DEVELOPMENT OF A MEASURE TO ASSESS ATTITUDES TOWARDS SUSTAINABLE DEVELOPMENT IN THE BUILT ENVIRONMENT: A PILOT STUDY

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The recognition of the importance of the construction industry for the three dimensions of sustainable development, the environmental, economic and social has gained widespread momentum in recent years. Yet despite policy drives and regulations from government as well as efforts from higher education institutions, progress towards implementation of sustainable practices within industry remains slow. The literature evidences that attitudes towards sustainable development are a major barrier to implementation of such practices. At present no measure exists to quantify attitudes towards all three dimensions of sustainability within a construction context. This paper describes the steps taken to develop such a measure, the Sustainable Development Attitudes Measure (SDAM). Once developed, in order to test the questionnaire and validate for dissemination in industry the SDAM was piloted amongst built environment students (n=230). Results indicated that the measure was both valid and reliable (α=.87). The resulting measurement tool will allow a broad range of practitioners working across the construction industry and higher education to assess which aspects of sustainable development are favoured over others and target less favourable aspects through increasing awareness, training and curriculum design. Validation processes are described along with directions for future work in relation to further validation of the measure and its usage.

Keywords: attitude, psychology, psychometrics, scale development, sustainable development.

INTRODUCTION

Since the publication of the Brundtland report (WCED 1987), sustainability has become an important topic on many agendas locally, nationally and globally. In more recent years, the recognition of the importance of the construction industry for sustainability through sustainable development has gained widespread momentum as whilst a built environment is necessary for us to live work and socialise, the construction of the facilities that allow us to do so have detrimental impacts on the environment.

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The construction industry is one of the largest employers in the world. It is Europe's largest industrial employer, accounting for 7% of total employment and 28% of industrial employment in the EU and employs over 2 million people in the UK alone (BERR 2006).

Socially and economically, the industry is a major source of employment and an area of significant financial investment with around £910 billion euros invested in construction in 2003, representing 10% of the gross domestic product (GDP) (European Commission 2006 cited in Ortiz et al. 2009) and the UK turning over in excess of £100 billion annually (Tsai & Chang 2012). However by contrast, environmentally the sector is responsible for high-energy consumption (50% of worldwide energy usage), solid waste generation, global greenhouse gas emissions, external/internal pollution and resource depletion (Ortiz et al. 2009) with construction consuming 40% of raw materials extracted (Bribian et al. 2011).

Organisations such as the UK's Building Research Establishment (BRE) and the Construction Industry Research and Information Association (CIRIA) have spent decades researching and documenting such impacts of the building industry (Murray & Cotgrave 2007) yet despite growing awareness of these issues, progress towards sustainable practice in the construction industry continues to be slow compared to other sectors. The construction industry is renowned for being resistant to change which has been attributed as one of the main reasons for not implementing sustainable strategies (Yang et al. 2005). A growing body of literature however evidences that certain barriers preclude the implementation of sustainable practices. The literature indicates that the main barriers are cost, responsibility, understanding and issues regarding policy and legislation. These are discussed in the following headings.

Cost

Cost is a major barrier to adopting sustainable approaches. In studies carried out by Cotgrave (2008) and Pitt et al. (2009), when asked what the key barriers to the industry for sustainable construction are, respondents indicated that cost/affordability was the main barrier. Such perceptions are however unfounded based on the pure assumption that, if the building is green, it must cost more (Hoffman & Hen 2008). A survey by the World Business Council on Sustainable Development (WBCSD) found that people tend to overestimate the cost premium of green building to be between 11% and 28% more than a normal building, with an average overestimation of 17% (WBCSD 2008). This is worrying given there appears to be a common consensus that unless adopting sustainable practices and use of sustainable materials achieves costs savings, the same will not be widely implemented (Constructing Excellence 2008; Baker Associates 2006). Professional bodies such as the Chartered Institute of Building (CIOB 2001) however report how industry can move sustainable development forward while still making a profit. Such claims are evidenced by reports from companies such as McGraw Hill Construction (2006) who found that clients opting for sustainable buildings expect greener buildings to achieve an average increase in value of 7.5% over comparable standard buildings, together with a 6.6% improved return on investment.

