't own a mobile phone, and a third of the world does not have access to the internet", *Mail Online*, Friday 12th October 2012. Available online at: http://www.dailymail.co.uk/news/article-2216625/Report-shows-1billion-people-dont-mobile-phone-half-world-access-internet.html#axzz2KgsuUMnJ

Marks and Spencer, "Doing The Right Thing – Our Plan A Commitments 2010-2015", *Marks and Spencer Group Plc.* (2010). Available online at: http://corporate.marksandspencer.com/documents/publications/2010/planacommitments2010

Marks and Spencer, "Cheshire Oaks Eco-Store", (2013). Available online at: http://plana.marksandspencer.com/we-are-doing/climate-change/cheshire-oaks

M. Murray and A. Dainty (Eds.), *Corporate Social Responsibility in the Construction Industry*, Taylor and Francis Group (2009).

M. Orlitzsky, F. L. Schmidt and S. L. Rynes, "Corporate social and financial performance: A meta-analysis", *Organization Studies*, **24** (3), 403-441 (2003).

M. Porter and M. Kramer, "Creating shared value", *Harvard Business Review*, **89** (1/2), 62-77 (2011).

M. Reynolds and K. Yuthas, "Moral Discourse and Corporate Social Responsibility Reporting", *Journal of Business Ethics*, **78**, 47-64 (2007).

P. W. Roberts and G. R. Dowling, "Corporate reputation and sustained superior financial performance", *Strategic Management Journal*, **23** (12), 1077-1094 (2002).

A. Sev, "How can the Construction Industry Contribute to Sustainable Development? A Conceptual Framework", *Sustainable Development*, **17**, 161-173 (2009).

T. E. Thomas and E. Lamm, "Legitimacy and Organisational Sustainability", *Journal of Business Ethics*, **110**, 191-203 (2012).

J. Unerman, "Strategic reputation risk management and CSR reporting", *Accounting, Auditing and Accountability Journal,* **21** (3), 362-364 (2008).

J. Upstill-Goddard, J. Glass, A. R. J. Dainty and I. Nicholson, "Integrating responsible sourcing in the construction supply chain", *Proceedings of the 28th Annual ARCOM Conference,* Edinburgh, UK, 1311-1319 (2012).

C. Vee, M. Skitmore, "Professional ethics in the construction industry", *Engineering, Construction and Architectural Management,* **10** (2), 117-127 (2003).

B. Wazir, "Nike accused of tolerating sweatshops", *The Observer,* 20th May 2001. Available online at: http://www.guardian.co.uk/world/2001/may/20/burhanwazir.theobserver

APPENDIX H PAPER 3: ANALYSIS OF RESPONSIBLE SOURCING PERFORMANCE IN BES 6001 CERTIFICATES

Full Reference

Upstill-Goddard, J, Glass, J, Dainty, A R J and Nicholson, I (2015). Analysis of responsible sourcing performance in BES 6001 certificates. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* 168(2), 71-81.

Abstract

Responsible sourcing (RS) of materials is defined as the ethical management of sustainability issues within the construction supply chain, and engagement is typically evidenced by certification to BES 6001, the framework standard for the responsible sourcing of construction products. Points are scored in BES 6001 under a number of clauses, yet little is known about RS practices. The aim was to extract knowledge about RS practices from all 138 nr. BES 6001 certificates issued to UK companies between 2008 and 2013. Data by performance rating, company size and product sector were analysed using Spearman's rho (ρ) and Cronbach's alpha (α). Performance against the life cycle assessment and resource use clauses was found not to significantly influence overall performance, so neither of these clauses can be assumed to represent good summary measures of sustainability performance. This suggests a refocusing of the scope of both these clauses might be appropriate in future developments of the standard.

Keywords – codes of practice and standards, corporate responsibility, sustainability

List of notation – ρ is the Spearman's rho correlation coefficient, α is Cronbach's alpha

Paper type – Journal

1 INTRODUCTION

The construction industry plays a key role in sustainable development (Sev, 2009), not least because the sector contributes around 7% of UK GDP (HM Government, 2013). A major part of this is the construction products sector, which has an annual turnover of over £50 billion and contributes around 4.5% to UK GDP (Construction Products Association; CPA, 2014). It provides essential materials for buildings, roads and highways and other infrastructure and contributes around one-third of total construction output and 10% of manufacturing output in the UK (CPA, 2014). Industry targets, such as those in the strategy for sustainable construction (HM Government, 2008), have shifted the focus towards embodied impacts, as well as operational impacts across the life cycle of a material, building or asset. Ghumra *et al.* (2011) report that assessment schemes such as the Building Research Establishment Environmental Assessment Method (BREEAM; BRE, 2011), and the Code for Sustainable Homes (CfSH; Department for Communities and Local Government, 2006), have directed this focus towards the built environment. Of particular relevance, as clients seek to maximise points in these schemes, is the traceability of materials used in construction, such that provenance is transparent and clearly communicated. Transparency (in this particular, supply chain focused, context) can be said to be obtained when all environmental and social impacts associated with that product are understood and communicated to stakeholders. One means of demonstrating this is through engaging with the concept of responsible sourcing (RS), which aims to demonstrate transparency with regard to the materials within a product. However, little is known about RS in practice, and so this research explores how the construction industry is approaching the RS agenda, through an analysis of performance of RS certificates.

2 CONTEXT

Responsible sourcing (RS) of construction products provides a means of managing sustainability issues associated with a product's supply chain, often from an ethical perspective (Glass, 2011). The 2008 strategy for sustainable construction (HM Government, 2008) set a national target of procuring 25% of construction materials from approved RS schemes by 2012. RS encourages organisations to examine in greater detail the transparency of constituent materials in products, and strives to eliminate negative social and environmental impacts from the supply chain. A key driver for engagement is that use of materials from RS schemes is

recognised through credits in BREEAM, CfSH, and Ceequal (the sustainability assessment, rating and awards scheme for civil engineering) (Ceequal, 2013). In 2008, the Building Research Establishment (BRE) launched BES 6001 (BRE, 2008), the framework standard for the responsible sourcing of construction products, with a second version launched a year later (BRE, 2009). To date, around 70 companies have obtained over 100 certificates for a range of different products (BRE, 2014a). Although RS engagement and certifications have increased in recent years, Young and Osmani (2013) report that literature on RS remains sparse, and furthermore, Glass (2011) and Glass *et al.* (2012) have highlighted the lack of a research agenda to drive awareness within industry and academia. Fundamentally, understanding of how to apply the concept appears limited in some sectors, and once an organisation has become BES 6001 (BRE, 2008; 2009) certified, the detail of how the organisation has scored against each clause in the standard and also how this might compare with similar products or organisations is not made public or shown on issued RS certificates. Communication of performance in such detail may result in improvements in understanding RS and application of BES 6001 (BRE, 2008; 2009) to different types of construction organisation.

The construction products sector is diverse and broad in nature; clearly, RS practices will differ between individual product sectors. For example, around 92% of the concrete industry (SCF, 2012) and 90% of the brick sector (BDA, 2012) are BES 6001 (BRE, 2008; 2009) certified. However, for other sectors, details of RS practices are limited, as suggested by evidence from Green Book Live (BRE, 2014b), an online reference source for environmental products and services. This can be attributed to differing approaches between sectors; for example, the concrete industry has online resources (The Concrete Centre, 2014) and industry guidance to support its constituent organisations in achieving BES 6001 (BRE, 2008; 2009) certification (SCF, 2010). By contrast, if sustainability publications from the natural stone sector are considered for example (Stone Federation, 2012a and 2012b), there is relatively little information on RS, and how firms might go about implementing RS practices, especially those categorised as small and medium sized (SMEs). It is widely accepted in the literature that SMEs tend to have limited access to resources to drive forward sustainability initiatives (e.g. Lee and Klassen, 2008) when compared with larger organisations, and yet figures quoted for the RS certified portion of the concrete industry suggest considerable engagement from the SME community.

Despite the burgeoning interest in RS, empirical studies of performance against a certification standard are sparse. By undertaking such research, a more rounded understanding of RS practices (between differing sub-sectors and between SMEs and non-SMEs) within the construction industry could be obtained. This would provide an improved understanding of how companies approach the standard and scoring patterns within RS certification.

3 BACKGROUND AND HYPOTHESES

BES 6001 (BRE, 2008; 2009) is a points-based standard; organisations are awarded points depending upon the level of compliance demonstrated under each clause. The standard is split into three sections (see table 1), but for scoring purposes, it is split into two; total score achieved in sections 3.2 for organisational management requirements and section 3.3 for supply chain management requirements, and total score achieved in section 3.4 for environmental and social requirements. It has a number of compulsory and optional elements, under which points are scored depending on the level of compliance. Depending upon the number of points that are scored, organisations are awarded a 'Pass', 'Good', 'Very Good', or 'Excellent' grade. Although certificates which have been issued under both versions one and two of BES 6001 (BRE, 2008; 2009) are used in this study, the majority fall under version two, so this is the main focus. The key difference between the two versions is the scoring of clause 3.4.6 for life cycle assessment (LCA) (see table 1), where three points had been available in part (a) of the clause in version one, but this was dropped to two points in version two.

Table 1: Structure of BES 6001 (figure adapted from BES 6001; BRE, 2009).

Section	**Element**			
3.2 Organisational Management Requirements	**(a) Compulsory (C)**	**(b) 1 point**		
3.2.1 Responsible sourcing policy	C			
3.2.2 Legal compliance	C			
3.2.3 Quality management system	C	ISO 9001 certified		
3.2.4 Supplier management system	C			
3.3 Supply Chain Management Requirements	**(a) Compulsory (C)**	**(b) 1 point**	**(c) 2 points**	**(d) 3 points**
3.3.1 Material traceability through the supply chain	C; 60% traceability	75% traceability	90% traceability	
3.3.2 Environmental management systems in the supply chain	C; Established 3.3.1 traceability to EMS	60% traceable to ISO 14001 sites	75% traceable to ISO 14001 sites	90% traceable to ISO 14001 sites
3.3.3 Health and safety management systems in the supply chain	C; Established 3.3.1 traceability to H&S MS	60% traceable to OHSAS 18001 sites	75% traceable to OHSAS 18001 sites	90% traceable to OHSAS 18001 sites
3.4 Environmental and Social Requirements	**(a) Policy/ Metrics**	**(b) Objectives/Targets**	**(c) Reporting performance**	**(d) External verification**
3.4.2 Greenhouse gas emissions	C+1	3	5	7
3.4.3 Resource use	C+1	3	5	7
3.4.4 Waste management	1	2	3	4
3.4.5 Water extraction	1	2	3	4
3.4.6 Lifecycle assessment	2	4	5	
3.4.7 Transport impacts	1	2	3	4
3.4.8 Employment and skills	1	2	3	4
3.4.9 Local communities	1	2	3	4

C=compulsory element. Numbers indicate points awarded for compliance with each tier of each clause. For section 3.4, all clauses follow a standard methodology, with first tier points awarded for the setting of a policy and metrics, second tier points awarded for the setting of objectives and targets, third tier points for reporting performance to stakeholders and top tier points awarded for external verification of these reported figures. The exceptions are clauses 3.4.3 and 3.4.6. Clause 3.4.3 for resource use does require as a mandatory element that a policy and metrics are set, but additional points are awarded for being able to demonstrate environmental stewardship at the source of constituent materials; three points for 60% traceability, five for 75% and seven for 90%. Clause 3.4.6 for lifecycle assessment awards points based on whether the organisation has developed any type of environmental label for their assessed product, with two points awarded for the development of a Type I or Type II environmental label, four points awarded for a Type III environmental label, or environmental product declaration (EPD), and five points are awarded for reporting the results of this EPD to stakeholders.

In total, nine points are available in sections 3.2 and 3.3, and 39 points available in section 3.4. Table 2 indicates how many points are required in each section to be awarded each overall assessment score (OAS). The organisation's OAS is given by the lowest score achieved; so, for example, if an organisation achieves a 'good' level of attainment (LOA) in sections 3.2 and 3.3 and a 'pass' LOA in section 3.4, then the LOA would be 'pass' (BRE, 2009).

Table 2: Threshold scores required to achieve overall assessment score in BES 6001 (adapted from BES 6001; BRE 2009).

	Levels of Attainment (LOA) and points required to achieve			
Section	**Excellent**	**Very Good**	**Good**	**Pass**
3.2 and 3.3 combined	8	5	3	Compulsory points
3.4	36	26	16	7

As Table 2 indicates, to score an 'excellent' LOA, it is only permissible to drop one point in sections 3.2 and 3.3, and only three points in section 3.4. So, an organisation aiming for an 'excellent' LOA must achieve maximum points in most clauses. Conversely, for organisations that achieved a 'pass' or 'good' LOA, there are a number of permutations for scoring the points required. Therefore, there is potential for variation in how organisations score points. The design of certificates (see BRE, 2014b) gives no indication as to how organisations achieved their LOA, which limits understanding of performance in BES 6001 (BRE, 2008; 2009) certificates and, particularly with 'pass' or 'good' certificates, what clauses (if any) the organisation did not score. It would be expected that the higher a certificate performs in a given clause, the higher the overall performance will be against the standard. Anecdotal evidence has suggested that there may be instances within the data however, where certificates have performed strongly under certain clauses, but have achieved a low overall assessment score (OAS), and vice-versa, therefore leading us to propose the first hypothesis (H_1) for this study.

H_1: Scoring highly in some clauses within section 3.4 of BES 6001 correlates to a high overall performance against the standard.

To derive overarching conclusions around performance against the standard for a group of certificates, it is important that the data are reliable, and that any conclusions can be stated with confidence. For example, all other things being equal, if one certificate for a small precast concrete manufacturer obtains a given level of performance under waste management, then it should be expected that another, similar company would score similarly under the same clause. If an individual clause is selected at random, it should produce a score that is consistent with the overall assessment score (OAS) for that certificate. If this were the case, it would then be said to have a good level of reliability. A means of looking at reliability is through gauging measures of internal consistency, which describes the extent to which all items in a test measure the same concept (Santos, 1999). The higher the measure of internal consistency, the more reliable the scale and hence the more confidence with which we can make a statement that would suggest that a high performer in an individual, randomly selected clause would be consistent with high overall performance. To obtain a higher OAS, and hence a higher LOA, certificates have to score highly in individual clauses consistently across all eight clauses in order to accumulate enough points. Therefore, we can propose our second hypothesis (H_2):

H_2: The higher the level of attainment (LOA), the greater the internal consistency within the results.

BES 6001 (BRE, 2008; 2009) covers a number of environmental and social issues (section 3.4). Traditional organisational engagement with sustainability has focused largely on environmental issues, although this can be extended to cover social and economic dimensions (Ahi and Searcy, 2013). There is a considerable body of literature that considers environmental management practices of organisations, particularly with reference to environmental management system (EMS) certification to ISO 14001 (BSI, 2004) (e.g. Brammer *et al.*, 2012; Daddi *et al.*, 2011; Hofmann *et al.*, 2012; Uhlaner *et al.*, 2012). An EMS requires an organisation to identify significant environmental aspects and impacts, such as waste, water use and greenhouse gas emissions. Given that some clauses within section 3.4 of BES 6001 (BRE, 2008; 2009) would in many cases be covered by the operation of an EMS (mandatory for BES 6001 anyway), we can arrive at our third and final hypothesis (H_3):

H_3: BES 6001 clauses that draw information from an organisation's environmental management system (EMS) result in a greater number of higher scores than those which do not.

4 METHOD

There are four UK certification bodies that offer certification to BES 6001 (BRE, 2008; 2009): the Building Research Establishment (BRE); British Standards Institution (BSI); Construction Products Certification (CPC); and Complete Integrated Certification Services (CICS; rebranded as Lucideon since data were collected). Assessment score data from these certification bodies were obtained, including product certified, overall assessment score (OAS) and corresponding level of attainment (LOA) and approximate company size (no. of employees). In total, 138 different scores were obtained from 106 nr. BES 6001 certificates; 25 of these certificates were assessed against version one of BES 6001 (BRE, 2008) and 81 of these certificates were assessed against version two (BRE, 2009). For analysis purposes, all certificates were grouped together given that the differences between each version are minimal. Due to confidentiality however, information relating to company size for 24 of these certificates were unavailable, thus reducing sample size to 114 scores from 82 certificates for these data. Some products could not be classified into one of our broad product categories either, thus reducing *n* to 109 for analysis of these data.

Data were then categorised according to three criteria; six broad product groups and three levels of attainment (LOA) (both listed in subsequent sections), and organisations were also split into small and medium sized enterprises (SMEs) and non-SME categories. Of particular interest were scores obtained in section 3.4 of BES 6001 (BRE, 2008; 2009), which considers performance under environmental and social requirements.

Spearman's rho (ρ) was used to determine how individual clause score correlates with total assessment score for each of the categories aforementioned. Spearman's rho is a measure of the strength of correlation that exists between two variables and is useful for analysing data that are not normally distributed. This study aimed to determine the correlation between individual clause score in section 3.4 of BES 6001 (BRE, 2008; 2009) and total score obtained, and preliminary analysis indicated that the data was not normally distributed. Therefore ρ was selected as the most appropriate measure of correlation between our two variables.

Reliability analysis, i.e. Cronbach's alpha, α, was then used to gauge measures of internal consistency within the data. Internal consistency indicates how closely related a set of items are in a group, or their level of reliability. Analysis of reliability will determine in which, if any, of the individual clauses of the standard a high individual clause score corresponds to a high total score, and thus which clauses could be seen as summary measures of performance. In this case, a reliable scale would be when two certificates that are the same in terms of the construct being measured (i.e. individual clause performance) score similarly overall (Field, 2013). α ranges in value from 0 to 1, and the higher the score, the more reliable the generated scale is (Santos, 1999). Figures for α were also obtained if each clause were removed from the scale; hence, we can see whether reliability was improved or reduced by including each clause within each scale.

5 RESULTS

Data were analysed according to three methods: level of attainment (LOA), company size, and product sector. The following subsections will discuss these in turn.

5.1. Level of attainment

Here, 138 assessment scores were categorised according to the assessment rating of the certificates; eight 'pass' (P) certificates, 51 'good' (G) certificates and 79 'very good' (VG) or 'excellent' (E) certificates. Only three E certificates were available, and so for data analysis, these were amalgamated with the 76 VG certificates.

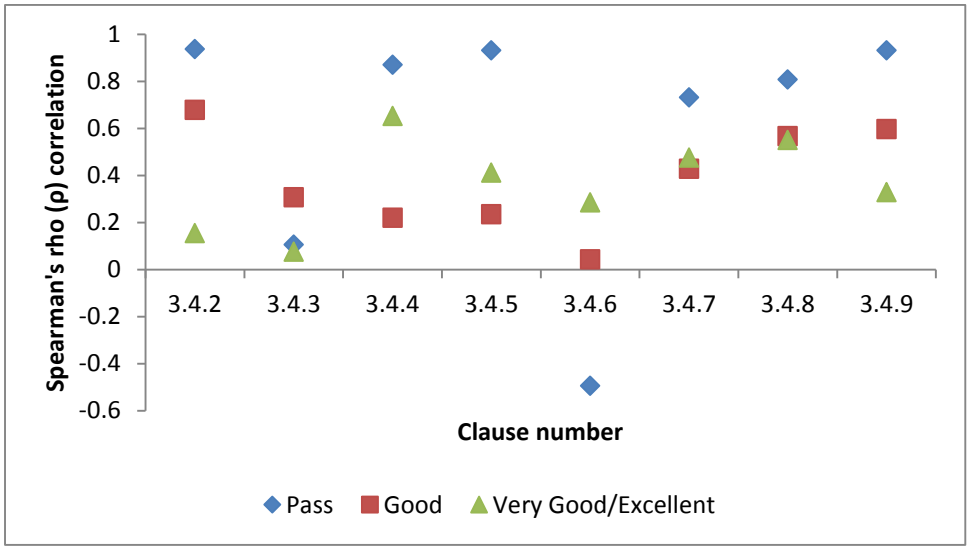

Figure 1: Spearman's rho, ρ, correlations for each clause with overall score for certificates according to level of attainment (LOA). Please refer to table 1 for clause headings.

