

Are construction professionals equipped with the knowledge and tools to address the sustainability dilemma?

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Abstract

This study attempts to explore the depth of knowledge and understanding of sustainability issues across a range of construction professions and utilise this evidence to reveal if Building Research Establishment Environmental Assessment Method (BREEAM) is being delivered with due diligence across the industry. A range of construction professionals, key actors in achieving sustainability across the built environment through their advisory roles in design and specification were interviewed (n = 7). It became apparent that knowledge and understanding of sustainability was certainly below an expected level of competence suitable to deliver solutions across the multifaceted sustainability crisis, with many professionals failing to see beyond energy efficiency and carbon reduction. Furthermore, it revealed that planning policy changes incorporating BREEAM as a condition has had negative effects, leading clients and professionals to engage only when required. It was also evident that BREEAM schemes are being used with the goal to obtain development consents and cost was determining actions taken rather than best sustainability outcomes. This results in both BREEAM and Sustainability being perceived as an add-ons rather than core elements or drivers of a project and, in doing so, reduces the effectiveness of the design. Based on this evidence, it is proposed that there is a timely need to change construction professionals' perceptions to achieve a truly sustainable built environment. With BREEAM being one of many similar certification schemes it is worrying that these findings may be the same elsewhere around the world.

Keywords: BREEAM, Green building certification, Sustainable buildings.

Introduction

Assessment of sustainable buildings and the increasing need to frame environmental issues within wider political and social debates (Cole, 2010) has seen the emergence of certification schemes globally (e.g. BREEAM, Green star and Leadership in Energy and Environmental Design (LEED)). The methods of certification provide an objective evaluation of resource use, ecological loadings and indoor environmental quality within a broad culture of performance measurement (Cole, 2010). Kaatz *et al.* (2006) agree that these schemes have the ability to impact design and construction practice, to challenge the existing norms and values of designers and constructors whilst validating and promoting a sustainable ethos concurrently.

As with the 'sustainability' and 'sustainable development' discourse, there is a similar debate in relation to construction in terms of 'green building certification' (GBC) and 'sustainable building certification' (SBC) (Newport *et al.*, 2003). A difference of focus has been identified between the schemes, undertaken in a very narrow context only assessing environmental aspects or they can adopt a broader view to include the social and economic principles as well (Cole, 2010). While SBC covers energy efficiency, it also includes social and environmental aspects (Zuo & Zhao, 2014). The focus of traditional GBC schemes is on environmental aspects (Kaatz *et al.*, 2006) in

terms of performance standards of technologies, energy and water savings and physical characteristics in terms of improved internal environments for occupants (Kaatz *et al.*, 2006). Primarily offering mitigation to environmental impacts of the building during construction and operation (Parker, 2012) GBC schemes follow a similar format of credit scoring against categories (Taylor, 2015), with different tools for various types of building (Barlow, 2011).

Mainly categorised as GBC BREEAM Schemes are widely used as a tool for achieving sustainability within the existing UK building stock. An investigation of the importance of these schemes in achieving a sustainable built environment and the impact of these schemes on UK construction and property sectors is provided. Engaging construction professionals to determine their interactions with certification schemes and the wider sustainability agenda to identify knowledge gaps to improve practice. Therefore, this study aims to investigate whether the UK construction professional is equipped with the knowledge and tools, in the form of BREEAM building certification schemes, to aid construction and refurbishment projects to improve the sustainability of the UK construction industry.

Background

To achieve a sustainable built environment it is important to understand how the development itself, along with concurrent impacts on the hinterland, fit within the wider societal sphere (Berardi, 2013). Sustainable construction requires more than current green building certification schemes were conceived to do, requiring a 'systems thinking' approach (Kaatz *et al.*, 2006) that considers the context and location of the development and associated direct and indirect stakeholders. Therefore, sustainability assessments cannot be used to evaluate the quality of building performance, but can be used to transform the context in which the building is developed. Three domains of environmental, social and economic are used to frame sustainability, but it is their points of intersection and understanding the way and extent that the domains affect each other positively or negatively that is considered critical (Cole, 2010). Although these less tangible aspects often take a back seat to quantitative carbon reductions prevalent in GBC, as demonstrated through criteria weightings of schemes (Barlow, 2011). On a whole-life basis the main opportunities for reduction in CO₂ emissions is during the use stage, savings can be made in the user operation of the building and their behaviours outside of that. The work of Elizabeth Shove (2002) demonstrates that social practices associated with our lifestyle have become unsustainable through a 'ratcheting up' of unsustainable behaviours. These self-replicating behaviours form new habits and social norms, contributing to the climate change and resource consumption crises through our daily actions. Societal transformation towards sustainable lifestyles involves technological artefacts, but it also requires new user practices, regulations, infrastructures and cultural meanings (Shove, 2010) for lasting change to occur. This view is evident in the work of Williams & Dair (2007), who discuss the link between technological and behavioural sustainability and how the built environment can influence sustainable behaviours, also echoed by Jones *et al.* (2010) who describe infrastructure layout and architectural characteristics of whole streets affecting the decisions that individuals make. These are the interactions between the domains that Cole (2010) referred to as critical, that are not considered by GBC's.