Policy and Legislation

In the UK, sustainable construction is still primarily a policy imperative driven by the public sector (central and local government) rather than by private sector market and client demand (Cooper et al. 2005). More government legislation, regulations and 'positive' incentives are seen by some as one of the main drivers for promoting

sustainability (Cooper et al. 2005). However as Cotgrave (2008) points out, it is unlikely that government will introduce such legislation as to do so would risk alienating industry by impeding their ability to make profits, a move likely to be hugely unpopular and ultimately a vote loser. Government ultimately rely on co-operation so even if they do impose more policies and regulations, their effectiveness relies on the response of industry (Murray 2011). In addition, whilst sustainability legislation has been shown to be a corporate driver for change the extent to which legislation changes attitudes is debatable (Meehan & Bryde 2013). This is illustrated by the fact that despite strong policy drives by UK government in recent years, many new developments in the UK still incorporate few sustainability features (Williams & Dair 2006) with much of industry unwilling to go above and beyond 'minimum requirements'. Industry needs to adopt sustainability of its own accord and thus there is an imperative need to change attitudes and perceptions so that they are able to 'create' a market demand for sustainability. Firms within industry that do so, will not only help to protect the environment but give themselves a competitive edge in an ever growing sustainability focused market but will also.

Understanding

Leal Filho (2000) states there are various reasons why the concept of sustainability may be hard to understand namely that sustainability: -

is not a subject per se since it is not classified as being of the domain of any given science but rather a component which may be incorporated into all disciplines and thus there tends to be a trend towards perceiving it as an abstract concept

- is too recent a field for its urgency to be seen as important
- is a fashion and will eventually go out of date
- is too theoretical
- is too broad a concept and therefore impossible too handle and thus achieve

The fact that nearly over 60 definitions of sustainability now exist (Hartshorn et al. 2005) adds to the confusion with many claiming that some definitions of sustainable development are too broad giving a wide ranging set of guiding making it very difficult to draw conclusions on how successful current practice is in achieving such wide remit of aims (Baker and Associates 2006).

Responsibility

There are mixed views as to where responsibility for sustainable practices lie particularly in relation to waste minimisation. Saunders and Wynn (2004) assessed subcontractors' attitudes towards waste minimisation, and found that eighty-five per cent of all respondents felt that the main contractor should bear the full responsibility of waste minimisation. Osmani et al. (2006) report that poorly defined responsibilities are leading to confusion as to who should control and monitor waste management finding that architects argued that waste was an issue for contractors, while contractors countered that a failure to address waste generation in design and poor waste management by subcontractors were the consequences of a lack of definition regarding roles and responsibilities in a contract. Construction professionals are not aware of the environmental damage they are causing and due to deferred responsibility no responsibility can be assumed (Lo et al. 2006). This uncertainty of and shifting of responsibility is clearly a barrier towards the adoption of sustainable practice.

Many professionals are aware of and are willing to undertake green building but due to the above barriers, a level of consternation permeates the industry with many

remaining sceptical and unenthusiastic as a result. This coupled with fear of the unknown and fear of risk pertaining to costs all have an adverse effect against progress towards sustainable practices in the industry. We now need to move from the rhetoric that permeates industry to action. At present no standardised measure exists to capture and quantify the above attitudes identified in the literature. It is important that such a tool be created if we are to find and develop ways of changing these attitudes. The rest of this paper describes the validation processes undertaken to develop such a measure, the Sustainable Development Attitudes Measure (SDAM). Initial validation results are presented along with future validation objectives and the practical considerations for use of the measure.

DEVELOPMENT OF THE SUSTAINABLE DEVELOPMENT ATTITUDE MEASURE (SDAM)

Attitudes are a latent construct and cannot be observed directly (Milfont & Duckitt 2010). Thus, rather than being measured directly, attitudes have to be inferred from overt responses (Himmelfarb 1993). Methods of attitude measurement can be broadly organized into direct self-report methods (such as questionnaires/interviews) and implicit measurement techniques (Krosnick, et al. 2005). For the purposes of the current research a questionnaire approach was deemed the best method to capture the data required.