Figure 1 shows that typical correlations for P certificates are fairly high and are lower for G and Very Good/Excellent (VG/E) certificates, implying that correlations between clause 3.4.3 for resource use and overall assessment score (OAS) and clause 3.4.6 for life cycle assessment (LCA) and OAS are generally lower than for other clauses.

Table 3: Cronbach's alpha, α, values and α values if each clause were removed for each overall assessment score (OAS).

Level of attain-ment (LOA)	**α**	**Cronbach's alpha if clause removed**							
		3.4.2 Greenhouse gas emissions	**3.4.3 Resource use**	**3.4.4 Waste management**	**3.4.5 Water extraction**	**3.4.6 Life cycle assessment**	**3.4.7 Transport impacts**	**3.4.8 Employment and skills**	**3.4.9 Local communities**
Pass	0.538	0.106	0.742	0.444	0.378	0.762	0.385	0.416	0.355
Good	0.117	-0.219	0.429	0.105	0.089	0.367	0.021	-0.080	-0.108
Very Good/ Excellent	0.192	0.371	0.268	-0.009	0.110	0.357	0.036	0.052	0.117

Table 3 shows α for the analysis of each level of attainment (LOA), and α if each clause was removed from the scale, or excluded from the calculation. The α values for LOA indicate poor levels of reliability, with Table 3 suggesting that reliability of all three scales is improved if clauses 3.4.3 and 3.4.6 are removed, implying that high performance under these clauses does not typically correlate with high overall performance. In the case of G and VG/E certificates, α values are so low (.117 and.192 respectively) that even removing these clauses from the scale does not render the α value high enough to be considered reliable. For VG/E certificates, it is clear that clause 3.4.2 should also be removed from the scale. The results are consistent with those in Figure 1, where the exclusion of clauses that correlate more poorly with overall score from the scale improves internal consistency, and hence reliability.

5.2. Company size

Data were also sorted by company size; categorised by SME or non-SME classification. The classification of SME is based upon the European Commission (2005) definition as an organisation with <250 employees and an annual turnover of <€50 million (approx. £41 million). 114 assessment scores were analysed; results are shown in Figure 2. Data from 15 SME certificates and 99 non-SME certificates were available.

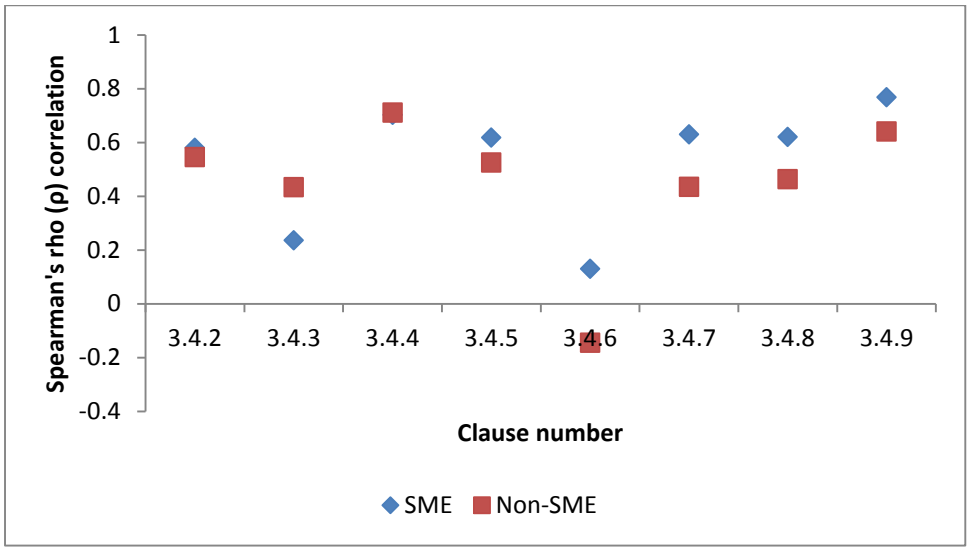

Figure 2: Spearman's rho, ρ, correlations for each clause with overall score for certificates according to company size.

Figure 2 suggests, as with results for level of attainment (LOA), that correlation coefficients for clause 3.4.3 for resource use and clause 3.4.6 for life cycle assessment (LCA) exhibited are lower than for other clauses. Clause 3.4.4 for waste management produced the strongest correlation coefficient for non-SMEs, with clause 3.4.9 for local communities exhibiting the highest correlation coefficient for SMEs. Clauses 3.4.4 and 3.4.5 also correlate relatively highly with overall score for both SMEs and non-SMEs.

Table 4: Cronbach's alpha, α, values and α values if each clause were removed for SMEs and non-SMEs.

Comp-any size	α	Cronbach's alpha if clause removed							
		3.4.2 Greenhouse gas emissions	**3.4.3 Resource use**	**3.4.4 Waste management**	**3.4.5 Water extraction**	**3.4.6 Life cycle assessment**	**3.4.7 Transport impacts**	**3.4.8 Employment and skills**	**3.4.9 Local communities**
SME	0.547	0.485	0.706	0.447	0.451	0.611	0.485	0.484	0.350
Non-SME	0.476	0.335	0.430	0.383	0.399	0.709	0.405	0.403	0.321

α values for company size (Table 4) indicate poor levels of reliability for both categories, with SME reliability improving if clause 3.4.3 for resource use and 3.4.6 for LCA are removed from the scale. For non-SME companies, only the removal of clause 3.4.6 results in increased reliability of the scale. α values were higher for the SME category showing that typically, overall score obtained constitutes a better summary measure of performance for the SME category than for larger companies, although these α values may still be regarded as unreliable (Field, 2013).

5.3. Product groups

Six broad product groups were identified and certification scores grouped accordingly. Figures 3 and 4 show the results. Data from eight aggregate, seven asphalt, 46 brick, nine cement, 31 concrete and eight steel certificates were available.

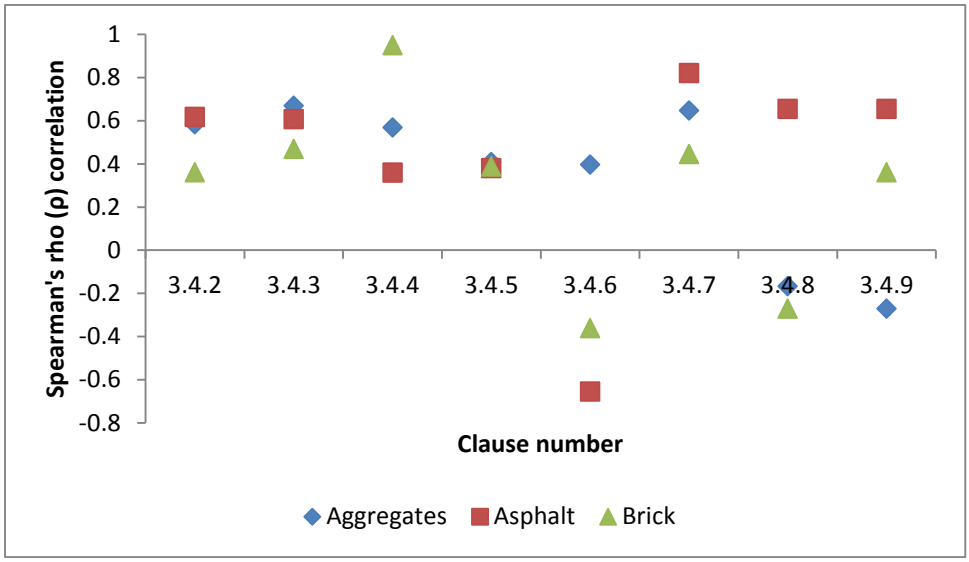

Figure 3: Spearman's rho, ρ, correlations for each clause with overall score for certificates according to the aggregates, asphalt and brick product sectors.

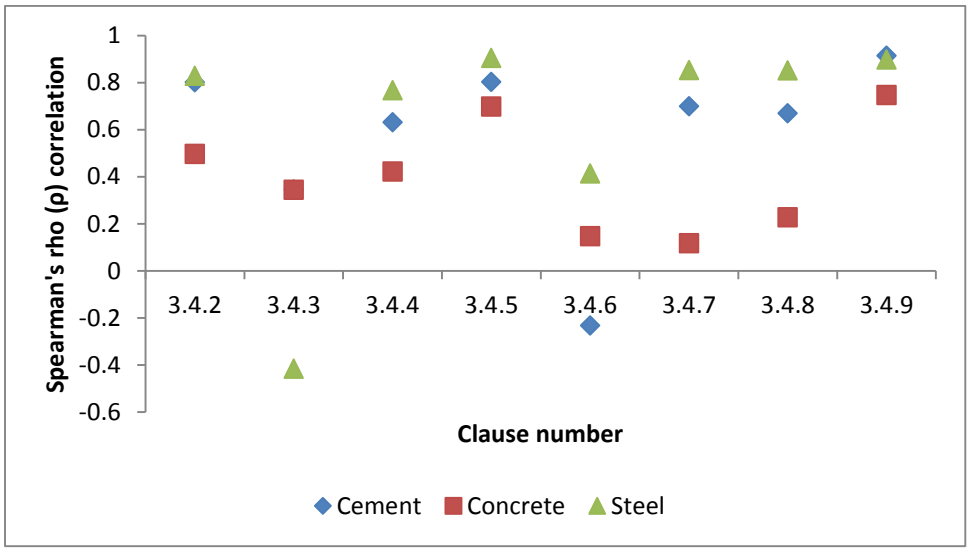

Figure 4: Spearman's rho, ρ, correlations for each clause with overall score for certificates according to the cement, concrete and steel product sectors.

Figures 3 and 4 show instances of high and low correlation coefficients for each product sector. However, performance under each clause differs between sectors, with some performing highly under clauses where others do not. Most poor or negative correlations are observed under

clauses 3.4.6 for LCA, although on the whole, correlations for clause 3.4.3 for resource use are also too low to warrant further analysis.

Table 5: Cronbach's alpha, α, values and α values if each clause were removed for each product group.

Product group	**α**	**Cronbach's alpha if clause removed**							
		3.4.2 Greenhouse gas	**3.4.3 Resource use**	**3.4.4 Waste management**	**3.4.5 Water extraction**	**3.4.6 Life cycle assessment**	**3.4.7 Transport impacts**	**3.4.8 Employment and**	**3.4.9 Local communities**
Aggregat-es	.296	.142	.247	.129	.279	.181	.092	.345	.530
Asphalt	-.239	-.558	-1.082	-.198	-.269	.686	-1.488	-.545	-.545
Brick	.067	-.127	-.381	-.158	.041	.526	-.177	.109	-.065
Cement	.731	.620	.750	.658	.689	.852	.651	.694	.593
Concrete	.317	.165	.412	.268	.124	.479	.407	.294	-.004
Steel	.774	.687	.851	.727	.695	.822	.721	.727	.693

Values for α (see Table 5) also indicate poor reliability in most cases, with the exceptions being cement and steel, which both return α values of more than .7, indicating good internal consistency (Field, 2013). Table 5 indicates that reliability improves in most cases if clause 3.4.6 is removed. It also shows that α values increase in three of the six product groups if clause 3.4.3 is removed, i.e. these clauses do not constitute good summary measures of performance. The other four product groups return low α figures suggesting very poor reliability.

6 DISCUSSION

Results indicate that consistently, clauses 3.4.3 for resource use and 3.4.6 for life cycle assessment (LCA) produce the poorest correlation coefficients with overall assessment score (OAS), relative to how other clauses correlate with OAS. These clauses also exhibit very low or negative correlations with all other clauses; typically these are positive, albeit often weak, suggesting that as performance in one clause increases, performance in another clause also increases, thus leading us to conclude that H_1 can be supported. Generally, performance in certain clauses does tend to correlate with total score, but generally, overall performance does not depend upon scores within clauses 3.4.3 and 3.4.6. In certain cases high performance in these clauses is actually to the detriment of total score.

The significance of these findings can also be characterised in terms of current industry practice. Developing an LCA for an organisation's products (as required by clause 3.4.6 of BES 6001) is an intensive process, and, relative to the other points available in BES 6001 (BRE, 2008; 2009) is much more difficult to obtain. Zackrisson *et al.* (2008) find that a key problem with obtaining wider uptake of LCA and Environmental Product Declarations (EPD) is the significant cost and time involved. Therefore, organisations may favour other clauses and aim for high performance under these to ensure they accumulate enough points to reach their desired level of attainment. So, LCA may be thought of as a clause that organisations will only attempt if they require additional points to reach their target level of attainment; a finding supported by the data, with 98/138 (71%) of the certificates scoring a zero for the LCA clause. It is also interesting that the LCA clause usually correlates negatively with other clauses (the exception being in the steel product sector where correlations were generally positive). Furthermore, it was observed in pass (P) certificates that higher performing certificates did not score for the LCA clause, yet lower overall performers all scored under part (a) of this clause. This provides further evidence that focusing on points under the LCA clause may be to the detriment of performance in other clauses, and indeed overall performance. Most construction product manufacturers do not hold third-party LCA data (Glass, 2012), and evidence indicates that it should be removed from the responsible sourcing (RS) agenda (BRE Global, 2013), and promoted as a separate entity via EN 15804 (BSI, 2012). Yet Jeswani *et al.* (2010) argues that LCA should be broadened by integrating with other methods of sustainability assessment, and although it is recognised that doing this via RS could be useful for addressing the three pillars of sustainability, our results show that there is a mismatch between the two agendas.

Furthermore, there is clear potential for LCA studies to provide object-oriented (environmental parameter) data within Building Information Models (BIM) in due course, and as such it could be expected that construction industry actors will increase their engagement with LCA in future years.

The findings for LCA are also relevant when revisiting H_2. As suggested by α values, internal consistency within the results is low; only analysis by product sector produces α values greater than .7; steel (.774) and cement (.731). α values do not appear to be higher for higher levels of attainment, with G and VG/E certificates revealing especially low α values; .117 and .192 respectively, indicating that these scales should not be deemed reliable. What the data do appear to suggest fairly consistently, is that removing either clause 3.4.3 for resource use or clause 3.4.6 for LCA from the scale would result in increased internal consistency. Values for α indicate that removal of clause 3.4.6 in all cases (except for aggregates in the product group analysis) will increase reliability, suggesting that this clause is not a good summary measure of performance. It can therefore be shown that specifiers looking to determine whether a supplier has carried out an LCA or holds an EPD should perhaps not consider using BES 6001 (BRE, 2008; 2009) certification status as a means of extracting LCA data, as these findings indicate that certificates with a high overall assessment score, and hence level of attainment, do not necessarily mean that the LCA clause has been scored well, if indeed at all. Instances of VG/E certificates scoring the LCA clause are considerably low (24%: 19/79). Ortiz *et al.* (2009) find that applying LCA can be very important in achieving sustainable development for the construction industry, yet results obtained here do not support this. The low levels of engagement with LCA observed suggest that current construction practices in this area are perhaps not sufficiently advanced. However, as this is based only on LCA data within BES 6001 (BRE, 2008; 2009) certificates, it does not capture the entire industry's current engagement with EPD, so further research is required. Furthermore, the BRE-maintained Green Book Live (BRE, 2014) resource provides information on EPD certificates to EN 15804 (BSI, 2012) and generic information on its environmental profiling scheme, so specifiers should consider consulting such a resource to obtain information on suppliers that are able to provide compliant LCA data.

The findings also appear to support H_3. Certification to BES 6001 (BRE, 2009) requires that an organisation has, as a mandatory requirement, in place a fully operational EMS, either following the principles of, or certified to ISO 14001 (BSI, 2004). In many cases, issues within

section 3.4 of BES 6001 (BRE, 2009) overlap with environmental aspects identified by an organisation's EMS. It was generally observed that performance under these areas was relatively high, which is likely because many applicant organisations had monitoring processes in place. Clause 3.4.2 for greenhouse gas emissions is particularly interesting; not only are emissions of greenhouse gases often covered in an organisation's EMS, but many heavy industries, including cement, are obliged to comply with the EU Emissions Trading Scheme (EU ETS; European Commission, 2013), for which demonstrating annual EU ETS reports will result in organisations being awarded maximum points under clause 3.4.2.

Clause 3.4.3 for resource use does not correlate with level of attainment and should also not be considered as a summary measure of performance. The clause is arguably relatively easily achieved – anecdotal evidence indicates that suppliers holding an ISO 14001 (BSI, 2004) certified environmental management system (EMS) and an explicit statement around resource efficiency in their environmental policy are classified as a 'traceable source' for this clause. BES 6001 (BRE, 2008; 2009) auditors have suggested that downloading and retaining a supplier's corporate social responsibility (CSR) report where the aforementioned practices are discussed would be satisfactory to be deemed 'traceable'. Furthermore, under version 2 of BES 6001 (BRE, 2009), this statement was not required to be verified or approved, implying that where organisations could not demonstrate ISO 14001 (BSI, 2004) certification and a relevant policy statement in any part of their supplier base, obtaining some type of stewardship statement from their suppliers that covered issues such as resource efficiency and protection of biodiversity could be deemed as verification of environmental stewardship at that material's source. Indeed, there is a high proportion of certificates scoring maximum points here. Interestingly, version 3 of BES 6001 (BRE, 2014c), added the requirement for such statements to be externally verified, implying that unlike under version 2, simply obtaining a short statement from suppliers will not be satisfactory for demonstrating stewardship at source, unless it has been verified by a third party. Perhaps this indicates that requirements under version 2 were rather too easy to obtain credit for, and as such did not present an examination of an organisation's supply chain with a sufficient level of rigour or consistency. Alternatively, it may simply indicate that industry expectations have increased in the meantime.

It is also significant that clause 3.4.3 (along with clause 3.4.2) holds heavier weightings than other clauses within this section, with a maximum of seven points available. It is also mandatory, so organisations are obliged to at least develop a policy and metrics. Considering

the earlier point made regarding LCA, it is possible that organisations focus more on this clause because it holds richer rewards in terms of points, and therefore contributes more towards an organisation's target points tally. However, it could also be argued that undertaking research into supplier environmental stewardship practices could also be time consuming (particularly for an SME where access to resources has already been noted as a challenge). This is supported by the results in the SME category, where the correlation coefficient between clause 3.4.3 and total score is lower than for non-SMEs. Further, removing clause 3.4.3 from the scale in the case of SMEs increases α to .706, which is considered a reliable scale (Field, 2013).

7 CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORK

We have presented an analysis of performance in BES 6001 (BRE, 2008; 2009) certificates for responsible sourcing between 2008 and 2013. Results indicate that correlation coefficients and Cronbach's alpha, α, values are relatively low, suggesting that generally, high performance in individual clauses of BES 6001 (BRE, 2008; 2009) does lead to higher overall performance in some cases, but that scoring mechanisms cannot be said to be reliable for determining a summary measure of performance. The scoring patterns suggest that organisations tend not to approach certification in a methodical way; rather there are different approaches at the company level. This is affected by management of the various social and environmental issues assessed within BES 6001 (BRE, 2008; 2009), yet it remains surprising that even relatively straightforward issues to manage, such as waste and greenhouse gas emissions – often considered in an organisation's EMS – still return low (although relatively higher in the context of this study) correlation coefficients and α values.