Social practice theory examines this further stating that people need the material, knowledge and meaning to guide behaviours (Shove, 2010). By offering facility provision, knowledge share and support for more sustainable regimes, sustainable behaviours can develop within a

community, sharing sustainable practices further to wider communities. Therefore, the social aspect of sustainable certification schemes should cover psychological wellbeing and comfort of occupants, accessibility to public facilities and level awareness to wider sustainability issues (Zuo & Zhao, 2014). Kaatz *et al.*, (2006) argues that sustainability assessments should act as educational and emancipating medium that empowers and promotes collaboration among building stakeholders. Consequently, SBC schemes have significant expectations and demands to transform design and construction processes and practices with the construction sector.

There is plenty of research comparing certification schemes (Zuo & Zhao, 2014; Ameen *et al.*, 2015), however, the findings of Gil and Duarte (2015) suggests no single tool covers all aspects of sustainability and there is scope to develop new tools or redevelop existing ones. There is no doubt that GBC schemes have contributed to promotion of higher environmental expectations and are directly and indirectly (Cole, 2010) influencing a trend towards sustainable development principles within building design. The current knowledge of the ecological and carrying capacity of the planet is still primitive, so framing the distance to sustainability within these schemes is difficult, however, initiating the discussion is valuable (Cole, 2010) to facilitate progress.

Although BREEAM is not a mandatory requirement of development, it is becoming increasingly required by planning authorities (Parker, 2012), funding agencies or by clients who invest in corporate social responsibility (Barlow, 2011). As with all audit systems BREEAM has limitations, but it does offer verifiable and independent assessment of the performance of building design construction and operation (Barlow, 2011). Therefore, this study attempts to explore the depth of knowledge and understanding of sustainability issues across a range of construction professions and utilises this evidence to reveal if BREEAM is being delivered with due diligence across the industry.

Methodology

The study commences with a literature review to understand the context and the issues within the sustainability dilemma facing the construction industry. Identifying a number of studies that engaged construction professionals and their interactions with BREEAM certification schemes, forming the basis for in-depth semi-structured interviews to be developed to allow examination of sustainability in the built environment within the construction professionals' current reality.

Construction professionals, who have expressed experience in BREEAM certification and Sustainability in the built environment from a variety of disciplines, were selected by responding to invitation to voluntarily undertake an interview to talk about their experiences. A range of ages and length of time in industry are contained within the sample allowing assessment of understanding and engagement of professionals throughout the industry with varying levels of education and industry experience, representative of the industry as a whole.

Table 1: Participant information

Participant	Gender	Age	Construction Experience	Profession
A	M	34	12	Quantity Surveyor
B	F	33	11	Architect
C	F	23	1	Real Estate Surveyor
D	M	40	18	Project Manager
E	M	55	33	Building Surveyor
F	M	44	22	Energy Manager
G	M	43	21	Client

Analysis

For the research to provide deeper understanding of experiences with the UK construction sector, grounded theory is employed allowing themes and theories to be generated through the analysis of the interviews. Due to sample size there may not be enough data generated to develop theories with the rigor required. Therefore, the research adopts template analysis, providing a basis for themes to be identified guiding the research.

The template is generated from the literature review, especially previous surveys undertaken around 10 years ago, that identifies drivers and constraints that were present and whether they are still in effect today forming the basis of the template analysis for use with this research.

Table 2: Template for analysis

Themes	Justification for interview questions	References
Conceptualisation of sustainability	The many different definitions and conceptualisations of sustainability, which has been cited as a barrier to progress. Analysis of how the sector views sustainability will identify where focus currently is for the construction professional.	1,2,4,8,9,10
Barriers and Drivers	Key barriers and drivers for use of BREEAM, identifying these within the interviews will provide deeper understanding of how these are experienced through professional practice.	1,2,3,5,6,
BREEAM in practice	BREEAM is the most common GBC scheme in the UK. Coding interactions with BREEAM in practice will allow identification of construction professional's perceptions of the schemes in use.	1,2,4,5,6,
Emergent Theories	Some theory will not have been discovered through the literature review. The transcriptions from interviews will be reviewed to identify emergent themes or trends.	
1 Dixon <i>et al.</i> (2008); 2 Pitt <i>et al.</i> (2009); 3 Cole (2010); 4 Kaatz <i>et al.</i> (2006); 5 Cinquemani and Prior (2010); 6 Barlow (2011); 7 Parkin <i>et al.</i> (2003); 8 Santillo (2007); 9 Vallance <i>et al.</i> (2011).		