In order to ensure a strong theoretical grounding, items were developed from the literature and existing measures. Existing measures tend to cover the environmental aspect only and items for the social and economic subscales were developed from the literature. A total of 70 items were pooled from the literature and placed into subscales representing the three dimensions of sustainability i.e. environmental, social and economic. A fourth scale 'other' was created to encompass important political issues pertaining to sustainable development.

Scale Response

When measuring attitudes, Likert-type scales are most commonly used which measure levels of agreement/disagreement. Such scales assume that the strength/intensity of experience is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured. Respondents may be offered a choice of five to seven or even nine pre-coded responses with the neutral point being neither agree nor disagree (Rattray & Jones 2007). A 5 point Likert scale was chosen for the current scale.

Content validity

Content validity is a non-statistical type of validity that involves "the systematic examination of the test content to determine whether it covers a representative sample of the domain to be measured" (Anastasi & Urbina 1997: 114). In order to ensure content validity, only items that were deemed to be relevant to sustainable development were considered. Content validity is usually conducted via a panel of experts in the domain being investigated (Rattray & Jones 2007). As such, the list was emailed to 10 experts, 5 from LJMU and 5 professionals in industry currently undertaking the MA in Sustainability at LJMU. Experts were asked to assess the content, relevance and clarity of the statements and provide their comments on the same. They were advised that the aim of the validation was to choose items they thought were worded in a way that would elicit strong attitudinal responses and if a question was too arbitrary, abstract, too obvious or too ambiguous to provide their

comments on the same. In addition they were asked to rate the item on a scale of 1-5 with 1 being weak and 5 being strong. After initial consideration of items, a number of meetings took place online via WIMBA classroom and face to face for further discussion and clarification of the validation process.

All ten experts provided verbal feedback with seven out of the ten experts providing ratings for the items. The 70 questions were then whittled down to 28 based on the ratings, feedback and comments for each item. To ensure students were engaging with the questionnaire and not just 'ticking boxes', three of the statements were given an opposing statement. These were statement numbers 3/15, 6/21 and 12/23. Items 18, 24, and 28 were negatively phrased and reverse scored in an effort to reduce response bias. A sample of questions is provided in Table 1 below.

Table 1: Example Questionnaire Statements Classified by Sub-scale

Environment
Global climate change will be a major problem for future generations unless the construction industry adopts sustainable practices.
Modern science and technological advancements will solve our environmental problems
Refurbishment of existing buildings should always be considered before new build is undertaken
Social
Using more resources than we need for the built environment is a serious threat to the health and welfare of future generations
Communities can significantly benefit from sustainable development
Sustainable development should create and provide jobs at a local level
Economic
Companies that are environmentally sustainable are more likely to be profitable over the long run
Acting sustainably is only worthwhile if it reduces costs.
It is all right for humans to use nature as a resource for economic purposes
Other
The Government should be leaders in sustainability and the environment
Corporate social responsibility is irrelevant to sustainable development
The construction industry is of vital important to sustainable development

Sampling

When piloting a questionnaire, a sample size of 300 is generally deemed best however sample sizes of 200 plus are acceptable (Rattray & Jones 2007). The SDAM was piloted to 230 built environment students across the UK through opportunity sampling. After removing questionnaires with uncompleted questions, there were a total of 226 useable questionnaires giving a response rate of 98.5%. Unfortunately the demographic section was only partially or not completed at all in some cases and so figures for age and gender are not accurate. Descriptive statistics indicate that of those who did complete demographics, 178 were male and 29 female (n = 207) with ages ranging from 18 to 48 and a mean age of 23 years (sd = 5.7, n = 170). Participants were instructed prior to completing the measures that it was important if possible to avoid ticking middle boxes and that if they were veering towards a more negative or positive response to tick boxes demonstrating this.

Inter-item Correlations

Items should inter-correlate at a significant level if they are measuring aspects of the same thing, in this case sustainable development. Any items that do not correlate at a 5% or 1% significance level should be excluded. Correlations for the SDAM revealed that all individual items correlate significantly with each other as do the subscales. Correlations for the subscales are reported here only (Table 2).