These data imply an apparent lack of a strategic approach to certification to the standard, and organisations are largely reactive in their response to it, favouring those clauses that are covered by existing management systems, that contain relatively easy to obtain points or are reflected by current industry practice. This is supported by De Colle *et al.* (2014) who found that organisations often implement standards without adaptation to their specific needs and characteristics, potentially causing detrimental effects. Through use of an example, they suggest organisations seek high scores in those indicators that it is easiest to score against with little consideration to how important they are to overall performance. Clearly, if the standard

poses a particular challenge for some applicant organisations (e.g. in terms of cost, resources and time), then differing practices and priorities at the organisational level may influence the organisation's ultimate performance against BES 6001 (BRE, 2008; 2009). Hence, there remains an unanswered question regarding the suitability of the standard for construction material suppliers and product manufacturers.

Despite the unique nature and novelty of this study, there are limitations. First, the dataset is small and when splitting it into individual categories, such as by product, the datasets are even smaller, and therefore conclusions, although relevant and significant, are based upon only a small 'snapshot' of the construction products industry. For some datasets, it was difficult to draw robust conclusions due to sample size. Stevens *et al.* (2012) question the usefulness of dividing data by company size via the broad categories of 'SME' and 'non-SME', for example. Although it is acknowledged that there are considerable differences and variations within each of these categories, the small size of the dataset meant that drawing valid conclusions would be difficult if we were to abide fully by Stevens *et al.* (2012) recommendation. Future work could consider a sample of BES 6001 (BRE, 2008; 2009) certifications in greater depth, and pose questions as to why performance patterns are observed.

BES 6001 data (BRE, 2008; 2009) analysed in this study provides only the individual clause score obtained against specific issues, yet Version 3 BES 6001 (BRE, 2014c) certificates will also include the scores obtained against the standard as an addendum. Potentially these data could feed into Building Information Models (BIM) in due course, although it is recognised that such an innovation may be some time coming as the industry continues to evolve its building information modelling agenda.

7.1. Practical relevance

The findings have a number of implications for industry. Results suggest that the material specifier should not assume that LCA status of a supplier will be covered by an organisation's BES 6001 (BRE, 2008; 2009) certificate. Similarly, they should not look at performance under the resource use clause and deem external verification of environmental stewardship from an organisation's suppliers a reliable summary measure of performance. The scores achieved under this clause, when compared with those of other clauses suggest that this clause is perhaps the single 'lowest hanging fruit', and that this distorts the picture somewhat. High performance here may result in an organisation achieving a higher LOA than their performance under other

clauses would perhaps suggest. These are also key findings for the Building Research Establishment. Moreover, if BES 6001 (BRE, 2008; 2009) was an easy standard to achieve certification to, it would be expected that correlations and internal consistencies would be high. However, the low internal consistencies and correlations between clause and total score are evidence that, generally, applicant organisations struggle to address the full breadth of issues covered by the standard in a consistent and comprehensive way. This may mean that the demands of BES 6001 (BRE, 2008; 2009) are too onerous for some organisations.

8 ACKNOWLEDGEMENTS

This research forms part of an Engineering Doctorate (EngD) programme, sponsored by Responsible Solutions Ltd and the Engineering and Physical Sciences Research Council (EPSRC), which is managed through the Centre for Innovative and Collaborative Construction Engineering (CICE), based at the School of Civil and Building Engineering at Loughborough University. The Building Research Establishment (BRE) provided feedback and comments during the drafting of this paper, and along with the British Standards Institute (BSI), Construction Products Certification (CPC) and Complete Integrated Certification Services (CICS; now Lucideon) provided all data that were used in this research. The support of all these parties is gratefully acknowledged.

9 REFERENCES

Ahi, P., Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production,* **52**, 329-341.

Brammer, S., Hoejmose, S., Marchant, K. (2012). Environmental Management in SMEs in the UK: Practices, Pressures and Perceived Benefits. *Business Strategy and the Environment,* **21**, 423-434.

BDA (Brick Development Association) (2012). *Brick Industry: Sustainability Strategy Progress Report 2012.* See http://www.brick.org.uk/wp-content/uploads/2013/01/Sustainability-Strategy-Progress-Report-2001-2012-web-reduced.pdf (accessed 13/02/2014)

BSI (2004). BS EN ISO 14001:2004: Environmental management systems – requirements with guidance for use. BSI, London, UK.

BSI (2012). BS EN 15804:2012: Sustainability of construction works – core rules for the product category. BSI, London, UK.

BRE (Building Research Establishment) (2008). BES 6001: ISSUE 1.0 Framework standard for the responsible sourcing of construction products. BRE Environmental and Sustainability Standard. BRE, Watford, UK.

BRE (Building Research Establishment) (2009). BES 6001: ISSUE 2.0 Framework standard for the responsible sourcing of construction products. BRE Environmental and Sustainability Standard. BRE, Watford, UK.

BRE (Building Research Establishment) (2011). BREEAM New Construction – Non-Domestic Buildings: Technical Manual SD5073 – 2.0:2011, BRE Environmental Assessment Method. BRE, Watford, UK.

BRE (Building Research Establishment) (2014a). *Responsible Sourcing of Construction Products (BES 6001): Event Details.* See http://www.bre.co.uk/eventdetails.jsp?id=7723 (accessed 01/03/2014)

BRE (Building Research Establishment) (2014b). *Green Book Live: Responsible Sourcing of Construction Products (BES 6001).* See http://www.greenbooklive.com/search/scheme.jsp?id=153 (accessed 20/02/2014)

BRE (Building Research Establishment (2014c). BES 6001: ISSUE 3.0 Framework standard for the responsible sourcing of construction products. BRE Environmental and Sustainability Standard. BRE, Watford, UK.

BRE Global (2013). *Product Category Rules for Type III environmental product declaration of construction products to EN 15804: 2012.* See http://www.bre.co.uk/filelibrary/Materials/BRE_EN_15804_PCR.PN514.pdf (accessed 15/04/2014)

Ceequal (Ceequal, 2013). *The sustainability assessment, rating and awards scheme for civil engineering.* See http://www.ceequal.com/ (accessed 04/03/2014)

The Concrete Centre (2014). *BES 6001*. See http://www.concretecentre.com/codes__standards/bes_6001.aspx (accessed 13/02/2014)

Construction Products Association (CPA) (2014). *Welcome to the Construction Products Association* See http://www.constructionproducts.org.uk/ (Accessed 18/02/2014)

Daddi, T., Magistrelli, M., Frey, M., Iraldo, F. (2011). Do environmental management systems improve environmental performance? Empirical evidence from Italian companies. *Environment, Development and Sustainability*, **13**, 845-862.

De Colle, S., Henriques, A. and Sarasvathy, S. (2014). The Paradox of Corporate Social Responsibility Standards. *Journal of Business Ethics*, **125(2)**, 177-191.

Department for Communities and Local Government (2006). Code for Sustainable Homes: A step change in sustainable home building practice. Department for Communities and Local Government, London, UK.

European Commission (2005). *The New SME definition User Guide and Model Declaration*. See http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf (accessed 25/02/2014)

European Commission (2013). *The EU Emissions Trading Scheme (EU ETS) Factsheet*. See http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf (accessed 03/02/2014)

Field, A (2013). *Discovering statistics using IBM SPSS statistics, 4th edition*. Sage, London, UK.

Ghumra, S., Glass, J., Frost, M. W., Watkins, M. and Mundy, J. (2011). Materials and energy assessment in Ceequal transport projects. *Proceedings of the Institution of Civil Engineers: Transport*, **164(3)**, 153-164.

Glass, J. (2011). Briefing: responsible sourcing of construction products. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability*, **164(3)**, 167-170.

Glass, J. (2012). The state of sustainability reporting in the construction sector. *Smart and Sustainable Built Environment* **1(1)**, 87-104.

Glass, J., Achour, N., Parry, T. and Nicholson, I. (2012). Engaging small firms in sustainable supply chains: responsible sourcing practices in the UK construction industry. *International Journal of Agile Systems and Management*, **5(1)**, 29-58.

HM Government (2008). Strategy for sustainable construction. Department of Business, Enterprise and Regulatory Reform, London.

HM Government (2013). Construction 2025 – Industrial Strategy: government and industry in partnership. Department for Business, Innovation and Skills, London.

Hofmann, K. H., Theyel, G. and Wood, C. H. (2012). Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices – Evidence from Small and Medium-Sized Manufacturers. *Business Strategy and the Environment*, **21**, 530-545.

Jeswani, H. K., Azapagic, A., Schepelmann, P. and Ritthoff, M. (2010). Options for broadening and deepening the LCA approaches. *Journal of Cleaner Production*, **18(2)**, 120-127.

Lee, S. Y. and Klassen, R. D. (2008). Drivers and Enablers That Foster Environmental Management Capabilities in Small- and Medium-Sized Suppliers in Supply Chains. *Production and Operations Management*, **17(6)**, 573-586.

Ortiz, O., Castells, F. and Sonnemann, G. (2009). Sustainability in the construction industry: A review of recent developments based on LCA. *Construction and Building Materials*, **23**, 28-39.

Santos, J. R. A. (1999). Cronbach's Alpha: A Tool for Assessing the Reliability of Scales. *Journal of Extension*, 37(2) Tools of the Trade, 2TOT3. See http://www.joe.org/joe/1999april/tt3.php (accessed 14/01/2014)

Sev, A. (2009). How can the construction industry contribute to sustainable development? A conceptual framework. *Sustainable Development*, **17(3)**, 161-173.

Stevens, P. A., Batty, W. J., Longhurst, P. J. and Drew, G. H. (2012). A critical review of classification of organisations in relation to the voluntary implementation of environmental management systems. *Journal of Environmental Management*, **113**, 206-212.

Stone Federation (2012a). Demonstrating Your Company's Sustainability Credentials. Stone Federation Great Britain, Kent, UK.

Stone Federation (2012b). Natural Stone: The Sustainable Solution. Stone Federation Great Britain, Kent, UK.

Sustainable Concrete Forum (SCF) (2010). Concrete Industry Guidance to Support BES 6001: Issue 3 – February 2010, Camberley, Surrey, UK.

Sustainable Concrete Forum (SCF) (2012). *Responsible Sourcing and the Concrete Industry: November 2012.* See http://apres.lboro.ac.uk/docs/Nov2012_Slater.pdf (accessed 13/02/2014)

Uhlaner, L. M., Berent-Braun, M. M., Jeurissen, R. J. M., de Wit, G. (2012). Beyond Size: Predicting Engagement in Environmental Management Practices of Dutch SMEs. *Journal of Business Ethics,* **109**, 411-429.

Young, J. and Osmani, M. (2013). Investigation into contractors' responsible sourcing implementation practice. *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* **166(6)**, 320-329.

Zackrisson, M., Rocha, C., Christiansen, K. and Jarnehammar, A. (2008). Stepwise environmental product declarations: ten SME case studies. *Journal of Cleaner Production,* **16**, 1872-1886.

APPENDIX I PAPER 4: IMPLEMENTING SUSTAINABILITY IN SMALL AND MEDIUM-SIZED CONSTRUCTION FIRMS: THE ROLE OF ABSORPTIVE CAPACITY

Full Reference

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (forthcoming). Implementing sustainability in small and medium-sized construction firms: The role of absorptive capacity. *Engineering Construction and Architectural Management,* 23(4), pages TBC.

Abstract

Purpose – Construction organisations are becoming increasingly aware of the impacts of their operations, from both an environmental and, more recently, a social viewpoint. Sustainability standards can enable an organisation to evidence a benchmarked level of performance against a particular issue. To date, research on standards has largely focused on the operational and administrative aspects of their enactment, rather than how they might affect – and be appropriated by – organizational actors. This research examines how capacity for learning can affect the success of implementing standards within two construction SMEs.

Design/methodology/approach – Taking an organisational learning and absorptive capacity (ACAP) perspective, this research uses the case study approach and abductive logic to understand what role learning plays with regard to sustainability standard implementation.

Findings – The results reveal that strong communication channels and commitment to training programmes increase the capacity for implementing standards, but that SMEs tend only to approach standards if they see immediate financial benefits stemming from their implementation.

Practical implications – SMEs provide a challenging context for the implementation of sustainability standards unless there are significant external levers and extrinsic motivation for

them to be embraced. Care should be taken in incorporating these aspects into the future design of standards that are more aligned with SME needs.

Social implications – Stakeholders should seek to apply pressure to firms to positively influence engagement with sustainability standards.

Originality/value – The role and importance of ACAP is an underdeveloped debate in the certification field. This study is the first that links the process of implementing a standard with the ACAP of an organisation.

Keywords – Absorptive capacity, corporate social responsibility, organisational learning, responsible sourcing, sustainability standards.

Paper type – Journal

List of abbreviations used

ACAP – Absorptive Capacity

APRES – Action Programme for Responsible Sourcing

BREEAM – Building Research Establishment (BRE) Environmental Assessment Method

CEEQUAL – Sustainability, Assessment, Rating and Awards Scheme for Civil Engineering

CSR – Corporate Social Responsibility

EMS – Environmental Management System

EPSRC – Engineering and Physical Sciences Research Council

FAME – Financial Analysis Made Easy

PACAP – Potential Absorptive Capacity

RACAP – Realised Absorptive Capacity

RS – Responsible Sourcing

SCM – Supply Chain Management

SME – Small and Medium-sized Enterprise

TA – Trade Association

1 INTRODUCTION

Corporations are increasingly recognising the importance of sustainability (Caprar and Neville, 2012), particularly given its potential as a driver to help reduce costs, manage risks, engage in innovation and drive internal change (Azapagic, 2003). Traditionally environmental issues (e.g. waste reduction, energy efficiency and carbon) have been at the forefront, influenced by legislation and numerous industry and government commitments. As a result, the sustainability and supply chain management (SCM) literature is relatively rich in its coverage of environmental issues (Ashby et al. 2012). Lehtonen (2004) recognises that the social dimension has the least coverage; perhaps because devoting sufficient attention to this represents a challenge (Klassen and Vereecke, 2012); Seuring and Müller (2008) also report that integration of the three sustainability pillars is rare.

Engagement with the sustainability agenda can be evidenced through effective SCM strategies, borne out of the need to comply with sustainability standards. These can take the form of formal, certifiable management systems, such as ISO 14001 (BSI, 2004) for environmental management systems, or guidance standards that demonstrate performance against a specific issue, but for which certification is not possible. Certification to ISO 14001 (BSI, 2004), for example, has been the subject of numerous studies (e.g. Brammer *et al.,* 2012; Daddi *et al.,* 2011; Hofmann *et al.,* 2012; Uhlaner *et al.,* 2012), and others have linked ISO 14001 (BSI, 2004) with effective SCM (Asif *et al.* 2013; Curkovic and Sroufe, 2011; Darnall *et al.* 2008; Delmas and Montiel, 2009). However, as Schweber (2013) remarks, research tends to focus on the technical features of assessment tools or standards, and hence little attention is devoted to the people or processes responsible for using them; this despite the need for learning and absorption of new knowledge over time (Maon *et al.*, 2009).

The research reported in this paper addresses this lacuna by investigating the relationship between sustainability certification schemes and organisational learning. In line with the approach advocated by Schweber (2013), implementation of standards within the firm will be considered as a process.

We aim to determine how organisational learning drives this process by considering absorptive capacity (ACAP) (Cohen and Levinthal, 1990; Gluch *et al.* 2009; Zahra and George, 2002). ACAP focuses on how knowledge is interpreted, used and implemented into organisational processes, and so will provide clarity on how new knowledge is appropriated such that it

facilitates implementation of standards. This approach will therefore determine the role for organisational learning in successful standards implementation.

2 SUSTAINABILITY IN THE CONSTRUCTION INDUSTRY

Sustainability for the construction industry can be termed 'sustainable construction', which comprises many processes to deliver built assets to enhance people's quality of life and stakeholder satisfaction (Adetunji *et al.,* 2003). An organisation can be said to be embracing sustainability in a holistic manner when it has taken appropriate actions to address environmental, social and economic issues (Lozano and Huisingh, 2011), although the environmental pillar is often prioritised at the expense of economic and particularly social issues (Klassen and Vereecke, 2014). This is surprising given that neglecting these can represent a considerable risk to the organisation, and that standards and schemes focusing on the social aspects of an organisation's operations (e.g. ISO 26000; BSI, 2010) do exist. However, Ahi and Searcy (2013) report a shift in this focus, perhaps due to highly-publicised stories in the media. For example, exposure of companies such as Nike (e.g. DeTienne and Lewis, 2005) and Primark (e.g. Jones *et al.,* 2009) in the 1990's and more recently Apple (Garside, 2013) for use of child labour and sweatshops in Asian manufacturing sites, caused negative press and unwanted attention from stakeholders, leading to tarnished reputations and public condemnation of their actions.

Given the degree of negative attention these organisations received, it is surprising that similar issues have gone relatively unnoticed and unreported in the construction sector, traditionally an industry with a track record of poor sustainability performance (Glass, 2012; Myers, 2005; Shen *et al.,* 2007). Although UK imports of raw construction materials remain relatively low, they are still substantial, with aggregate influxes reported at c.3.1 million tonnes (Highley, 2005) and Indian sandstone imports reported to average around 280,000 tonnes per year (Ethical Trading Initiative (ETI), 2013). Furthermore, the average monthly UK trade deficit in the year to May 2014 was £2.4 billion (Office for National Statistics, 2014), implying significant material inflows. Hence, environmental and social factors associated with such products represent a considerable risk, yet instances of the industry's lack of adherence to ethical codes and social norms (beyond exposure for poor health and safety practices) are rarely found in the

public spotlight. Potentially, this could be a major risk to companies operating within the industry, so arguably should form part of an organisation's risk management strategy.

Incorporating sustainability into risk management processes is a relatively straightforward task for larger organisations, where often time, staff and financial resources are readily available. However, for the SME, these resources are often less abundant and so sustainability measures are viewed as a costly (Revell and Blackburn, 2007) and time-consuming outgoing. Furthermore, they tend to regard themselves as 'invisible' and so are unlikely to regard corporate social responsibility (CSR) as something that could cause potential reputational risks (Jenkins, 2006). However, SMEs typically make up 99% of all firms (EC, 2013) and there is growing recognition of their collective social and environmental impacts (Jenkins, 2006; Morsing and Perrini, 2009). Around 950,000 SMEs are in operation in the UK construction industry (BIS, 2014), and hence their aggregated impacts are substantial. This implies potential challenges with engaging the construction sector in CSR activities; as such a large number of firms may suffer the aforementioned resource access issues. Supply chain pressure can motivate SMEs to formalise CSR or implement standards (Ciliberti *et al.*, 2009) as companies include CSR requirements in their purchasing specifications or in supply contracts (Ayuso *et al.*, 2013). This means SMEs are more likely to engage in CSR activities when pressured by organisations in the upstream supply chain (Baden *et al.*, 2009) and as these larger organisations seek to demonstrate responsibility throughout the supply chain, the pressure tends to increase. Previous work has also linked supply chain power as a means of diffusing CSR along the supply chain (Amaeshi *et al.*, 2008; Ciliberti *et al.*, 2009) as larger organisations use their power to dictate environmental and social criteria to their smaller suppliers (Ayuso *et al.*, 2013). Therefore CSR activity becomes an important activity for SMEs that operate in such global supply chains.

A recognised means of demonstrating sound CSR performance in the construction industry is by engaging with the concept of responsible sourcing (RS), which can be defined as the management of social and environmental issues within the supply chain, often from an ethical perspective (Glass *et al.*, 2012). Around 70 firms in UK construction have obtained RS certificates (BRE, 2014b), such is its perceived value in demonstrating CSR. The next section will consider why the RS agenda is so significant to a construction organisation wanting to demonstrate good social and environmental practice.