Results

The debate on the definition and conceptualisation of sustainability (Parkin *et al.*, 2003; Santillo, 2007), has been accused of holding up progress towards achieving sustainable outcomes (Dixon *et al.*, 2008; Pitt *et al.*, 2009; Vallance Perkins & Dixon, 2011). The three pillars approach is a common conceptualisation adopted that identifies sustainability is achieved through addressing environmental, economic and social elements (Cole, 2010). Participants were asked how they conceptualise sustainability; responses reflected the literature debate in terms of the diversity of responses. All participants mentioned the environment or environmental aspects, such as reducing CO2 emissions in one form or another. Although, nearly half of participants, only mentioned environmental aspects of CO2 emission reductions but nothing else. Participant E's response to the question illustrated this point well by saying:

"Sustainability for me is basically a reduction in carbon footprint generally, and that's in terms of methods of manufacture, emissions involved in movement, vehicular movement of materials to site and also the implementation of those materials in use and how to reduce carbon footprint going forward."

Sustainability perceived as a reduction in carbon emissions, is a common trend throughout all

participants; even those who identified deeper understanding understood the baseline of carbon reduction well. However, only discussing this environmental element is not delivering the full scope of sustainability, described as ‘traditional sustainability’ by participant G who interpreted that *“when asked about sustainability most people assume the baseline is energy conservation”*. Reduction in carbon and energy efficiency is a predominant theme mainly due to media coverage getting the headlines (Ameen *et al.*, 2015) at present, but the focus is also there due to ability for quantification of return on investment from savings (Parker, 2012; Taylor, 2015). Failure to recognise that the sustainability issue goes deeper than just energy efficiency demonstrates a lack of understanding about the core underpinnings in the sustainability discourse and with construction professionals missing this core competency, how can sustainable solutions ever be recognised, let alone realised?

Participant C in contrast responded to the conceptualisation question by drawing on the Brundtland (1987) definition of sustainability, describing the need to design not to hurt future generations, but also saying *“it’s not just about the environment, its social and economic aspects as well, and obviously the environmental stuff”*. Participant B also discussed social aspects such as consideration of the design of internal environments having potential for improving health and well-being of occupants and provision of good transport links can allow people economic potential, meaning that only two participants identified aspects of social and economic spheres of sustainability when asked about how they conceptualise sustainability. Participant F referred to the triple bottom line, which represents people, planet and profit, a form of full cost accounting (Elkington, 1998) when discussing their conceptualisation. However, only one bottom line is evident when considering the concept of sustainability:

“[Sustainability] has to include the triple bottom line, which is this economic appraisal issue. One can take the moral high ground from the point of view of looking at saving energy and saving carbon, that is all well and good but the reality, in commercial business the concept of sustainability is making sure that that business itself is sustainable, economically, for its shareholders who it’s accountable too, or the public, if it is a public organisation with public expenditure. Therefore for sustainability to be truly sustainable then it must contain this triple element this third bottom line which is financial sustainability.”

The explanation is focussed in the economic sphere, but solely the economics of the company itself not the wider community or development stakeholders and is truly representative of the capitalist paradigm in which construction in the commercial sector operates. With the commercial sector providing so much investment in the construction sector operating with these intentions, it is difficult for the industry adopt an alternative approach. Commercial business develops, refurbishes and renovates property regularly, which presents opportunities to improve sustainability within existing buildings, where the construction professional needs to drive the sustainability agenda. Construction professionals need the knowledge to challenge this attitude, to educate their clients into building towards a sustainable built environment.

All participants highlighted cost as a barrier to the uptake of BREEAM schemes but few indicated opportunities offered, such as increased rental and sale prices (Michl *et al.*, 2016), by illustrating these construction professionals may influence client decisions more effectively when giving professional advice. However, as Michl *et al.* (2016) postulates, increased returns will only be realised in a market that recognises sustainability, the market is moving in that direction but to

value sustainability then all stakeholders must have a shared view (Kaatz *et al.*, 2006).