Table 2. Correlations between subscales of the SDAM

	Environmental Subscale	Social Subscale	Economic Subscale	Other Subscale	*SDAM Total*
Environmental Subscale	1				*.738*
Social Subscale	.543	1			*.861*
Economic Subscale	.372	.516	1		*.743*
Other Subscale	*.454*	*.675*	*.530*	*1*	*.846*

**Correlation is significant at <0.05 level **correlation is significant at <0.01 level (two-tailed)*

Reliability

An important aspect of a psychometrically developed measure is the reliability of the scale and its subscales. Chronbach's alpha is used to test for internal consistency of scales. Different authors have differing views on what are acceptable alpha levels for measures. Bryman & Cramer (2001) posit that if items show good internal consistency, Cronbach's alpha should exceed .7 for a developing questionnaire and .8 for a more established questionnaire. Hair and Anderson (2010) however posit that for exploratory research, levels of .6 are acceptable.

Reliability for the SDAM was .87 overall indicating that the scale has excellent reliability. Alpha scores for the subscales were all acceptable except the economic subscale (.529). which was below the acceptable level required (see Table 3). Item total statistics indicated that if item 10 was dropped this would bring the subscale to a reliable level of .605. The mean score for the SDAM total 103.10 was with a standard deviation of 13.47 indicting a good variance across responses.

Table 3. Reliability Coefficients for the SDAM and subscales with Means and Standard Deviations

	Chronbach's Alpha (α)	Mean	*sd*
SDAM Total	.87	103.10	*13.47*
Environmental Subscale	.60	25.00	*4.11*
Social Subscale	.74	26.61	*4.31*
Economic Subscale	.60	23.74	*3.84*
Other Subscale	*.78*	*27.77*	*4.58*

CONCLUSIONS

Adverse attitudes preclude implementation of sustainable practices within the construction industry. The construction industry faces many challenges in relation to sustainable development yet many of these challenges are not as problematic as industry perceives them to be. It is imperative that the construction industry change its outlook and attitudes towards sustainable development in order to move the agenda

along. In light of the current economic climate and the diminishing government emphasis on sustainable development and education for sustainable development policy (Martin et al. 2013) this is more important now than ever. The focus on achieving sustainability must not be lost as this will undoubtedly impede progress. The development of a standardised measure to assess attitudes to pinpoint areas for improvement in the context of sustainable development within the construction industry and in higher education is therefore an important step forward to making progress in this field. The findings from the pilot study that the SDAM is a statistically sound measure are very promising. The economic subscale had the lowest reliability and lowest mean indicating that attitudes towards this subscale were less favourable than the others. This finding reflects findings in the literature that attitudes towards costs are the biggest barrier to implementation of sustainable practice and demonstrates how the SDAM can highlight areas for improvement. For example increasing awareness of how industry can still make a profit and more training/education on life cycle costing may help to improve attitudes in this area.

All research is not without its limitations. One limitation of this study was that a lot of participants omitted demographic information which would have allowed for examining differences between age groups and level of study and may have provided some interesting findings. For the purposes of the research however it is not a major drawback as the main aim was to develop a tool to measure attitudes. The main limitation of the study was that data was only conducted at one time point. No test re-test reliability analyses were conducted to assess whether the SDAM holds internal consistency over time. This is not a major issue at this stage in this research however as it is a process which can be addressed later on.

Whilst it could be argued that the sampling population was a limitation, Shepherd et al. (2009) in developing a questionnaire looking at sustainable values noted that using student samples was permissible when looking at psychological phenomena. The results from this exploratory study however provide only a snapshot of built environment students' attitudes towards sustainable development and as with any research, one must take caution when generalising findings to a wider population.

In order to strengthen the rigour of the questionnaire a factor analysis will be undertaken to explore further the theoretical construct of the SDAM and assess the quality of individual items. Once this has been undertaken a further replication study will be undertaken to generalise findings to a wider audience of built environment students from across the UK.

The resulting measurement tool should be of benefit to a broad range of practitioners working across the construction industry and higher education. In using the tool, both will be able to assess which aspects of sustainable development are favoured over others and those less favourable could be targets for increasing awareness, training and curriculum design.

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