3 A FOCUS ON RESPONSIBLE SOURCING

The joint government and industry strategy for sustainable construction (HM Government, 2008) set, as part of its targets, that by 2012, 25% of construction products should be procured from schemes recognised for responsible sourcing (RS). Attention to this agenda has been accelerated by the publishing of the BES 6001 (BRE, 2009) framework standard and numerous other industry targets and commitments (e.g. UK Contractor's Group (UKCG), 2012). For example, around 92% of UK concrete (SCF, 2010) and 90% of UK brick (BDA, 2012) is available with an RS certificate. Construction contributes around 7% of GDP in the UK (BIS, 2013), and so a significant volume of material is now available through RS approved schemes. In addition, RS is seen as market-driven through points that are available in sustainability assessment schemes (such as the Building Research Establishment Environmental Assessment Method; BREEAM (BRE, 2014) and CEEQUAL, the sustainability assessment, rating and awards scheme for civil engineering; CEEQUAL (2015)). It is also viewed as a quasi-voluntary agenda, given that a lack of engagement with the standard may limit business opportunities, with customers opting to buy products from certified competitors. Glass (2011) reports that the absence of a common definition of RS means that understanding varies widely, with the term apparently often used interchangeably with terms such as ethical sourcing and sustainable procurement. This research will therefore use RS as a lens, given its relatively wide coverage of holistic sustainability issues within the construction supply chain.

RS is rooted within the CSR literature (Upstill-Goddard *et al.*, 2012); currently debated as representing anything from corporate philanthropy, to a means by which an organisation can increase revenue (Murray and Dainty, 2009). Broadly, CSR considers how sustainability issues are integrated into business strategies and practices (Jones *et al.*, 2006), and, given increasing public interest in sustainability, companies recognise that demonstrating good ethical and sustainable performance can maintain positive relations with stakeholders. For construction companies, where social and environmental impacts tend to be significant, there is perhaps the greatest emphasis to focus on CSR issues (Murray and Dainty, 2009). Therefore, given the potential of RS to be seen as an indicator of sustainability at product and organisation level, engagement with RS should be prioritised. Furthermore, the structure of BES 6001 (BRE, 2009) suggests a focus on environmental, social and economic objectives across the life cycle of a product and effective auditing of constituent materials in the supply chain (Glass, 2011).

There is however a weak research agenda around RS (Glass, 2011), with literature largely limited to research carried out through the Engineering and Physical Science Research Council (EPSRC) funded APRES (Action Programme for Responsible Sourcing) network (APRES, 2014) and related works (Glass, 2011; Glass *et al*, 2012; Upstill-Goddard *et al.*, 2012, 2013 and 2015; Young and Osmani, 2013). RS certification can only be awarded to a construction product manufacturer (i.e. construction contractors cannot be awarded a BES 6001 (BRE, 2009) certificate), yet research on its implementation in an organisation is a notable omission. Schweber (2013) suggests that considering implementation as a 'process', and focusing on the individuals within the organisation, can yield an understanding of the extent to which employees and the 'process' interact, and if any inertia is present. It can be inferred from this that a degree of learning is required in order to effectively implement standards, and the next section considers the link between sustainability standard implementation and organisational learning. Furthermore, by considering implementation as a 'change process', we might better understand how employees adapt to new fields of knowledge, cited by Gann (2001) as having potential to upset the established order.

4 ORGANISATIONAL LEARNING AND SUSTAINABILITY IMPLEMENTATION

Introduction of sustainability policies and processes can be considered as organisational change processes, involving a degree of learning over time (Maon *et al.*, 2009). Senge (1990) introduced the concept of the learning organisation: fundamentally, organisations can only learn once there is collective individual learning. Learning processes of organisations are inherently different from those in individual learning as they are reflected in organisational culture (Love *et al.*, 2000). Despite this, organisations themselves cannot learn per se (Love *et al.*, 2000), as knowledge is bound within individuals making up the organisation. It can thus be inferred that organisations must provide resources to their employees for supplementing knowledge, such as training programmes.

Effective organisational learning is said to be dependent upon high absorptive capacity (ACAP) (Kim, 1998). Absorptive capacity is defined as the ability of a firm to create competitive advantage through implementation and exploitation of knowledge and new resources (Cohen

and Levinthal, 1990; Gluch *et al.* 2009; Zahra and George, 2002). Zahra and George (2002) identify two types of ACAP:

- Potential (PACAP): the ability of a firm to acquire and assimilate knowledge;
- Realised (RACAP): the ability of a firm to transform and exploit acquired knowledge.

ACAP facilitates the development of proactive environmental strategies (Delmas *et al.*, 2011), and in a construction context, it has been shown that its operationalization into a change management approach can improve capability-based competitiveness (McAdam *et al.*, 2010). Hofmann *et al.* (2012) link environmental management practices with underlying capabilities and suggest firms should develop certain competencies prior to engaging with sustainability initiatives. Sustainability standards are one means of improving sustainable performance, which itself is dependent upon ACAP (Saenz *et al.*, 2014); their implementation requires changes in organisational structure, processes and norms, so relies on effective organisational learning. Importantly, Gluch *et al.* (2009) revised Zahra and George's (2002) model of ACAP in light of 'green' innovation within construction (see figure 1), determining knowledge acquisition, assimilation and transformation to be central to an organisation's capacity and its business performance. The transformation and exploitation of knowledge is core to developing a firm's innovation potential (Cepeda-Carrion *et al.*, 2012). Such innovations are highly dependent upon employee attitudes and support (Chawla and Kelloway, 2004) and employee motivation (Sexton and Barrett, 2003a and 2003b); arguably, in the absence of positive employee attitudes, implementation of sustainability standards may not be straightforward. Furthermore, attitudes may limit the transformation and exploitation of knowledge that sustainability standards provide and hence also ACAP. Indeed this is implied in the Gluch *et al.* (2009) model, where social integration mechanisms are direct antecedents of RACAP. Social integration mechanisms lower barriers for information sharing and exploitation and include communication and top management support which are suggested to influence attitudes and motivation among employees.

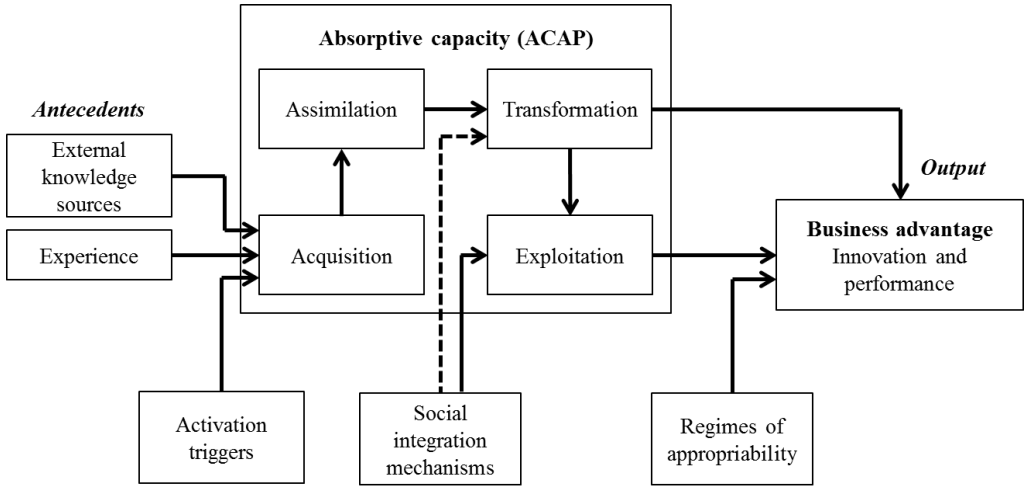

Figure 1: Model of green ACAP in the construction industry (adapted from Gluch et al. 2009)

Gluch *et al.* (2009) also suggest external knowledge sources of RS and experience in broader CSR initiatives can drive knowledge acquisition activities, and the effect of those events that compel a company to respond to specific stimuli, termed activation triggers (Gluch *et al.*, 2009). These are termed as the three antecedents to ACAP (Gluch *et al.* 2009; Zahra and George, 2002). Stewart and Gapp (2014) have linked learning, CSR and improved performance in a SME context, and although research into SME engagement with CSR and environmental performance is relatively common, Morsing and Perrini (2009) argue that much of it lacks a focus on 'how' and 'with what impact' SMEs engage with CSR. Therefore this research will focus on testing the Gluch *et al.* (2009) model to determine how the social integration mechanisms of ACAP can provide insights into 'how' organisations (specifically SMEs) use new knowledge to engage with CSR. As uptake of RS increases within construction and becomes important in the context of a construction organisation's SCM activities, it appears germane to focus on this as the case specifics, with the aim of generalising any theory to broader issues within SCM. This research will focus on the implementation of RS within two UK-based construction SMEs, and fundamentally will answer two interrelated research questions:

RQ1: *What role do standards play in driving sustainability?*

RQ2: *To what extent is ACAP an enabler of embracing sustainability standards?*

5 METHODOLOGY

The research methodology was based on the case study approach due to its examination of contemporary events (Yin, 2009) and its unique ability to aid theory development through consideration of in-depth insights of empirical phenomena and their contexts (Dubois and Gadde, 2002). Here, implementation of sustainability standards, as exemplified by RS, is assumed to represent a 'complex issue', given its limited research, literature and generated related theory.

Two UK-based SME construction product manufacturers of differing sizes and structures that were working towards certification to the standard were selected. A multiple case (embedded) design was developed through a case study protocol and a series of aims and research questions (Yin, 2009). Central to this was a 'systematic combining' approach grounded in abductive logic (see Dubois and Gadde, 2002), which considers the case study not as a linear process, but rather as an intertwined method. Using this method, a constant switching between empirical observations and theory generates a greater level of understanding of both empirical phenomena and theory. In this case, although research into organisational learning and ACAP has been widespread, coverage of this in a construction SME context is non-existent to our knowledge therefore rendering an inductive or deductive approach to this research problem unsuitable.

Although Eisenhardt (1989) reports difficulties with generating robust theory with fewer than four cases, Yin (2009) argues otherwise, stating that using at least two cases is appropriate to generate useful results. Furthermore, Dubois and Gadde (2002) suggest that any advantages gained by increasing the number of cases are countered by certain disadvantages; particularly that researching a greater number of cases with the same resources will result in greater breadth yet reduced depth of analysis. Therefore it was felt that two cases would provide ample empirical data to generate valuable findings. Furthermore, uptake of BES 6001 (BRE, 2009)

among construction SMEs has been limited; for example, Upstill-Goddard *et al.* (2015) show that in a sample of 114 BES 6001 (BRE, 2009) certificate scores, only 15 were from SMEs. Therefore, organisations that were eligible and willing to participate in this study were not abundant in number.

Central to conducting a case study, and indeed any form of social research, is ensuring that the research design follows a logical method. Yin (2009) postulates that the quality of a research design can be judged by applying logical tests to the research framework. Four tests (construct

validity, internal validity, external validity and reliability) were conducted to ensure that a robust methodology and compelling results were generated.

Data were collected predominantly via conducting semi-structured interviews. However, formal meetings were observed on a participatory basis and observation of more informal social interactions were made possible by supervised factory tours. Participatory meetings tended to concern the development of documentation required to comply with the standard and observations concerned the day-to-day tasks carried out on the office and factory sites. Prior to collecting these data, analysis of the FAME (Financial Analysis Made Easy) database provided key financial and employment figures for the most recent financial year available. Twelve interviews were conducted (six for each case), with two employees selected from each of three broad categories of staff (i.e. units of analysis); top management, office-based staff dealing with sales and marketing, and factory/production staff. By selecting respondents from different job roles the research was able to generate a representation of data from a cross-section of each company. Very little attention has been paid to the role that production staff have with regard to introduction of sustainability policies (Bolis *et al.*, 2012). As the implementation of BES 6001 (BRE, 2009) can be considered a change process, interviews with such staff focused on change processes within each organisation and the sources of internal and external knowledge that drove these changes. Interviews were recorded and transcribed such that the data collected could be reviewed. Finally, findings were mapped onto the Gluch *et al.* (2009) adaptation of Zahra and George's (2002) model of ACAP to determine the extent of applicability of their model to the context considered here.

Table 1 gives a brief overview of the main characteristics of each of the cases used in this study.

Table 1: Key characteristics of two construction SMEs that form this case study. All financial figures are approximations due to rounding.

	Company A	Company B
Turnover	£11.9 million (2014)	£5.1 million (2013)
No. of employees	41	60
Gross Profit	£2.1 million	£1.6 million
Profit/employee	£26,293	-£6,598
Year of incorporation	1965	2008
Sustainability management systems in place	ISO 14001	None

(Company B became part of a Holdings Company in 2008; as a standalone organisation, year of incorporation was 1955).

6 RESEARCH FINDINGS

6.1 Company A: Precast concrete products manufacturer

The BES 6001 (BRE, 2009) certification process was successfully completed with the organisation obtaining a 'Very Good' BES 6001 (BRE, 2009) certificate rating, awarded in early 2013. The company had also held certification to ISO 14001 (BSI, 2004) for environmental management systems (EMS) for a number of years. Therefore, reflecting on the ACAP model in figure 1, it is clear that this represents an element of the 'experience' antecedent. Many policies and environmental procedures were already in place within the company because of its ISO 14001 (BSI, 2004) certification; BES 6001 (BRE, 2009) only required minor changes or cross-referencing. The 'experience' gained in implementing BES 6001 (BRE, 2009) directly benefited the company in its pursuit of BES 6001 (BRE, 2009).

Interviewees also demonstrated an openness to change processes, recognising that standards were introduced for the better. Once external knowledge had been acquired and assimilated by the company, all employees were informed of the need for the change and the reasons for it. External knowledge sources were deduced to come primarily from the trade association (supplemented by the consultancy engaged to help them through the project), who were openly driving uptake of RS through their members. Due to the size of the company (see Table 1), any required changes can be actioned quickly. It was deduced that this openness to change was due

to well-functioning communication structures which indicate the presence of social integration mechanisms. Furthermore, the Managing Director of Company A exhibited a high level of support for the standard; it was noted that the majority of sustainability standards are *'set up with the larger companies in mind'* and so, as an SME, certification was felt to be a struggle for Company A. The Managing Director took responsibility for implementing and maintaining the standard as he felt that he needed to fully understand the requirements and implications of certification before delegating. This then enabled the Managing Director to exhibit high knowledge levels which can then be communicated to other employees, which further enabled the company to effectively transform external knowledge through social integration mechanisms.

The company had also witnessed increasing demand for evidence of certification to BES 6001 (BRE, 2009) from its customers and had even experienced loss of work, prior to implementation, due to not holding a BES 6001 (BRE, 2009) certificate. From an ACAP process perspective, the element of customer demand for certification is clearly aligned to activation triggers; this customer demand was a key reason for Company A initiating the BES 6001 (BRE, 2009) implementation project. It was also stated that although such 'change processes' are not necessarily influenced by the practices of competitors, it was also remarked that in instances where certification affected competitiveness, the actions of competitors would become an important activation trigger.

6.2 Company B: Natural stone producer

In contrast to Company A, the implementation of BES 6001 (BRE, 2009) in Company B was delayed by a number of problems which resulted in the eventual failure of the project. The initial driver for implementing BES 6001 (BRE, 2009) was that it had been identified as an opportunity to become a market leader, which represents the main activation trigger from an ACAP perspective. However, a large factor in the failure of the project was that Company B perceived that clients and customers were not asking for evidence of the certificate, so implementing the standard was not prioritised. Similar to Company A, this indicates that activation triggers play a major role in driving the knowledge acquisition process; although this opportunity to become a market leader cannot be said to have the same effect on knowledge acquisition activities as customer pressure, as without this pressure the organisation does not prioritise knowledge acquisition activities. Furthermore, external knowledge sources appeared

to be rather limited, with Company B only appearing to source external knowledge from the consultancy that were assisting them with the implementation. As a result, limited external knowledge was sourced and hence there was little evidence of awareness of BES 6001 (BRE, 2009) among staff not directly involved in the project. However, this is also indicative of a lack of communication from top management (similar to Company A, the Managing Director had assumed responsibility for running the project), as external knowledge sources were not completely absent which would lead it to be plausibly assumed that some level knowledge would be apparent among these staff. This also suggests that tasks were not being delegated to production staff as had been agreed in meetings. From an ACAP perspective, this translates to a lack of social integration mechanisms within the company, which limits the conversion of potential ACAP into realised ACAP. Indeed many interviewees were openly critical of the communication structure between the sales and production staff, indicating awareness that communication was an issue in need of improving.

In contrast to the results obtained from Company A, although some interviewees recognised that change was important and that it was necessary for employees to approach change in an open manner, it was also remarked that there tended to be widespread opposition to any change within the organisation. It was widely cited that a lack of drive from top management was synonymous with limited care for enacting such change. From an ACAP perspective, this again highlights a lack of social integration mechanisms within the company. An example of this was the meetings held between sales and production staff, where it was stated that *'there probably aren't enough meetings'* and that *'they're* [management staff] *probably not bothered, so why should I be'.* Despite this, the Managing Director remarked that the BES 6001 (BRE, 2009) certification process did not represent a big change in their current activity, but rather that it could help with 'housekeeping'. It is inferred from this that the Managing Director had not communicated this to employees within the organisation, again demonstrating a lack of social integration mechanisms.

7 DISCUSSION

The contrasting experiences within the two cases suggest that organisational structures and norms have a significant role to play in implementing sustainability standards. Our results

especially highlight the importance of effective organisational communication as a key enabler of positive attitudes to change.

Gluch *et al.* (2009) suggest three antecedents of what they term 'green ACAP' as predictors of the knowledge acquisition phase; external knowledge sources, experience and activation triggers. Activation triggers are a direct predictor of knowledge acquisition (Gluch *et al.*, 2009), yet Zahra and George (2002) show them to be a moderator of acquisition activities. Our results tend to support Gluch *et al.* (2009), although we redefine 'activation triggers' as 'stakeholder pressure'. Our results show that when implementing sustainability standards in construction SMEs, in the absence of stakeholder pressure, knowledge acquisition activities will not be initiated as there is limited business risk if certification is not obtained. Huang (2013) highlights that SMEs are often required to comply with large organisations' CSR policies, with a failure to do so potentially resulting in a loss of business. This supports the findings from Company A, where it was very apparent that certification to BES 6001 (BRE, 2009) was only considered for this reason. Indeed this was the also the case when they implemented ISO 14001 (BSI, 2004); it was recognised across the company that ISO 14001 had brought many benefits, particularly with access to projects they would not otherwise have had the opportunity to supply to. Revell and Blackburn (2007) show that if clients do not prioritise environmental issues, there is little perceived value in differentiating on environmental performance. Stakeholder pressure has the greatest direct influence on knowledge acquisition activities (Gluch *et al.*, 2009), and if this pressure is not present then acquisition of new knowledge is diminished, as it does not become an organisational priority. This was the case with Company B, where although activation triggers were present in the form of ambition to lead the market, the limited customer pressure to obtain BES 6001 (BRE, 2009) meant that the implementation project was not prioritised. Not engaging with the standard posed no immediate business risk, and so Company B focused its resources and efforts elsewhere. A major concern of the SME, particularly those in construction, an industry characterised by low barriers to entry and low profit margins (Revell and Blackburn, 2007), is keeping afloat and generating sufficient business. As sustainability has become a key enabler of business generation, it is only pursued by the SME for this reason; if holding certification will make a positive impact on business opportunities then it will be considered. On the other hand, if customers are not actively requesting evidence of certification, then its value is perceived to be low. Brammer *et al.* (2012) show that the smallest companies consider engagement with environmental issues conducive to limited benefits, which further supports our findings that SMEs only engage with sustainability

standards if not doing so poses an immediate threat. Furthermore, subsequent to this research, Company A have allowed their BES 6001 (BRE, 2009) certification to expire, citing a lack of customers and clients requesting evidence of the certification. As such, we therefore suggest that for the construction SME, when considering implementation of sustainability standards, other activation triggers are not important for stimulating knowledge acquisition activities. In our results, 'customer pressure' is the antecedent to knowledge acquisition but we suggest the term 'stakeholder pressure', should replace the term 'activation triggers' as this can include pressures from other sources, such as local communities and trade associations (both of which were evident to some degree in our research).