Another key barrier identified was of complexity of BREEAM Schemes and associated cost in terms of time and money in achieving a high rating was shared by most participants. Participant B summarised well by stating: “If you are not going to score high enough then you won’t do it, if it costs too much to achieve you won’t do it.” When considering this barrier it is essential to draw upon the previous analysis of conceptualisation responses, it is evident some clients view sustainability in a green building context, focusing on energy efficiency, not acknowledging wider sustainability issues. This narrow view misses sustainability opportunities, such as green roofs and rainwater harvesting, which have lower cost for installation but have less tangible results in terms of return on investment, often taken out during value engineering processes.

Regulatory changes have influenced the uptake of BREEAM schemes in many local authority planning policy documents (Parker, 2012) making a specific BREEAM rating a requirement of planning conditions. Both participants G and F agreed that planning drove this uptake, Participant G comments that Bristol City Council planning policy framework, has a ‘robust’ sustainability policy, when working outside of this area, other councils’ requirements differ:

“In Bath, you could potentially ignore BREEAM, the planning policy doesn’t require you to do anything but we feel we give ourselves a better chance of getting a planning decision by being proactive and undertaking a BREEAM assessment... The problem is when developing on behalf of an institution like a pension fund or an investment fund. If they see us spending money when it is not a requirement of a planning application they ask why are we wasting money on this... Then sometimes it is squeezed out of the project, then architects and contractors get wind of it not being a planning condition, they ask why are we spending our time and efforts doing this if it is not a requirement? So it is important to have it as a contractual obligation and a policy at local authority planning or else it tends to get swerved.”

The regulatory driver does have an effect, yet the client can often refuse the ‘unnecessary’ cost if it is not a requirement. This sentiment is evident amongst construction professionals who question why they have to do additional work if it is not a requirement of planning. This shows a direct conflict between one of the key drivers (legislation in the form of planning) and barriers (cost of complexity) identified by this study. These conflicts are managed in practice, usually to the detriment of sustainability, Participant F has experience of BREEAM as requirement of planning and has identified that sustainability requirements can be ‘Swerved’.

“I think BREEAM can be manipulated in such a way that it supports a planning application and secures your planning application, then that’s what the project manager will target at the most cost effective way, not necessarily the best for saving energy... The reality is where biomass boilers were put in to secure BREEAM and planning approval, but those biomass boilers we knew full well, were there to secure the planning approval. We ran them for a couple of months and then we had to bypass them and go back to conventional boilers which was always the unofficial thing but we knew we couldn’t get the building through planning if we hadn’t done it.”

This identifies that the regulatory driver is used to push through developments with no intention of using the technologies once the BREEAM certification and planning permission has been granted. This behaviour, will not help towards achieving a sustainable built environment, making

it hard to enforce a voluntary scheme that is a condition of planning based on a score that is interpreted and manipulated in a way that will suit the developers' intentions and not offer the best sustainability outcomes. This demonstrates a reluctance to engage with sustainability, unless it must be incorporated into project. Participant B furthers this by recognising sustainability is viewed as an additional aspect to projects, rather than core to the development, saying: "some people see it as an add on, like adding on solar panels to tick a box and getting some biodiversity by putting a pile of logs in a project somewhere counts as a point". Using sustainability as an additional extra and not being core through the design leads to missed opportunities, especially in terms of larger holistic systems thinking approaches (Kaatz *et al.*, 2006). Early sustainability consideration during the design process enables more effective and cost efficient results (Reed & Gordon, 2000), viewing it as an addition to the project will reduce effectiveness. Participant G indicated frustration and further elaborated on the view of sustainability as an added extra to the role of the construction professional by saying:

"I wouldn't say it was onerous....If it were any other part of your job like writing a monthly report or doing a planning application, that's onerous but you just get on and do it, because it's your job. But with BREEAM it is seen as an extra... so that's the biggest challenge, to get people to accept it is part of their job and that it is important, not just an add on."

Construction professionals work is governed by deadlines, with high workloads processing a lot of design and construction information. BREEAM adds more work to the project, therefore more work to undertake and manage. It is why many can view this as an extra, but this attitude needs to change and sustainability needs to be core to the role of the construction professional.

Responsibility is a theme with participants over differing questions. Participant A mentions "sustainability is to be as responsible as possible" while Participant B identifies personal responsibility by saying "Anything we put into that building, I have to be responsible for that", and recommends sustainability to a client as "really being more aware and responsible for the building and environment". Demonstrating that the responsibility is theirs but also shared with clients and other professionals within the construction industry. Participant E described personal responsibility transcending the professional environment by saying:

"I think everybody has a duty of care really to help us move in the right direction, I personally believe in it, but that goes further, you have to start looking inward in your own house, on a personal level."