External knowledge sources, such as trade association (TA) support and the guidance provided by the consultancy engaged by both organisations were core to the initiation of the implementation process. Both organisations obtained similar levels of support from a consultancy in developing policies and procedures, advising on data collection and supplier assessment, but TA support varied. Existing literature makes a clear connection between knowledge acquisition activities and TA (Roy and Thérin, 2008) and networks (Christopher and Gaudenzi, 2009). Klewitz and Hansen (2014) propose that external interaction, such as participation in TA events, can increase innovative capacity within the SME. Our findings also indicate differing levels of TA support however, with guidance on BES 6001 (BRE, 2009) provided to Company A (SCF 2010 and 2012) recognised as a major aide in the implementation process. One Company A employee stated that some individuals within the organisation view many standards as being set up with larger companies in mind, so such documentation helps to increase uptake among SMEs. Similar support documentation was not made available by the TA that Company B held membership with; it could be inferred from this that a lack of guidance from the TA rendered the implementation task considerably more cumbersome for Company B. Jenkins (2006) shows that SMEs favour networking as a means of increasing learning, and the greater the level of TA involvement, the greater the opportunities for networking. We infer that the differing levels of support from each TA represent differing levels of new knowledge for each case. Gann (2001) highlights the importance of such institutions due to the access to knowledge they can provide, and Lin (2012) also alludes to the importance of professional institutions in addressing the CSR agenda due to the uncertainty surrounding standards. Our findings also suggest that TA support is a key source of external knowledge in implementing standards. However, we suggest that external knowledge sources represent a 'secondary antecedent' in this context; these are important in affecting the acquisition activities of an

organisation once the decision has been made to work towards certification, but in isolation do not represent as important a driver as stakeholder pressure.

The third antecedent proposed by Gluch *et al.* (2009), experience, was also found to be a factor in the success of a sustainability scheme implementation project. Company A had held ISO 14001 (BSI, 2004) certification for a number of years which rendered them compliant (to some extent) with many of the environmental requirements within BES 6001 (BRE, 2009). A pre-existing sustainability standard aids implementation of further standards as far as ACAP is concerned, as employees are more familiar with the processes required. Firms not only need to acquire knowledge of standards, but they also need to learn how to build up processes that enable them to absorb this knowledge (Delmas *et al.*, 2011). ACAP is generated using the prior knowledge of the organisation to facilitate uptake of new knowledge (Cohen and Levinthal, 1990); combining of both prior and new knowledge can aid creation of competitive advantages. The presence of an EMS in Company A can be defined as a source of prior knowledge of a sustainability standard that was not present in Company B, and it could be suggested that this had enabled it to 'build up the processes' as suggested by Delmas *et al.* (2011). ISO 14001 (BSI, 2004) certification also gave Company A experience of operating a management system, and as such many of the requirements to collect, monitor and measure data and report for annual review, for example, were already in place, with minor changes required to collect additional data or slightly modify data collection process. For Company B, there was no such system, and as such no mechanisms in place for data collection and measurement. Therefore, the need to integrate the requirements of BES 6001 (BRE, 2009) into day-to-day roles and responsibilities was a much bigger challenge for Company B because it had no prior experience of operating a management system. Again, we suggest this is a 'secondary antecedent' to stakeholder pressure. These secondary antecedents support the primary antecedent of stakeholder pressure, as they themselves increase acquisition activities but are not sufficient in themselves to encourage acquisition and assimilation of standard-related knowledge. Figure 2 shows our revised model of green ACAP when considered from a standards implementation perspective.

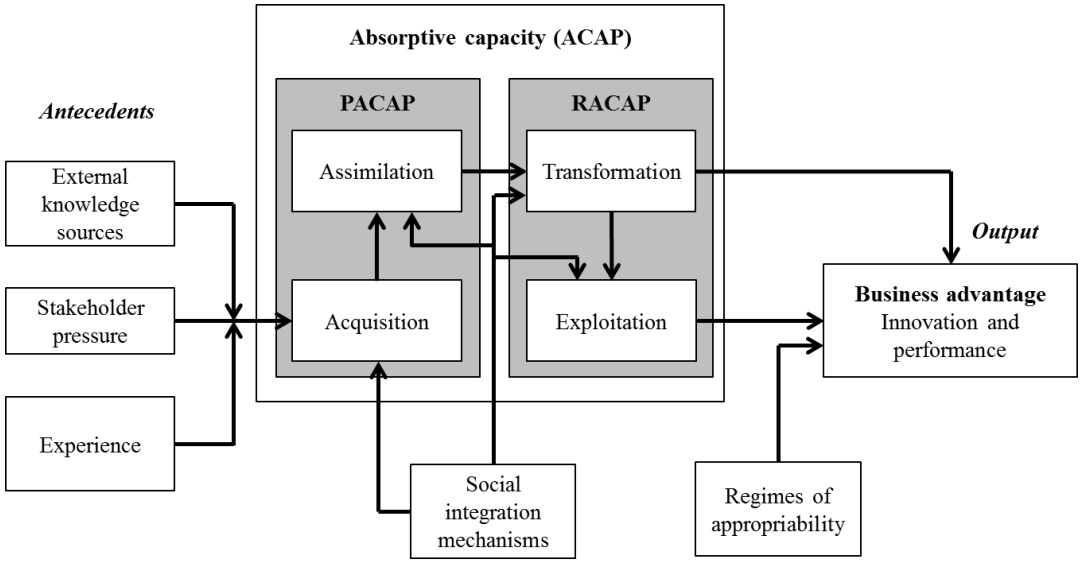

Figure 2: A revised ACAP model for sustainability standard implementation within construction SMEs.

The three antecedents identified by Gluch *et al.* (2009) directly affect the knowledge acquisition phase; it is widely accepted in the literature that this precedes the assimilation phase (Easterby-Smith *et al.*, 2008; Gluch *et al.*, 2009; Zahra and George, 2002). Assimilation of knowledge is typically actioned through training programmes, which open up learning opportunities and hence can influence employee values and beliefs (Linnenluecke and Griffiths, 2010) as well as the organisation's ACAP (Gann, 2001). Training is therefore integral to sustainability ambitions (Quinn and Dalton, 2009), and forms a core part of relevant management systems standards, such as ISO 14001 (BSI, 2004). However, as mentioned above, neither organisation evidenced significant commitment to investment in training beyond that which was required immediately. Nevertheless, Company A did exhibit higher levels of ACAP than Company B, and this may be due in part to Company A holding certification to ISO 14001 (BSI, 2004). Gluch *et al.*, (2009) found that fully functioning assimilation mechanisms are important for both sustainability assessments of a product and as a predictor of sustainability performance. Although it cannot be stated explicitly that assimilation mechanisms are functioning in Company A, it was found that assimilation of knowledge appears to be more successful in Company A than in Company B, and so mechanisms for assimilating knowledge are synonymous with higher sustainability performance in this study.

Social integration mechanisms, such as the support of top management for the sustainability standard and robust communication structures, facilitate the sharing and exploitation of knowledge (Gluch *et al.*, 2009). They are identified as key facilitators of knowledge sharing

and exploitation (Zahra and George, 2002), yet Gluch *et al.* (2009) found little evidence to support this in their study. However, our results suggest that social integration mechanisms, such as support from top management and robust communication structures, play central roles in sustainability implementation across all four ACAP activities (see Figure 2). Ensuring good practice and compliance with the standard across the organisation requires good communication to ensure that all employees are aware of the change process and their roles and responsibilities. Differing attitudes to change were observed in the case organisations, although these were influenced by the communication structures in place. Where there was evidence of good communication (i.e. awareness of the implementation project across the organisation), attitudes to change were generally more positive and employees were more receptive to the change. It is true that these organisations are flexible to change – the small size of our case organisations was an advantage – but in the absence of strong communication channels, explaining what the 'change' is, as opposed to only why it is happening, is core to obtaining positive attitudes. Intra-organisational communication represents a form of second hand learning, which hence aids competitiveness (Kim, 1998), as it is a means of communicating new information through the organisation. It also influences the assimilation and transformation of knowledge processes that are recognised as core to ACAP (Pinkse *et al.*, 2010), so it can be strongly concluded that communication structures are a key enabler of implementation of sustainability standards and increasing ACAP.

Gluch *et al.* (2009) also suggest top management support is an important social integration mechanism, with this linking directly to management knowledge. The model suggests, that top management support is a predictor of knowledge transformation and exploitation activities, and thus is core to putting acquired and assimilated knowledge (PACAP) into practice. In both our cases, the Managing Director took overall responsibility for the BES 6001 (BRE, 2009) implementation process. In the case of Company A, this was because it was felt by the Managing Director that for the scheme to be enacted effectively, it was important for him to understand it in the first instance before delegating responsibility to someone else within the company. In Company B, although the Managing Director also took overall responsibility; the main tasks associated with implementation were delegated to another employee, who also held responsibility for other management systems, namely quality, environmental and health and safety. It became clear that this workload presented a major problem; the employee reported that health and safety issues were the prime concern, and took up most of his time. Therefore perhaps this is another reason for the lack of progress within Company B. Cassells and Lewis

(2011) report that a lack of action by the firm does not necessarily reflect the personal attitude of owner-managers in SMEs; a finding that appears to resonate with Company B. During meetings, the Managing Director was always positive about reasons for pursuing the standard and held strong beliefs that certification would benefit the company. However, for Fenwick (2007), a low focus by management on sustainability issues can hinder adoption, so perhaps it can be inferred that although the Managing Director of Company B appeared to hold a proactive view of sustainability, this was not translated into practice. If we link this back to our findings around communication structures, and consider Gloet's (2006) link between dialogue and effective leadership, it can also be suggested that Company B did not have robust leadership in place to effectively enact such change. Gluch *et al.* (2009) suggest that perhaps the influence of the Managing Director is not significant enough to positively affect an organisation's ACAP in instances such as this. This is supported by our findings, which also evidenced discontent among the workforce with how the company was being managed. This is a particularly interesting finding, as it is suggestive of a lack of influence by management in some cases when it comes to 'secondary priorities' such as sustainability. This warrants further research as it is somewhat beyond the scope of this study.

8 CONCLUSIONS

The findings of this study suggest that working to a given standard can enable a company to benchmark performance and improve 'housekeeping' on site. The sustainability agenda is a core concern of many organisations and industries, and as such, being able to demonstrate positive engagement with this agenda is likely to become increasingly important in being awarded contracts or meeting customers' criteria. Certification to standards is the most tangible means of demonstrating engagement with sustainability (Upstill-Goddard *et al.*, 2012). They can enable an organisation to demonstrate a benchmark level of performance, and standards themselves can help to promote commonly accepted processes and practices (De Colle *et al.*, 2014). They also evidence engagement with sustainability while opening up business opportunities and hence competitive advantage. As RS is a key indicator of sustainability at the product and organisational level, achieving a 'benchmark' level of performance can provide assurance to customers that sustainability has been considered holistically within the organisation and its supply chain. For the SME, a key concern is generating enough business

to keep afloat. Pursuing the sustainability agenda can act as an enabler to generating more work, often rendering sustainability compliance crucial to the success of the business. Despite this, particularly in the case of the SME, sustainability certification will only be considered if it will have a positive financial impact on the business. In short, unless the SME is asked specifically for evidence of a given certificate, it may be viewed as a costly and unnecessary activity. The argument for CSR engagement as corporate philanthropy (cf. Murray and Dainty 2009) does not appear to be true in the case of the SMEs investigated here, who are motivated by the extrinsic reward that achievement of standards can generate.

Our findings also support the model proposed by Gluch *et al.* (2009) for green innovation in construction, with the key predictors of knowledge acquisition (external knowledge sources, experience and activation triggers) all being particularly important in building absorptive capacities. However, we suggest that the term 'stakeholder pressure' should replace 'activation triggers' and that this has the most influence on whether firms pursue sustainability, with the other antecedents (experience and external knowledge sources) proposed by Gluch *et al.* (2009) more representative of secondary antecedents. Underlying the implementation of sustainability standards is a good communication structure, which also acts as a means of transporting knowledge through the organisation as it results in a greater understanding among the workforce of what the change is, and why it is happening. This tends to result in employees being more receptive to the change and holding more positive attitudes about it, therefore leading us to conclude that poor communication, both internally and with other organisations, represents a major barrier to implementation of sustainability standards. As noted by Hotho *et al.* (2012), interaction through communication is important to increase absorptive capacities (ACAP). We suggest that communication, coupled with top management support, acts to increase all four ACAP activities as these help to promote change and stimulate positive attitudes within the workforce. Finally, having a pre-existing management system in place appears to provide the organisation with a helpful resource. This research has highlighted that the ways in which construction organisations source and use knowledge is important, and it can be concluded that learning activities should be present throughout the organisation in order to increase ACAP and support the successful implementation of standards. Our findings have a number of potential applications within research and can be generalised to other sectors. Firstly, we have found support for the premise that organisations must ensure full buy-in throughout the company because, without employee support, transfer of knowledge internally is unlikely to occur. Involving employees in decisions to work towards standards and informing them of

the implications for the company (as well as their own responsibilities) can help provoke positive attitudes towards both the standard and the subject matter to which it pertains. The latter point is particularly relevant because ongoing compliance may rest on employee diligence and operational effectiveness. Secondly, RS tends to be construction-specific, yet from the perspective of implementing standards, our findings may have applicability in sectors where RS principles are evident and strived for through supply chain practices, such as the fashion and food industries. However, further research would be needed to determine whether a 'standards-based approach' to interpreting ACAP is appropriate, on a sector-by-sector basis.

It is clear that the role and importance of ACAP is an underdeveloped debate in the certification field. There are no studies that consider the process of implementing a standard from an ACAP viewpoint, despite this study showing that ACAP is an important concept to understand in this context. Future research could also consider the implementation of more widely used and recognised certification schemes, such as ISO 14001 (BSI, 2004) and could consider the implementation of these in other sectors or among larger organisations to generalise our findings. This might be especially timely in future years given the revision process that ISO 14001 has been undertaking, with the revised standard published in late 2015 (IEMA, 2015).

9 REFERENCES

Adetunji, I., Price, A., Fleming, P. and Kemp, P. (2003), "Sustainability and the UK construction industry - a review", *Proceedings of the Institution of Civil Engineers – Engineering Sustainability*, Vol. 156, No. 4, pp. 185-199.

Ahi, P. and Searcy, C. (2013), "A comparative literature analysis of definitions for green and sustainable supply chain management", *Journal of Cleaner Production*, Vol. 52, No. 1, pp. 329-341.

Amaeshi, K. M., Osuji, O. K. and Nnodim, P. (2008), "Corporate Social Responsibility in Supply Chains of Global Brands: A Boundaryless Responsibility? Clarifications, Exceptions and Implications", *Journal of Business Ethics*, Vol. 81 No. 1, pp. 223-234.

APRES (Action Programme on Responsible Sourcing) (2014), "About APRES", available at: http://apres.lboro.ac.uk/ (accessed 17 February 2014).

Ashby, A., Leat, M. and Hudson-Smith, M. (2012), "Making connections: a review of supply

chain management and sustainability literature", *Supply Chain Management: An International Journal,* Vol. 17 No. 5, pp. 497-516.

Asif, M., Searcy, C., Zutshi, A. and Fisscher, O. A. M. (2013), "An integrated management systems approach to corporate social responsibility", *Journal of Cleaner Production,* Vol. 56 No. 1, pp. 7-17.

Ayuso, S., Roca, M. and Colomé, R. (2013), "SMEs as "transmitters" of CSR requirements in the supply chain", *Supply Chain Management: An International Journal,* Vol. 18 No. 5, pp. 497-508.

Azapagic, A. (2003), "Systems Approach to Corporate Sustainability: A General Management Framework", *Process Safety and Environmental Protection,* Vol. 81 No. 5, pp. 303-316.

Baden, D. A., Harwood, I. A. and Woodward, D. G. (2009), "The effect of buyer pressure on suppliers in SMEs to demonstrate CSR practices: An added incentive or counter productive?", *European Management Journal,* Vol. 27, No. 6, pp. 429-441.

BDA (Brick Development Association) (2012), "Brick Industry: Sustainability Strategy Progress Report 2012", available at: http://www.brick.org.uk/wp-content/uploads/2013/01/Sustainability-Strategy-Progress-Report-2001-2012-web-reduced.pdf (accessed 12 June 2014).

BERR (Department for Business, Enterprise and Regulatory Reform) (2008), Strategy *for sustainable construction*, BERR, London, UK.

BIS (Department for Business, Innovation and Skills) (2013), *Construction 2025 – Industrial Strategy: Government and Industry in Partnership*, DBIS, London, UK.

BIS (Department for Business, Innovation and Skills) (2014), "Business population estimates for the UK and regions", available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/377934/bpe_2014_statistical_release.pdf (accessed 19/01/2015).

Bolis, I., Brunoro, C. and Sznelwar, L. I. (2012), "The worker's role in knowledge management and sustainability policies", *Work: A Journal of Prevention, Assessment and Rehabilitation,* Vol. 41 No. 1, 2713-2720.

Brammer, S., Hoejmose, S. and Marchant, K. (2012), "Environmental Management in SMEs in the UK: Practices, Pressures and Perceived Benefits", Business *Strategy and the*

Environment, Vol. 21 No. 7, pp. 423-434.

BSI British Standards (2004), Environmental management systems: Requirements with guidance for use, BSI, London, BS EN ISO 14001: 2004.

BSI British Standards (2010), Guidance on social responsibility, BSI, London, BS ISO 26000:2010.

Building Research Establishment (BRE; 2009). *BES 6001: Framework standard for the responsible sourcing of construction products,* Building Research Establishment, Watford.

BRE (Building Research Establishment) (2011). *BREEAM UK New Construction: Non-Domestic Buildings Technical Manual SD5076-1.0: 2014,* Building Research Establishment, Watford.

BRE, (Building Research Establishment) (2014). "Responsible Sourcing of Construction Products (BES 6001): Event Details", available at: http://www.bre.co.uk/eventdetails.jsp?id=7723 (accessed 20/07/2015)

Caprar, D. V. and Neville, B. A. (2012), ""Norming" and "Conforming": Integrating Cultural and Institutional Explanations for Sustainability Adoption in Business", Journal *of Business Ethics,* Vol. 110 No.2, pp. 231-245.

Cassells, S. and Lewis, K. (2011), "SMEs and environmental responsibility: do actions reflect attitudes?", *Corporate Social Responsibility and Environmental Management,* Vol. 18 No. 3, pp. 186-199.

CEEQUAL (2015), "The sustainability assessment, rating and awards scheme for civil engineering", available at: http://www.ceequal.com/ (accessed 21 January 2015)

Cepeda-Carrion, G., Cegarra-Navarro, J. G. and Jimenez-Jimenez, D. (2012), "The Effect of Absorptive Capacity on Innovativeness: Context and Information Systems Capability as Catalysts", *British Journal of Management,* Vol. 23 No. 1, pp. 110-129.

Chawla, A. and Kelloway, E. K. (2004), "Predicting openness and commitment to change", *Leadership and Organization Development Journal,* Vol. 25 No. 6, pp. 485-498.

Christopher, M. and Gaudenzi, B. (2009), "Exploiting knowledge across networks through reputation management", *Industrial Marketing Management,* Vol. 38 No. 2, pp. 191-197.

Ciliberti, F., Baden, D. and Harwood, I. (2009), "Insights into corporate social responsibility practices in supply chains: a multiple case study of SMEs in the UK", *Operations and Supply Chain Management: An International Journal*, Vol. 2 No. 3, pp. 154-166.

Cohen, W. M. and Levinthal, D. A. (1990), "Absorptive capacity: A new perspective on learning and innovation", *Administrative Science Quarterly,* Vol. 35 No. 1, pp. 128-152.

Curkovic, S. and Sroufe, R. (2011), "Using ISO 14001 to promote a sustainable supply chain strategy", *Business Strategy and the Environment,* Vol. 20 No. 2, pp. 71-93.

Daddi, T., Magistrelli, M., Frey, M. and Iraldo, F. (2011), "Do environmental management systems improve environmental performance? Empirical evidence from Italian companies", *Environment, Development and Sustainability,* Vol. 13 No. 5, pp. 845-862.

Darnall, N., Jolley, G. J. and Handfield, R. (2008), "Environmental management systems and green supply chain management: complements for sustainability?", *Business Strategy and the Environment,* Vol. 17 No. 1, pp. 30-45.

De Colle, S., Henriques, A. and Sarasvathy, S. (2014), "The Paradox of Corporate Social Responsibility Standards", *Journal of Business Ethics,* Vol. 125 No. 2, pp. 177-191.

DeTienne, K. B. and Lewis, L. W. (2005), "The Pragmatic and Ethical Barriers to Corporate Social Responsibility Disclosure: The Nike Case", *Journal of Business Ethics,* Vol. 60 No. 4, pp. 359-376.

Delmas, M., Hoffmann, V. H. and Kuss, M. (2011), "Under the Tip of the Iceberg: Absorptive Capacity, Environmental Strategy, and Competitive Advantage", *Business and Society,* Vol. 50 No. 1, pp. 116-154.

Delmas, M. and Montiel, I. (2009), "Greening the supply chain: When is customer pressure effective?", *Journal of Economics and Management Strategy,* Vol. 18 No. 1, pp. 171-201.

Dubois, A. and Gadde, L. E. (2008), "Systematic combining: an abductive approach to case research", *Journal of Business Research,* Vol. 55 No. 7, pp. 553-560.

Easterby-Smith, M., Graça, M., Antonacopoulou, E. and Ferdinand, J. (2008), "Absorptive Capacity: A Process Perspective", *Management Learning,* Vol. 39 No. 5, pp. 483-501.

Eisenhardt, K. M. (1989), "Building Theories from Case Study Research", *Academy of Management Review,* Vol. 14 No. 4, pp. 532-550.

ETI (Ethical Trading Initiative) (2013), "Sandstone from Rajasthan, India", available at: http://www.ethicaltrade.org/in-action/programmes/sandstone-rajasthan-india (accessed 16 May 2014).

EC (European Commission) (2013), "Fact and figures about the EU's Small and Medium Enterprise (SME)", available at: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/index_en.htm (accessed 24 November 2014).

Fenwick, T. (2007), "Developing organisational practices of ecological sustainability", *Leadership and Organisation Development Journal,* Vol. 28 No. 7, pp. 632-645.

Gann, D. (2001), "Putting academic ideas into practice: technological progress and the absorptive capacity of construction organizations", *Construction Management and Economics,* Vol. 19 No. 3, pp. 321-330.

Garside, J. (2013), "Child Labour uncovered in Apple's supply chain", *The Guardian,* available at: http://www.theguardian.com/technology/2013/jan/25/apple-child-labour-supply (accessed 23 July 2015).

Glass, J. (2011), "Briefing: responsible sourcing of construction products", *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* Vol. 164 No. 3, pp. 164-165.

Glass, J. (2012), "The state of sustainability reporting in the construction sector", *International Journal of the Smart and Sustainable Built Environment,* Vol. 1 No. 1, pp. 87-104.

Glass, J., Achour, N., Parry T. and Nicholson, I. (2012), "Engaging small firms in sustainable supply chains: responsible sourcing practices in the UK construction industry", *International Journal of Agile Systems and Management,* Vol. 5 No. 1, pp. 29-58.

Gloet, M. (2006), "Knowledge management and the links to HRM", *Management Research News,* Vol. 29 No. 7, pp. 402-413.

Gluch, P., Gustafsson, M. and Thuvander, L. (2009), "An absorptive capacity model for green innovation and performance in the construction industry", *Construction Management and Economics,* Vol. 27 No. 5, pp. 451-464.

Highley, D. E. (2005), "The role of imports to UK aggregates supply", available at: nora.nerc.ac.uk/11253/1/CR05041N.pdf (accessed 17 April 2014).

Hofmann, K. H., Theyel, G. and Wood, C. H. (2012), "Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices – Evidence from Small and

Medium-Sized Manufacturers", *Business Strategy and the Environment,* Vol. 21 No. 8, pp. 530-545.

Hotho, J. J., Becker-Ritterspach, F. and Saka-Helmhout, A. (2012), "Enriching Absorptive Capacity through Social Interaction", *British Journal of Management,* Vol. 23 No. 3, pp. 383-401.

Huang, S. K. (2013), "The Impact of CEO Characteristics on Corporate Sustainable Development", *Corporate Social Responsibility and Environmental Management,* Vol. 20 No. 4, pp. 234-244.

IEMA (Institute for Environmental Management and Assessment) (2015), "Revision to the International EMS Standard ISO 14001", available at: http://www.iema.net/policy-iso14001revision (accessed 21 January 2015).

Jenkins, H. (2006), "Small Business Champions for Corporate Social Responsibility", *Journal of Business Ethics,* Vol. 67 No. 3, pp. 241-256.

Jones, P., Comfort, D. and Hillier, D. (2006), "Corporate social responsibility and the UK construction industry", *Journal of Corporate Real Estate,* Vol. 8 No. 3, pp. 134-150.

Jones, B., Temperley, J. and Lima, A. (2009), "Corporate reputation in the era of Web 2.0: the case of Primark", *Journal of Marketing Management,* Vol. 25 No. 9-10, pp. 927-939.

Kim, L. (1998), "Crisis construction and organisational learning: Capability building in catching up at Hyundai Motor", *Organization Science,* Vol. 9 No. 4, pp. 506-521.

Klassen, R. D. and Vereecke, A. (2012), "Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance", *International Journal of Production Economics,* Vol. 140 No. 1, pp. 103-115.

Klewitz, J. and Hansen, E. G. (2014), "Sustainability-oriented innovation of SMEs: a systematic review", *Journal of Cleaner Production,* Vol. 65 No. 1, pp. 57-75.

Lehtonen, M. (2004), "The environmental-social interface of sustainable development: capabilities, social capital, institutions", *Ecological Economics,* Vol. 49 No. 2, pp. 199-214.

Lin, H. (2012), "Cross-sector Alliances for Corporate Social Responsibility Partner Heterogeneity Moderates Environmental Strategy Outcomes", *Journal of Business Ethics,* Vol. 110 No. 2, pp. 219-229.

Linnenluecke, M. K. and Griffiths, A. (2010), "Corporate sustainability and organisational culture", *Journal of World Business,* Vol. 45 No. 4, pp. 357-366.

Love, P. E. D., Li, H., Irani, Z. and Faniran, O. (2000), "Total quality management and the learning organization: a dialogue for change in construction", *Construction Management and Economics,* Vol. 18 No. 3, pp. 321-331.

Lozano, R. and Huisingh, D. (2011), "Inter-linking issues and dimensions in sustainability reporting", *Journal of Cleaner Production,* Vol. 19 No. 2-3, pp. 99-107.

Maon, F., Lindgreen, A. and Swaen, V. (2009), "Designing and Implementing Corporate Social Responsibility: An Integrative Framework Grounded in Theory and Practice", *Journal of Business Ethics,* Vol. 87 No. 1, pp. 71-89.

McAdam, R., Miller, K., McMacken, N. and Davies, J. (2010), "The development of absorptive capacity-based innovation in a construction SME", *International Journal of Entrepreneurship and Innovation,* Vol. 11 No. 3, pp. 231-244.

Morsing, M. and Perrini, F. (2009), "CSR in SMEs: do SMEs matter for the CSR agenda?", *Business Ethics: A European Review,* Vol. 18 No. 1, pp. 1-6.

Murray, M. and Dainty, A. (2009) (eds.), Corporate *Social Responsibility in the Construction Industry*, Taylor and Francis Group, London, UK.

Myers, D. (2005), "A review of construction companies' attitudes to sustainability", *Construction Management and Economics,* Vol. 23 No. 8, pp. 781-785.

ONS (Office for National Statistics) (2014), "Summary: UK Trade, May 2014", available at: http://www.ons.gov.uk/ons/rel/uktrade/uk-trade/may-2014/summ-uk-trade--may-2014.html (accessed 16 July 2014).

Pinkse, J., Kuss, M. J. and Hofmann, V. H. (2010), "On the implementation of a "global" environmental strategy: The role of absorptive capacity", *International Business Review,* Vol. 19 No. 2, pp. 160-177.

Quinn, L. and Dalton, M. (2009), "Leading for sustainability: implementing the tasks of leadership", *Corporate Governance,* Vol. 9 No. 1, pp. 21-38.

Revell, A. and Blackburn, R. (2007), "The business case for sustainability? An examination of small firms in the UK's construction and restaurant sectors", *Business strategy and the environment,* Vol. 16 No. 6, pp. 404-420.

Roy, M. J. and Thérin, F. (2008), "Knowledge Acquisition and Environmental Commitment in SMEs", *Corporate Social Responsibility and Environmental Management,* Vol. 15 No. 5, pp. 249-259.

Sáenz, M. J., Revilla, E. and Knoppen, D. (2014), "Absorptive Capacity in Buyer-supplier Relationships: Empirical Evidence of Its Mediating Role", *Journal of Supply Chain Management,* Vol. 50 No. 2, pp. 18-40.

Schweber, L. (2013), "The effect of BREEAM on clients and construction professionals", *Building Research & Information,* Vol. 41 No. 2, pp. 129-145.

Senge, P. (1990), *The Fifth Discipline: The Art & Practice of The Learning Organization*, Century Business, London, UK.

Seuring, S. and Müller, M. (2008), "From a literature review to a conceptual framework for sustainable supply chain management", *Journal of Cleaner Production,* Vol. 16 No. 15, pp. 1699-1710.

Sexton, M. and Barrett, P. (2003a), "The role of technology transfer in innovation within small construction firms", *Engineering, Construction and Architectural Management,* Vol. 11 No. 5, pp. 342-348.

Sexton, M. and Barrett, P. (2003b), "Appropriate innovation in small construction firms", *Construction Management and Economics,* Vol. 21 No. 6, pp. 623-633.

Shen, L. Y., Hao, J. L., Tam, V. W. Y. and Yao, H. (2007), "A checklist for assessing sustainability performance of construction projects", *Journal of Civil Engineering and Management,* Vol. 13 No. 4, pp. 273-281.

Stewart, H. and Gapp, R. (2014), "Achieving Effective Sustainable Management: A Small-Medium Enterprise Case Study", *Corporate Social Responsibility and Environmental Management,* Vol. 21, No. 1, pp. 52-64.

SCF (Sustainable Concrete Forum) (2010), *Concrete Industry Guidance to Support BES 6001 – Issue 3 (February 2010)*, Sustainable Concrete Forum, Surrey, UK.

SCF (Sustainable Concrete Forum) (2012), *Concrete Industry Guidance Document on Sustainability Performance Indicators – Issue 6 (January 2012),* Sustainable Concrete Forum, Surrey, UK.

Uhlaner, L. M., Berent-Braun, M. M., Jeurissen, R. J. M. and de Wit, G. (2012), "Beyond Size: Predicting Engagement in Environmental Management Practices of Dutch SMEs", *Journal of Business Ethics,* Vol. 109 No. 4, pp. 411-429.

UKCG (UK Contractors Group) (2012), "Materials Task Group", available at: http://www.ukcg.org.uk/business-improvement/environment/materials-task-group/ (accessed 17 February 2014).

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2012), "Integrating responsible sourcing in the construction supply chain", in Smith, S. (Ed). Proceedings of the 28th Annual ARCOM Conference 2012, Association of Researchers in Construction Management, Edinburgh, Vol. 2, 3-5 September 2012, pp. 1311-1319.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2013), "Characterising the relationship between responsible sourcing and organisational reputation in construction firms", in Soetanto, R., Tsang, N. and Ahmed, A. (Eds). Proceedings of the Sustainable Building and Construction Conference 2013, Coventry University, Coventry, Vol. 1, 3-5 July 2013, pp. 215-224.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2015), "Analysis of responsible sourcing performance in BES 6001 certificates", *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* Vol. 168 No. 2, pp. 71-81.

Yin, R. K. (2009), *Case Study Research Design and Methods: Fourth Edition*, Sage Publications, California, USA.

Young, J. and Osmani, M. (2013), "Investigation into contractors' responsible sourcing implementation practice", *Proceedings of the Institution of Civil Engineers: Engineering Sustainability,* Vol. 166 No. 6, pp. 320-329.

Zahra, S. A. and George, G. (2002), "Absorptive capacity: a review, reconceptualization, and extension", *Academy of Management Review,* Vol. 27 No. 2, pp. 185-203.

APPENDIX J PAPER 5: DEVELOPING A SUSTAINABILITY ASSESSMENT TOOL TO AID ORGANISATIONAL LEARNING IN CONSTRUCTION SMES

Full Reference

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2015). Developing a sustainability assessment tool to aid organisational learning in construction SMEs. *In:* Raiden, A. B. and Aboagye-Nimo, E. (eds). *Proceedings of the 31st Annual ARCOM Conference*, 7-9 September, Lincoln, UK, Association of Researchers in Construction Management, 457-466.

Abstract

Organisations engage with sustainability for a number of reasons, often implementing standards to demonstrate commitment to sustainability or benchmark performance. However, many scholars discuss sustainability from an operational or administrative perspective, largely neglecting the role of individuals making up the organisation. Central to organisational development are the learning processes of these individuals and how these translate into organisational learning. Although research into organisational learning is abundant, relatively little is known about how construction organisations, particularly those classified as SMEs, undergo learning processes in order to increase their knowledge. Furthermore, organisational learning requires high absorptive capacities (ACAP) and previous research has linked this with successful standard implementation. SMEs are often pressurised by customers to obtain certification to multiple standards, yet often lack the necessary expertise, and financial and time resources to implement these. This research argues that organisational learning is a key limiting factor in successful sustainability standard implementation. Specifically, the development phase of a sustainability self-assessment tool to identify environmental and social aspects most relevant to an organisation's operations is presented. Following this, the tool then enables the level of organisational knowledge held about each of these aspects to be determined such that

learning approaches are informed to increase learning and knowledge and hence absorptive capacities. The main components of this assessment tool are presented and rules for its operation and development established. Next steps for the assessment framework and suggestions for its applicability to construction product manufacturers are also offered.

Keywords – absorptive capacity, corporate social responsibility, organisational learning, sustainability assessment; sustainability standards.

Paper type – Conference

1 INTRODUCTION

Demonstrating commitment to sustainability and enacting positive change to incorporate greener behaviours at the organisational level is often evidenced via certification to sustainability standards. Standards are adopted to demonstrate the performance of the organisation or their products against specific areas. They are voluntary and comprise a list of statements providing guidance and requirements on commonly accepted norms under these specific areas. Many studies have considered the role that these have from an operational or administrative perspective, such as how certification to ISO 14001 (BSI, 2004) for environmental management impacts on organisational performance (e.g. Link and Naveh, 2006). While certification to standards has been found in many cases to hold significant benefits, such as improved legitimacy (Bansal and Hunter, 2003), cost savings (Raines, 2002) and increased trade opportunities (Prakash and Potoski, 2007) in the case of ISO 14001 (BSI, 2004), it is also argued that the expense associated with implementing them and the intensive demands placed upon staff and time resources often render them unattainable for many organisations, particularly small and medium sized companies (SMEs).

However, the increased focus on sustainability assessment in supply chains (Varsei et al., 2014), coupled with the growing interest in product stewardship (Schroeder (2012), for example), is creating increased demand for evidence of certification to sustainability standards within product supply chains. Consequently, 'voluntary' standards are becoming ever more 'quasi-voluntary', which SMEs struggle to engage with due to resource constraints (Cassells and Lewis, 2011). Within the construction industry, clients tend to prioritise suppliers that can demonstrate compliance with standards over those that cannot, meaning that increasingly certification is becoming a key factor in awarding supplier contracts.

Such operational and administrative issues are not the only barriers to certification however; high levels of absorptive capacity are suggested as a necessary prerequisite for sustainability certification given the learning required to comply with, and maintain certified performance under, such evolving standards. Indeed it is argued here that learning represents perhaps the most significant barrier to complying with standards, and the lack of resources that SMEs typically possess affects their ability to effectively learn. Cost-effective practical tools are therefore required to support this learning, yet there is currently a paucity of such tools available to construction SMEs. Questions remain, however, as to the form that sustainability assessment

tools should follow to increase learning within construction SMEs such that they can comply with sustainability standards. This research establishes principles to support construction SMEs in establishing any gaps in compliance and in identifying learning actions to effectively manage sustainability issues. These principles can then be used to govern the design of a framework to aid in the development of a more detailed tool. It is important at this point to highlight that such principles and the tool are not confined to SMEs however and as such may be applicable to non-SME organisations. The tool is specifically targeted at SMEs in this research due to their relative struggles in complying with sustainability criteria.

2 IMPLEMENTING SUSTAINABILITY STANDARDS IN SMES

SMEs are often considered to have fewer than 250 employees, a turnover of less than €50 million and make up around 99% of all businesses (European Commission, 2013). Collectively they contribute to about 60% of commercial waste and 80% of pollution in the UK (Cassells and Lewis, 2011), but when considered individually, their impacts are regarded as relatively low (Brammer et al., 2011). Jenkins (2006) argues however, that there is growing recognition of their collective environmental and social impacts, with Russo and Perrini (2010) even suggesting that sustainability holds greater importance for them than for their larger counterparts due to their stronger links with local communities.

Much has been written in the sustainability and supply chain management literature about how SME engagement with sustainability is hampered by tight resource constraints (e.g. Ciliberti et al., 2008; Lepoutre and Heene, 2006). Implementing a sustainability standard is a resource-intensive process, requiring the provision of vast financial resources (Revell and Blackburn, 2007) and commitments in time from staff who also hold other responsibilities within the business. Although there is often considerable overlap between many of these sustainability standards, such as that of ISO 14001 (BSI, 2004) and BES 6001 (BRE, 2014), they are rarely implemented in a coherent and holistic manner. Furthermore, SMEs do not possess the resource to implement multiple standards simultaneously (Tsai and Chou, 2009).

Research has also shown that customer pressure can drive adoption of standards (Delmas and Montiels, 2009), often more so than the organisation's technical capacity to implement them (Simpson et al., 2012). In a UK construction context, where 950,000 SMEs operate (BIS,

2014), standards are only implemented by product manufacturers at the request of customers. Hence, implementation is only considered by the SME when it has sufficient resources and demand from customers to warrant certification. However, resources and demand aside, learning is argued to be a key barrier to successful standard adoption in the SME, and implementation of standards can be linked to the organisational knowledge and learning structures that are in place.

Sustainability standards represent an important area for the SME, yet without the in-depth knowledge of how to implement such standards, they often struggle to keep up with the demands of their clients. Therefore, facilitating learning when implementing a sustainability standard is an important but rarely considered area for research.

3 LINKING STANDARDS AND ORGANISATIONAL LEARNING

Implementation of standards can be thought of as a change process requiring organisational learning (Maon et al., 2009) and the knowledge obtained from this learning can affect SME commitment to sustainability (Halila, 2007). However, the majority of SMEs are 'vulnerably compliant' according to Perrini (2006), as they do not possess sufficient knowledge to ensure full compliance with sustainability requirements. Therefore, in order to increase uptake of sustainability among the SME community, provision and facilitation of learning holds great significance.