Discussing home life identifies the underlying behavioural sustainability aspect is identified. Through the interview however, the discourse with participant E focussed on carbon reduction, so it is apparent that the connection between their role in building design and specification and their ability to support behavioural sustainability through design decisions was not present. The disconnect here could be associated with knowledge and understanding of sustainability, but more so the link between technological and behavioural sustainability (Williams & Dair, 2007) and how the built environment effects behaviour (Jones *et al.*, 2010).

Discussion

Studies agree that a lack of common definition for sustainability is a key barrier to achieving sustainability in construction (Dixon *et al.*, 2008; Pitt *et al.*, 2009). A decade after these studies

this issue is still prevalent in this study, leading to missed opportunities and loopholes to avoid good practice in terms of sustainability. Through the interviews, a range of sustainability knowledge was present. The majority of the study not identifying the three spheres of sustainability and the two that did refer to them not discussing them with confidence demonstrates that knowledge of sustainability is not at a level for deployment of effective solutions. To categorise different levels of knowledge or competence within sustainability the four stages of professional competence are used to assign participants a stage of competence. The first category of unconscious incompetence refers to those not aware of what they do not know (Participants A, D, E, F); in this category are those that focussed on CO2 emission reduction only. This group failed to identify spheres of sustainability but they are not aware that they do not know. Conscious incompetence is demonstrated by one participant (Participant G), where they know that they and do not know everything but are still making decisions knowing that they do not know. The third category have the correct intuition of sustainability as a concept and are delivering it in practice where possible, however some thought is required as it is not second nature to them yet and a lack of confidence is still demonstrated (Participants B and C). The final category is where professionals should have the right intuition and be able to deliver optimum solutions to achieve effective results subconsciously; however, none are in this category which means sustainable solutions are not being delivered.

With the majority of construction professionals unconsciously incompetent, progress is slow. The view of sustainability as solely energy efficiency and CO2 reductions is hindering progress towards a sustainable built environment. Due to the complexity of sustainability, many factors influence each other causing tipping points; fortunately, solutions are interconnected in their nature. Sustainability research and development operates at a systemic level and requires a systems thinking approach (Kaatz *et al.*, 2006) to realise the real potential that new developments can have for all stakeholders in all spheres of sustainability. Rather than viewing projects in isolation, construction professionals must understand that sustainability is more than energy efficiency, that it includes economic aspects such as providing opportunities of employment and wealth generation, social aspects in terms of providing a healthy cityscape, places for interaction and exercise with comfortable and liveable residential provision

Conclusions

From the study the following conclusions are derived:

1. BREEAM schemes are being used as a tool to gain planning and regulatory approvals, rather than an opportunity to get the best performance out of the building itself. This is leading to cost making the decisions on the projects rather than best sustainable outcomes, construction professionals are looking for the lowest cost option to achieve points rather than considering the best design options;
2. The cost element is also prevalent in terms of decision to implement schemes in the first place, if seen to be too costly or complex and time-consuming increasing design costs, clients will not be inclined to do it, causing projects not to adopt sustainability schemes for these reasons alone;
3. Construction professionals view sustainability as energy efficiency and therefore only consider how to reduce energy wastage and emissions. This perception fails to recognise the multifaceted challenge posed to sustainability, leading to missed opportunities for systems thinking design solution; and
4. The majority of professionals believe the importance of sustainability and identify with a responsibility. However, it is viewed as an additional aspect to their role, detracting from their

workload reducing the inclination to engage deeply in the sustainable design process.

Recommendations

Based on the conclusions the following recommendations are derived:

The research demonstrated the heavily debated conceptualisation of sustainability, this debate was accused of holding up progress a decade ago. Through the interviews it was evident that a clear common conceptualisation is still not present amongst the study sample, if representative of the wider industry, it indicates this barrier is still negatively effecting progress toward solutions, not just with BREEAM schemes but all certification schemes globally. Research into how prevalent this barrier is throughout the industry is required to allow formulation of an industrywide conceptualisation is required by an interdisciplinary team of construction professionals, sustainability consultants and social scientists specialising in behaviour change for sector wide adoption at an international level.

It is evident that to achieve sustainability in the built environment a paradigm shift is required, in terms of how sustainability is perceived, but also how designers and clients value design, to design for more than just compliance, to strive for excellence. Sustainability needs to become core to all aspects of the construction professional's role to ensure it is given the attention required to achieve the best networked solutions that tackle the multifaceted problems facing our society. Sustainable must become the standard by which development is permitted, the construction sector can no longer accept the situation and continue with the current 'business as usual' attitude, it must strive collectively and collaboratively to change systemic problems.

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