Organisational learning has been shown to be highly dependent upon the absorptive capacity (ACAP) of the organisation (Kim, 1998). ACAP is the ability of a firm to create competitive advantages through implementation and exploitation of knowledge and new resources (Cohen and Levinthal, 1990; Zahra and George, 2002). ACAP has been linked with effective development of environmental strategies (Delmas et al., 2011) and sustainable performance improvement in supply chains (Sáenz et al., 2014), and in a construction context, green innovation and performance (Gluch et al., 2009). An important component of ACAP is knowledge acquisition, which is key for sustainability innovations (Halme and Korpela, 2014), as those organisations that engage in regular knowledge acquisition activities tend to exhibit greater environmental commitment (Roy and Thérin, 2007).

It is thus posited that providing knowledge acquisition opportunities can not only mobilise learning for the SME, but can also encourage a more proactive attitude to sustainability issues. Potentially, SMEs can then become effective 'transmitters' of sustainability throughout the supply chain (Ayuso et al., 2013); therefore ensuring SME engagement with sustainability can be important in increasing supply chain sustainability.

Through the provision of a learning tool for the SME, this increase in supply chain sustainability can be obtained. This tool should not only support meeting the requirements of standards, but also ensure SMEs have the necessary expertise to obtain added value from implementing these standards. There are however a wealth of standards in the public domain, potentially creating a confusing landscape. Therefore a tool should also consider those issues most significant to an SME, such that performance in those areas of most significance to its operations is prioritised. The following sections of this paper will look at the development of a framework upon which such a tool could be based.

4 DEFINING THE PRINCIPLES FOR THE ASSESSMENT FRAMEWORK

1. Prioritising of issues based on risk

Integrating sustainability requires a systems approach with an appropriate management framework (Azapagic, 2003). Reporting frameworks, such as the Global Reporting Initiative (GRI, 2013), encourage organisations to consider different sustainability aspects depending on whether they represent material issues. Likewise, the new ISO framework (IRCA, 2014) requires an organisation to look at its context and how this governs those internal and external issues that it deems to be significant. The latest version of the GRI guidelines (G4) lists 91 sustainability indicators under 46 different aspects, split into seven broad sections. Clearly, reporting against all these indicators would constitute a considerable task, particularly for an SME. Although this is not expected by the GRI, it does highlight the wide range of issues that could be considered relevant to sustainability. It is however plausible to suggest that even conducting a materiality assessment to identify and address the list of 'material' issues would still represent a significant challenge for many SMEs. This example of GRI indicates that such a leading framework to guide sustainability reporting (Brown et al., 2009) is inappropriate for SMEs, as its demands are too onerous for organisations with limited resources.

Some standards however, are rather more prescriptive in what they require compliance with. For example, anecdotal evidence highlighted the case of a construction product manufacturer that was forced to create documentation and policy statements around efficient use of water, as this was required under BES 6001 (BRE, 2014), despite the fact water did not constitute a significant issue for that organisation. In this case, the sole reason that the organisation pursued this issue was to score more 'points' under BES 6001 (BRE, 2014). De Colle et al. (2014) cite a similar example, where an assessment tool that was used by two oil companies was designed in such a way that high scores could be obtained by focusing on questions where it was easiest to score points, rather than where the highest risks occurred. Perversely, this could lead to an organisation scoring a 'high' level of sustainability performance against the tool, even though it may score poorly against individual 'high risk' issues.

An organisation's assessment of risk can be linked to management of its reputation (Bebbington et al., 2008) and thus those issues that have a greater potential to cause reputational damage are often considered issues of higher risk. The significance of an individual aspect can be defined by how much of an impact it has on the environment, society or economy. Furthermore this significance of an aspect is directly linked to risk; poor management of individual aspects that are deemed significant might cause greater risks to the organisation's reputation, leading to potential negative or unwanted attention from stakeholders or the media.

Reputational drivers have been shown to be core reasons for an organisation to adopt the GRI (Nikolaeva and Bicho, 2011) and in a construction context, engaging with responsible sourcing has been linked to reputational issues (Upstill-Goddard et al., 2013). Clearly, taking actions to protect reputation holds great significance; such a risk assessment can aid an organisation in prioritising areas for attention. Therefore, we can arrive at our first principle for our proposed framework: it must initially seek to identify sustainability aspects that are most significant to the organisation in terms of risk, such that performance improvement against 'high risk' aspects is prioritised.

2. Developing the modular approach

Once significant aspects have been identified, the organisation can then begin to address each of these in a systematic way. By setting a uniform framework for the assessment of each sustainability aspect, a standardised approach to obtaining management and performance improvements for each aspect can be developed. Such a framework should focus on breaking

down the requirements of management system standards to render them more approachable for an SME, as many such standards are developed with the aim of targeting primarily big businesses (Enderle, 2004). For this reason, the framework will take a 'modular' approach, with different aspects each representing one module.

Clearly, the first step for any assessment tool is to establish the current position of an individual organisation with regard to individual aspects. Methods such as gap analyses (used at the start of a BES 6001 (BRE, 2014) implementation project, for example), use of maturity matrices (used to guide development of BS 8903 (BSI, 2010) for sustainable procurement), and baseline data collection (such as an initial environmental review used in an ISO 14001 (BSI, 2004) environmental management system (EMS)) can all be used to establish current performance level. Operational controls can then be set, which could be formalised through the setting of control procedures and objectives and targets to strive for performance improvements. BES 6001 (BRE, 2014) sets requirements for organisations to develop a 'documented management system' for many of the environmental and social aspects covered by the standard. This requires an organisation to set a policy, metrics and objectives and targets for specific issues, enabling effective management of each aspect. In this proposed framework, such documentation is concerned with developing and designing the management processes for each aspect.

Once the 'Design' stage has been completed, and procedures are in place for managing each aspect, the organisation can then begin to implement these. This should ensure that all procedures are fully embedded within the organisation, data are collected, monitored and measured and training and awareness raising activities are conducted (see Azapagic, 2003). Organisations could also use this stage to implement auditing activities to ensure procedures are correctly being carried out and data collected are accurate. These activities should be termed the 'Implementation' stage of the framework. Full engagement at this stage should cause the organisation to have fully operational robust processes to manage different sustainability issues.

However, in order to set further improvement targets and strive for these on an on-going basis, the proposed framework should also include a 'Review' stage, where all data are reviewed and any necessary corrective actions emanating from audits are advised. This can then contribute towards a 'continual improvement' culture, as advocated by many of the ISO management systems.

It is therefore suggested that each ‘module’ is based upon this ‘Design, Implement, Review’ process, which is similar to the 'Plan-Do-Check-Act' approach suggested in the ISO 14001 (BSI, 2004) standard. Therefore, the second principle for the proposed assessment framework has been determined: it must address all significant aspects in a modular way following a systematic approach, as outlined above.

3. Prescribing learning approaches to improve sustainability management

A criticism often levied at standards is that they tend to encourage a ‘box-ticking’ approach to compliance, where specific clauses are implemented with little consideration as to how they bring a wider benefit to the organisation (De Colle et al, 2014). This can directly lead to standards actually failing to improve performance (Simpson et al., 2012), which somewhat contradicts the reasons behind their implementation. As such, our assessment framework should seek to avoid prescriptive actions that could potentially cause a ‘box-ticking’ approach to any tool that is developed out of it. Given the links already made between sustainability standards and organisational learning, it is suggested that this framework should look to prescribe learning actions for each aspect by determining what knowledge the organisation possesses about the requirements of the sustainability standards.

Considering the systematic nature of the modules as discussed previously, learning actions should focus on the design, implementation or review of a particular module. It is suggested that by formulating a question set for each module that considers those topics core to complying with that module, any tool could determine the gaps in the organisation’s knowledge about that specific module and as such, can highlight areas where further learning might be required. This will ensure that organisations can implement standards in a way that adds value to their operations. As such, ACAP can be increased, as organisations are essentially ‘learning-by-doing’, which aids in increasing their transformation of knowledge (see Zahra and George, 2002). The third principle for the development of the framework is thus set: it should relate the knowledge gaps of the organisation to the requirements of the sustainability standard and prescribe learning actions where these gaps exist.

Figure 1 shows how these rules fit within the high-level design of the framework. This framework can then be used to guide development of the assessment tool.

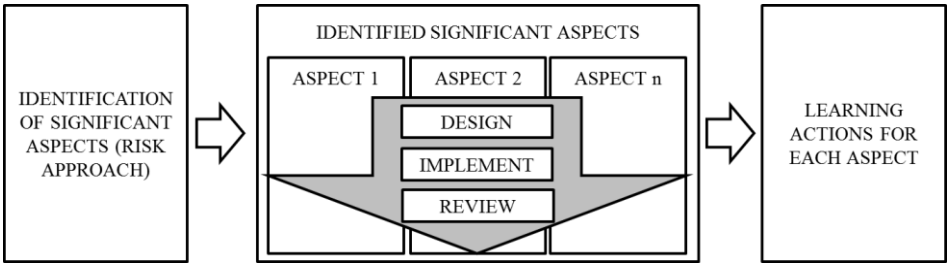

Figure 1: The high level framework according to the development principles established.

5 APPLICATION OF THE TOOL: A LEARNING DIMENSION

The high-level framework developed above can be used to guide the development of a sustainability assessment tool, which can be used by an organisation to address either the requirements of a specific sustainability standard or to address broader corporate responsibility requirements. As explained in the previous section, the final stage of the framework (labelled as 'learning actions for each aspect' in figure 1) will need to understand what the organisation is required to do and their awareness around these requirements. This will enable the prescription of learning actions for the organisation such that it can obtain sufficient knowledge to address the requirements of the modules it is addressing. Implicit in the framework is that organisations need to adopt a 'learning organisation' form (Senge, 1990). The type of learning that an organisation undergoes is dependent upon its culture (Love et al., 2000); therefore an organisation's learning is dependent upon the level of individual learning. Management system standards, such as ISO 14001 (BSI, 2004), stress the significance of training programmes, but it is imperative that such activities are fully implemented and their importance fully recognised, as Tennant and Fernie (2013) report that ad hoc delivery of management-led training does not maximise the potential for learning.

If this framework is to assist in the delivery of effective learning for employees, it must ensure that full commitment is given to the learning activities prescribed within the framework. These should be planned, and organisations using the framework will need to set aside time for employees to undergo any learning activities. However, given the tendency for the SME to possess limited time resources (Lepoutre and Heene, 2006), such learning activities developed as part of the tool will need to focus on short 'bitesize' activities, such that the effect of time constraints is minimised.

6 CONCLUSIONS AND RECOMMENDATIONS

This research paper has presented the principles and some components of a learning framework, which will be used to guide the development of a sustainability assessment tool. The framework rests on three principles: Firstly, the tool must identify those sustainability aspects most significant to an organisation's activities such that resources can be concentrated on key aspects; secondly, the framework should follow a modular design, with each individual aspect representing one 'module', so significant aspects are addressed in a systematic way; and finally, the framework should establish knowledge gaps and link these to the requirements of sustainability standards, thereby prescribing learning actions that will aid in the organisation complying with standards. This enables an SME to undergo learning to ensure that the requirements of sustainability standards are complied with. It also enables an organisation to increase its learning and knowledge and hence absorptive capacities (ACAP).

These principles also govern the three high level components of the framework under which the detailed modules and questions will be developed. Next steps will consider the development of individual modules using the principles presented by establishing what is required by different standards against specific aspects. Within each of these individual modules, question sets to understand the knowledge held about each aspect will be developed according to the modular principles established. The framework must however also seek to be free of any limitations, and as such, development must focus on avoiding a 'box-ticking' approach to compliance. This will be addressed by extracting the organisational performance intricacies for different aspects and setting bespoke learning objectives in order to provide added value to the sustainability standard being implemented.

Finally, the development of the framework presented here contributes specifically to literature linking learning and ACAP with improved sustainability performance in supply chains. An assessment tool developed by use of this framework will enable an organisation to set proactive sustainability strategies by focusing on learning and development outcomes which lead to increased organisational learning and hence ACAP. Furthermore, by considering the ability of SMEs to 'transmit' sustainability through the supply chain (Ayuso et al., 2013), this framework can provide a useful starting point for wider sustainability adoption.

7 ACKNOWLEDGEMENTS

This research forms part of an Engineering Doctorate (EngD) programme, sponsored by Responsible Solutions Ltd and the Engineering and Physical Sciences Research Council (EPSRC), managed through the Centre for Innovative and Collaborative Construction Engineering (CICE), based at the School of Civil and Building Engineering at Loughborough University. The support of all these parties is gratefully acknowledged.

8 REFERENCES

Ayuso, S., Roca, M. and Colomé, R. (2013). SMEs as "transmitters" of CSR requirements in the supply chain. Supply Chain Management: An International Journal 18(5), 497-508

Azapagic, A. (2003). Systems Approach to Corporate Sustainability: A General Management Framework. Trans IChemE, Part B, 81, 303-316.

Bansal, P. and Hunter, T. (2003). Strategic Explanations for the Early Adoption of ISO 14001. Journal of Business Ethics 46(3), 289-299.

Bebbington, J., Larrinaga, C, and Moneva, J. M. (2008). Corporate social reporting and reputation risk management. Accounting, Auditing and Accountability Journal 21(3), 337-361.

BIS (Department for Business, Innovation and Skills) (2014). Business population estimates for the UK and regions [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/377934/bpe_2014_statistical_release.pdf [Accessed 19/01/2015].

Brammer, S., Hoejmose, S. and Marchant, K. (2012). Environmental Management in SMEs in the UK: Practices, Pressures and Perceived Benefits. Business Strategy and the Environment 21(7), 423-434.

Brown, H. S., de Jong, M. and Lessidrenska, T. (2009). The rise of the Global Reporting Initiative: a case of institutional entrepreneurship. Environmental Politics 18(2), 182-200

BRE Building Research Establishment (2014). BES 6001: Framework standard for the responsible sourcing of construction products Issue 3.0. BRE, Watford, UK.

BSI British Standards (2004). BS EN ISO 14001:2004: Environmental management systems - requirements with guidance for use. BSI, London, UK.

BSI British Standards (2010). BS 8903:2010: Principles and framework for procuring sustainably. Guide. BSI, London, UK.

Cassells, S. and Lewis, K. (2011). SMEs and Environmental Responsibility: Do Actions Reflect Attitudes? Corporate Social Responsibility and Environmental Management 18(3), 186-199.

Ciliberti, F., Pontrandolfo, P. and Scozzi, B. (2008). Investigating corporate social responsibility in supply chains: a SME perspective. Journal of Cleaner Production 16(15), 1579-1588.

Cohen, W. M. and Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly 35(1), 128-152.

De Colle, S., Henriques, A. and Sarasvathy, S. (2014). The Paradox of Corporate Social Responsibility Standards. Journal of Business Ethics 125(2), 177-191.

Delmas, M. and Montiel, I. (2009). Greening the Supply Chain: When is customer pressure effective? Journal of Economics and Management Strategy 18(1), 171-201.

Delmas, M., Hoffmann, V. H. and Kuss, M. (2011). Under the Tip of the Iceberg: Absorptive Capacity, Environmental Strategy, and Competitive Advantage. Business and Society 50(1), 116-154.

Enderle, G. (2004). Global Competition and Corporate Responsibilities of Small and Medium-Sized Enterprises. Business Ethics: A European Review 14(1), 51-63.

EC (European Commission) (2013). Facts and figures about the EU's Small and Medium Enterprise (SME) [Online]. Available at: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/index_en.htm [Accessed 31/03/2015]

Gluch, P., Gustafsson, M. and Thuvander, L. (2009). An absorptive capacity model for green innovation and performance in the construction industry. Construction Management and Economics 27(5), 451-464.

GRI Global Reporting Initiative (2013). G4 Sustainability Reporting Guidelines Implementation Manual. Global Reporting Initiative, Amsterdam, the Netherlands.

Halila, F. (2007). Networks as a Means of Supporting the Adoption of Organizational Innovations in SMEs: The Case of Environmental Management Systems (EMSs) Based on ISO 14001. Corporate Social Responsibility and Environmental Management 14(3), 167-181.

Halme, M. and Korpela, M. (2014). Responsible Innovation Toward Sustainable Development in Small and Medium-Sized Enterprises: a Resource Perspective. Business Strategy and the Environment 23(8), 547-566.

IRCA International Register of Certificated Auditors (2014). IRCA briefing note on Annex SL [Online]. Available at: http://www.irca.org/Documents/press/2012/IRCA%20Annex%20SL%20brochure.pdf [Accessed 15/04/2015]

Jenkins, H. (2006). Small Business Champions for Corporate Social Responsibility. Journal of Business Ethics 67(3), 241-256.

Kim, L. (1998). Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. Organization Science 9(4), 506-520.

Lepoutre, J. and Heene, A. (2006). Investigating the Impact of Firm Size on Small Business Social Responsibility: A Critical Review. Journal of Business Ethics 67(3), 257-273.

Link, S. and Naveh, E. (2006). Standardization and Discretion: Does the Environmental Standard ISO 14001 Lead to Performance Benefits? IEEE Transactions on Engineering Management 53(4), 508-519.

Love, P. E. D., Li. H., Irani, Z. and Faniran, O. (2000). Total quality management and the learning organisation: a dialogue for change in construction. Construction Management and Economics 18(3), 321-331.

Maon, F., Lindgreen, A. and Swaen, V. (2009). Designing and Implementing Corporate Social Responsibility: An Integrative Framework Grounded in Theory and Practice. Journal of Business Ethics 87(1), 71-89.

Nikolaeva, R. and Bicho, M. (2011). The role of institutional and reputational factors in the voluntary adoption of corporate social responsibility reporting standards. Journal of the Academy of Marketing Science 39(1), 136-157.

Perrini, F. (2006). SMEs and CSR Theory: Evidence and Implications from an Italian Perspective. Journal of Business Ethics 67(3), 305-316.

Prakash, A. and Potoski, M. (2007). Investing Up: FDI and the Cross-Country Diffusion of ISO 14001 Management Systems. International Studies Quarterly, 51(3), 723-744.

Raines, S. S. (2002). Implementing ISO 14001 - An International Survey Assessing the Benefits of Certification. Corporate Environmental Strategy 9(4), 418-426.

Revell, A. and Blackburn, R. (2007). The Business Case for Sustainability? An Examination of Small Firms in the UK's Construction and Restaurant Sectors. Business Strategy and the Environment 16(6), 404-420.

Roy, M. J. and Thérin, F. (2008). Knowledge Acquisition and Environmental Commitment in SMEs. Corporate Social Responsibility and Environmental Management 15(5), 249-259.

Russo, A. and Perrini, F. (2010). Investigating Stakeholder Theory and Social Capital: CSR in Large Firms and SMEs. Journal of Business Ethics 91(2), 207-221.

Sáenz, M. J., Revilla, E. and Knoppen, D. (2014). Absorptive Capacity in buyer-supplier relationships: Empirical evidence of its mediating role. Journal of Supply Chain Management 50(2), 18-40.

Schroeder, H. M. (2012). Developments in the recycling industry and the growth of product stewardship: the role of enterprise information systems. International Journal of Product Lifecycle Management 6(1), 65-78

Senge, P. (1990). The Fifth Discipline: The Art & Practice of The Learning Organisation. Century Business, London, UK.

Simpson, D., Power, D. and Klassen, R. (2012). When One Size Does Not Fit All: A Problem of Fit Rather than Failure for Voluntary Management Standards. Journal of Business Ethics 110(1), 85-95.

Tennant, S. and Fernie, S. (2013). Organizational learning in construction supply chains. Engineering, Construction and Architectural Management 20(1), 83-98.

Tsai, W. H. and Chou, W. C. (2009). Selecting management systems for sustainable development in SMEs: A novel hybrid model based on DEMATEL, ANP and ZOGP. Expert Systems with Applications 36(2), 1444-1458.

Upstill-Goddard, J., Glass, J., Dainty, A. R. J. and Nicholson, I. (2013). Characterising the relationship between responsible sourcing and organisational reputation in construction firms. In: Soetanto, R., Tsang, N. and Ahmed, A. (2013) (eds). Proceedings of the Sustainable Building and Construction Conference, Coventry, 3-5 July 2013, 215-224.

Varsei, M., Soosay, C., Fahimnia, B. and Sarkis, J. (2014). Framing sustainability performance of supply chains with multidimensional indicators. Supply Chain Management: An International Journal 19(3), 242-257.

Zahra, S. A. and George, G. (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension. Academy of Management Review, 27(2), 185-203.

APPENDIX K INTERVIEW CONSENT AND ETHICAL CLEARANCE FORM

Interview Protocol: Information and Ethical Clearance

Thank you for agreeing to participate in this research project. This form will provide you with all necessary information for this study, and should be retained by the participant upon completion of the research. The researcher will also retain a copy for their records. This sheet will also require the participant to agree that they understand the purpose of the study, their rights and how the information will be used by signing the form once they have read it. **At this stage it is important to remind participants that they have the right to withdraw from the study at any time without giving prior explanation.** This form is provided for study participants in line with Loughborough University's ethical codes of practice for research involving human participants.

Study Information

Researcher

The researcher for this study is James Upstill-Goddard, a final year engineering doctorate (EngD) student from Loughborough University's Centre for Innovative and Collaborative Engineering (CICE), based at Responsible Solutions Ltd (RSL). James' research has looked at small and medium-sized businesses (SMEs), specifically those within the construction industry, and how they can engage with sustainability certification.

He can be contacted on email at J.D.Upstill-Goddard@lboro.ac.uk, or James@responsible-solutions.co.uk

Purpose and process of the study

As part of this EngD project, we have developed a framework that is designed to assist RSL, as a consultant, work more effectively with SMEs. The eventual aim will be to use this framework to develop a tool that in future years can be used with clients in certification projects. The purpose of this framework is to understand what the organisation already has in place around specific sustainability issues, and what extra work might be required to comply with the requirements of a given standard. The framework also delivers cost savings to the client, as it reduces consultant time, (particularly on-site time) which can aid SMEs in reducing their overall costs for the project.

As we have now reached a point where the first iteration of this framework is complete, we now need to test it with a selection of companies, in order to obtain feedback on the usefulness and design of our framework such that we can make any improvements before we continue in its development. As such, we have asked you to use the framework and answer the questions within it as they apply to your business. During the course of the use of the framework, you will be required to send it back to James once complete, and there may be a need for James to send this back to you for additional information, depending upon your answers to the questions.

Following this, James would then like to arrange to meet with you to discuss the framework with you. This will therefore enable us to understand, from your responses, whether we are asking the right type of questions, whether they are phrased correctly, and whether you had any problems using the framework.

We aim to obtain, from this pilot study, an understanding of whether our framework asks the right questions, whether it is designed appropriately, and whether the questions make sense to potential users. This will enable us to use your feedback to further develop and improve the framework, while ensuring that its design remains useful and relevant for the type of organisations that might benefit from its use in future years. The findings from the feedback will then be used to compile a short report on the findings of the study which will be included as part of James' EngD thesis and formal assessment.

Due to the use of sensitive intellectual property within this pilot phase, we have also asked you to sign and return a confidentiality agreement for this pilot phase. As per the terms of this agreement, the participant is reminded that the terms of this confidentiality agreement should be abided by and that the participant should ensure they retain a copy of this for their records.

Use of Data

All interviews will be recorded on a small Dictaphone device to enable the researcher to capture as much data as possible. During the interview, the researcher may also make additional notes. The audio recording will then be used by the researcher to transcribe the interview once back at the university, after which the recording will be destroyed.

At no time will this recording be aired to any third party. Content of the recording is solely between the researcher and the participant. Any participants who feel that they do not wish to be recorded are invited to express this wish prior to beginning the interview.

Due to the sensitive nature of personal information, no company or individual's names will be released or discussed in any outputs from this study. This will render identification of study participants or the companies involved impossible and this will be made clear to all participants prior to commencing data collection.

The researcher will not require any participants to state any personal information but would like to politely request that individuals provide their job title prior to beginning the interview. This is only to analyse how feedback differs between different job roles in different companies.

Any participants are welcome to request copies of the results of the study should they be interested, and should inform the researcher that they wish to be provided with this.

Declaration of understanding

I, the participant, have read the above and understand the purpose of this study, how the data will be used and my rights to withdraw from the study. I also understand I have the right to refuse recording of the interview and have informed the researcher of my wish regarding this and that no information that would enable identification of the company or any individuals will be used.

Participant

Signature: _____

Print Name: _____

Date: _____

Researcher

Signature: _____

Print Name: _____

Date: _____

APPENDIX L CONFIDENTIALITY AGREEMENT

CONFIDENTIALITY AGREEMENT

Between: Responsible Solutions Limited, whose registered office is at The Point, Granite Way, Mountsorrel, Loughborough LE12 7TZ (RSL)

And: XYZ Co, whose registered office is at: XXXXX, XXXXX, XXXX ("Company")

Company and RSL are hereinafter referred to as the "parties" or either one therefore as "party".

The Project: RSL are developing a sustainability assessment framework for SME's and wish to engage the Company to help test this framework to aide its further development. During the course of this project information of a technical, commercial, or proprietary nature may be disclosed by a part to the other party and accordingly both parties agree that such disclosure shall be subject to the terms set out herein.

Confidential information, means: all and any information, documents, data and opinions disclosed by or on behalf of a party to the other party including without limitation commercial, financial or proprietary material, pricing information, data, know-how, formulae, processes, operating methods and procedures, results, designs, drawings, specifications, industrial and or intellectual property, computer programmes or other software and any other information relating to the project, including documents prepared as part of the project.

Disclosing party, means: the party disclosing confidential information to the receiving party or the party to whom the confidential information belongs.

Recipient, means: the party in receipt of confidential information from the disclosing party or otherwise acquired by that party.

Permitted purpose, means: the analysis or use of confidential information in connection with the project.

Third party, means: any party other than RSL or the Company to whom the receiving party is considering disclosing the confidential information.

This agreement applies to all confidential information disclosed or released, whether in writing, orally, through computer media, on drawings and plans, physically through the supply of samples of material or finished products, visually or by any other means and whether or not marked as confidential.

In consideration of the disclosure and release of the confidential information it is hereby agreed that:

The parties shall at all times keep the confidential information secret and confidential.

The parties shall use the confidential information solely for the permitted purpose and for no other purpose. The parties shall not, without prior written consent of the disclosing party, disclose, share, copy, publish or make use of for their own purpose any of the confidential information of the disclosing party.

The confidential information will only be passed to other employees of the recipient in furtherance of this Agreement on a "need to know" basis and any person to whom this confidential information is passed must acknowledge and by bound by the terms of this agreement.

Without prejudice to the preceding provisions or the remainder of this agreement, the confidential information will not be passed to any third party without the express permission of the other party.

Without prejudice to the preceding provisions or the remainder of this agreement, any confidential information shall not be subject to any form of reverse engineering.

On the conclusion of the discussions between the parties to this agreement, the obligations imposed on both Parties will remain in effect without limit of time notwithstanding the return of all confidential information by the recipient to the disclosing party, and any disclosure of confidential information at any time during this time will be in breach of this agreement unless the confidential information becomes available in the public domain.

On the conclusion of the discussions between the parties to this agreement or on the request of the originating party, all information or material which is capable of being returned to the originating party shall be returned within thirty days from the conclusion of such discussions or such request, and no copies shall be retained of any of the information so returned.

Nothing in this agreement shall apply to any information which is in the possession of the other party prior to entering into this agreement, or which is in the public domain prior to entering into this agreement or which comes into the public domain during the course of this agreement unless it has come into the public domain through a breach of this agreement by one of the parties hereto.

For the avoidance of doubt, the confidential information and all intellectual property and other rights therein shall at all times remain the property of the disclosing party. Nothing in this agreement shall be construed deemed by implication or otherwise to convey to either party any rights including under patent, patent application or copyright of the other party.

If a breach of any condition of this agreement occurs or if the disclosing party has reasonable grounds for believing that such breach has occurred or will occur then:

The disclosing party may require the immediate return of all confidential information in the hands of the recipient and/or any third party and may immediately repossess such confidential information; and

The disclosing party shall not be obliged to continue the supply of any confidential information to the recipient in terms of any contract, agreement, or arrangement between the disclosing party and the recipient.

The recipient acknowledges that the confidential information is important to the disclosing party's business, that an award in damages may be insufficient to protect such business in the event of any breach hereof, and that the disclosing party may seek an action for interdict or injunction or of specific implement or such other action as the disclosing party deems appropriate if it suspects such breach.

This agreement shall be governed by and construed in accordance with the Laws of England.

Signed on behalf of the parties to this agreement by a duly authorised official:

Responsible Solutions Limited	XYZ Co
The Point, Granite Way, Mountsorrel,	XXXXXX
Loughborough LE12 7TZ	XXXXXXX
Signature:	Signature:
Name:	Name:
Job title:	Job title:
Date:	Date:

APPENDIX M QUANTITATIVE ANALYSES METHODS

Two types of quantitative analyses were used as part of this EngD. These are introduced below.

Spearman's rho correlation coefficient

Spearman's rho correlation coefficient (ρ) is a nonparametric measure of the strength of correlation that exists between two variables. It is particularly useful for measuring the correlation within datasets that are not normally distributed. The equation for calculating Spearman's rho correlation coefficient is shown in figure M1.

$$\rho = 1 - \frac{6\sum_{i=1}^{n} D_i^2}{n(n^2-1)}$$

Figure M1 Spearman's rho correlation coefficient

Where:

$n =$ the number of pairs of measurements;

$D_i^2 =$ the difference of the ith pair of rankings.

To calculate ρ, all *x*-values and *y*-values for a data set are ranked in ascending order and assigned a 'rank' (1, 2, 3, n). The data should then be listed in ascending order by the ranked *x*-values ('rank x_i'). The corresponding ranked *y*-values ('rank y_i') for each of the ranked *x*-values are then subtracted from the *x*-values to calculate the difference between these *x*-values and *y*-values (D_i). These are then squared to calculate for D_i^2. This was calculated automatically by use of the IBM statistics software SPSS when used in this research project due to the size of datasets being used.

Reliability analysis

Reliability means that a measure should consistently reflect the construct that it is measuring. Reliability analysis is achieved by looking at measures of internal consistency, which indicate

how closely related a set of items are in a group (level of reliability). The most commonly used measure of scale reliability is Cronbach's alpha (α), which is given by the equation in figure M2.

$$\alpha = \frac{N^2\overline{\mathrm{Cov}}}{\sum s^2_{item} + \sum \mathrm{Cov}_{item}}$$

Figure M2 Cronbach's alpha (α)

Where:

$N =$ number of items;

$\mathrm{Cov} =$ covariance between the items;

$s^2 =$ item variance

Cronbach's alpha (α) ranges in value from 0 to 1; the higher the score, the more reliable the scale. Generally, it is accepted that α values of 0.7 and above are deemed to be 'reliable'. For use of Cronbach's alpha, the IBM statistics programme SPSS was used to analyse the data, so all calculations for α were calculated automatically. SPSS also produces data for 'Cronbach's alpha if is item deleted' which are the values of α if that item is not included within the calculation. This will therefore indicate the change in α that would be seen if α is not included within the calculation (Field, 2013). If the α value increases in this column then the removal of that item has improved the reliability of the scale, and so this item should be removed from the scale to improve reliability.

References

Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics, 4th Edition. Sage, London, UK.

APPENDIX N PILOT INTERVIEWS

Opening questions

Thinking about how each issue affects your ability to conduct business (Scale of 1-5; 1 not at all, 5 very important):

- How important an issue is waste to your organisation?
- How important an issue is procurement to your organisation?
- How important an issue is child labour to your organisation?

Section 1: Structure of the framework

Questions focusing on the design and structure of the framework, as well as the logic of the questioning.

- How easy was the framework to follow?
    - Scale of 1-5; 1 being not easy at all; 5 being very easy
- Did the progression through the questions feel logical?
- Did the overall framework make sense?
- Was the framework in its current design easy to understand?

Section 2: Content of the questions

Questions focusing on the content and detail of the questions, including whether they make sense etc.

- Overall, how easy were the questions to understand?
    - Scale of 1-5; 1 being not easy at all and 5 being very easy.
- Were there any questions that you didn't understand, or felt were out of place?
    - How could those questions that didn't make sense be amended?
- How appropriate is the level of questioning?
    - Did you feel there were any questions that appeared unnecessary, or were repetitive?

- Did you understand the questions?
    - Was it too little?
    - Was it too much?

Section 3: Application of the framework

Questions focusing on the use/application of the framework within the company.

- Overall, how relevant were the questions to your business?
    - Scale of 1-5; 1 being not relevant at all and 5 being very relevant.
- Did you feel that the time it took to completing the questions within the framework was appropriate?
- How useful was the framework in helping you to understand what is required under each of the issues?
- Is the framework a useful tool for companies that are starting out on their sustainability journey?
- Were you prompted to answer a question on something that you hadn't previously considered?
- How will you take any 'lessons learnt' away from this pilot exercise and implement them within your business?

Section 4: Specific feedback

- Are there any aspects of the framework that we have not discussed that you wanted to raise?
- Were there any aspects of the framework that you felt required improvement or amending?

- Did any of these questions highlight any knowledge gaps that your organisation might have?

    - What might help you to address these knowledge gaps?

APPENDIX O FEEDBACK FROM FRAMEWORK PILOTS

Feedback from Pilot Programme

Positives

- Made sense and easy to understand
- Appropriate level of information being sought to be extracted
- Time spent was fine – but then again, if you are going down this route you don't mind investing the time
- Very useful as it operates almost as a 'self-audit'
- Very useful in helping to understand what is required under each of these issues. If you knew that by answering yes to all these questions you had enough to go for certification then that would be really useful.
- Did prompt some companies to go away and do more in certain areas
- Very clear structure
- Clear logic to questioning and easy to understand
- Idea to provide e-learning type material liked – would be very useful.
- Useful tool for an organisation that wants to improve their sustainability impacts
- Did alert some pilot companies to improvements they might need to make
- Framework very easy to use – follows logically and makes sense. It is thought provoking.
- Although it is initially quite daunting, once it was focused upon it was quite easy and quite interesting.
- Appropriate level of questioning – it was felt that it could be a bit riskier going deeper if it is an initial process.
- Good starting point for businesses to understand what they have or haven't got.
- Much quicker to complete than was initially thought.
- Does make you realise that the questions are there for a reason and that you probably should be doing it if you're not – a bit of an eye opener.
- Very useful in helping you understand what is required as it covers all the salient topics.
- Felt the sort of questions being posed were perfectly reasonable.
- Covers everything in a very succinct and workable manner
- E-learning idea a good one – felt it would have been useful to them when working through this stuff years ago

- Final idea was a good one, although need to ensure that the personal contact that is present at an implementation project shouldn't be lost.
- Structure is logical and makes sense.
- Clear which questions had to be answered
- Questions were pitched at the right level.
- Time spent was appropriate
- Had some use in helping to understand what is required under each issue. Useful 'benchmark' for companies starting out on their sustainability journey.
- Quite concise and compact – thought it would be bigger than it was. To make it more detailed was possibly cloud the issues.
- Optimise for one screen
- Nothing seemed out of place.
- Very quick to complete
- Very logical 'entry level' questions which clearly follow a PDCA cycle. Pitched at the right sort of level and structure made sense.
- It was easy to understand and follow although initially appeared a little daunting.
- Nothing that appears out of place.
- The way it is structured and the way it works through the questions and the language used is very good.
- Good questions are being asked that are based on common sense. Logical in their style.
- This would have been very helpful for some of the companies when they were implementing sustainability standards.
- Useful in helping an SME to understand what is required.
- The idea of linking the framework in with a learning approach makes sense and will add value.
- Level of questioning is about right from a BES 6001 point of view and are 'there or thereabouts' in terms of the information they are looking to obtain.
- Idea of having a risk-based first stage with 'tell us about your organisation' type questions is a good one as this gives a good idea of context, scale of operations, etc.
- Idea behind its development is a good on – i.e. sending a client a question set which can be done in their own time, saves them money as the consultant is not required on site,

enables the consultant to carry out a desktop review of the information provided and thus more effectively identify areas that require support.

Improvements: Content

- Instructions too long and wordy
- Expandable information boxes to explain terms and why things are important would be useful
- Some repetition at times (although this was often more to do with nature of answers rather than the wording of questions)
- Unclear whether separate policy needed or whether statement on another policy is satisfactory
- No specifics on hazardous waste
- Do the learning actions proposed give us a 'rod for our own back'? In terms of updates etc.
- Legal compliance section and stronger emphasis on minimising waste.
- Good practice and understanding of cost could be included in the expandable information boxes. It was felt this would be especially important for the SME.
- Child labour could be linked with modern slavery as this goes a little further.
- Young worker policies had been covered in two organisations' codes of conduct.
- Checklist of final things at the end that need to be attached
- Generate an 'action plan' with colour coded priorities signifying high, medium and low. Useful for an SME if they are miles off the pace as it can save them spending loads to find out they are nowhere near.
- The content could be designed such that it highlights opportunities for the SME.
- Questions are quite formal in terms of terminology – need to avoid dumbing down too much so as to not make it applicable to anyone but perhaps some of this could be looked at? For SMEs, it may not necessarily be an environmental/sustainability professional completing it so they will not necessarily be *au fait* with all terms/concepts.
- Perhaps needs to focus a little more on some of the fundamentals as for someone 'coming in from the cold' it could perhaps be quite challenging.

- Use of 'organisational policy' in the procurement module is confusing –this is a terminology issue that should be reworded to make it more applicable to/understandable for the SME.
- Perhaps the focus should be more about adding value to the organisation, and as a consequence, you are also complying with the standards.
- In the child labour section, need to be careful about the use of 'young workers' as a term, as this could potentially deter companies from using young workers legally (i.e. work experience, apprenticeships, etc.).
- Some questions could perhaps look to draw out more information or give the user more information.
- Fundamental for SME – what do I need to do to stay in business?
- When assessing the relevance of modules, think about the broader supply chain, not just the organisation itself.

Improvements: Structure

- Design was confusing initially – could put off the SME. A lot to look at.
- More clarity needed around some of the action boxes.
- Instructions/key should perhaps be clearer – one person completed incorrectly
- Colours not good to distinguish between boxes – shapes are better
- Size of answer box can influence the sort of answer given
- Flow should maybe go across the page to make it more user-friendly.
- Arrows should be used between boxes to indicate the flow.
- Structure of one question needs reviewing
- Formatting to optimise it for one screen
- Individual questions could have their own worksheet
- Simplify coding of questions
- Perhaps have a 'summary page' that asks all the big questions first (do you have a policy? Do you set objectives and targets? Etc.). If you answer 'no' to any of these, then you are taken to another slide and answer the 'no' questions relevant to those.
- Not very easy to follow – more to do with how it appears on screen.
- Perhaps the framework could be designed as a cloud-based questionnaire?

- Make questions that you don't need to answer not visible and only reappear when/if they are required to be answered

Improvements: Application

- Not overly relevant for the very small companies
- Some in the company would have probably answered differently
- Might take a while for an absolute beginner to complete it and understanding it might be difficult for them
- Depending upon the knowledge of the person answering it this could be quite difficult.
- Split up strategic and non-strategic questions.