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Purpose of the Series

The aim of this publication is to provide an opportunity for students to publish the findings of their undergraduate or postgraduate work. Guidance on publication will be given by staff who will act as second authors. It is hoped that by providing a guided transition into the production of papers that students will be encouraged throughout their future careers to publish further papers. Guest papers are welcomed in any field relating to the Built Environment. Please contact E.A.Laycock@shu.ac.uk. A template will be provided on request.

Acknowledgements

The editorial team would like to acknowledge and thank Will Hughes, Professor in Construction Management and Economics, University of Reading for permission to use the ARCOM template and the associated resources.

EDITORIAL

Welcome to this edition of the Transactions. This journal would not be possible without the commitment made by our alumni to producing a paper based on their research findings. Sometimes producing a written paper takes students a little longer to do as they find work and move on to greater challenges. It takes a lot of courage to produce a paper from dissertation work knowing that this will be looked at by future students as well as a wider audience. As always I hope that the support offered by tutors and the editorial team helps to overcome this challenge.

I would like to take this opportunity to thank staff and students for their hard work and dedication both during the dissertation and afterwards in producing a paper, without which this journal would not be possible. I would also like to thank the editorial board and the reviewers for their diligent work and supportive feedback which is so vital to ensuring that this publication happens.

Prof. Elizabeth Laycock

Editor, Built Environment Research Transactions

CONTENTS

A STUDY OF LIFE CYCLE COST MODELLING AND THE ASSOCIATED RISK IN OPERATIONAL EDUCATION PFIS

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This paper presents the results of a study undertaken during 2013/14 on Life Cycle Cost (LCC) in Private Finance Initiatives (PFIs) regarding modelling techniques and the related risk; specifically how risk is allocated between the PFI partners and what control measures can be utilised to reduce or mitigate those risks. Concentrating on operational projects in the education sector the technical methods and guidance from industry, literature and recent updates in the market surrounding the PF2 and the publication of the New Rules of Measurement 3 (NRM3) are investigated. Primary data was gathered from case studies on live projects, reviews of detailed forecasting methods and interviews with industry professionals. It was found that industry guidance was widely utilised and the NRM3 has the potential to unify the uncoordinated methods currently in use. Innovation and computer aided processes are driving improvements in forecasting, however during the operational phase of projects LCC accuracy risk is mitigated and managed by Facilities Management (FM) Service Providers. Service Providers are the correct owners of this risk, but that it is unclear if potential rewards (from unspent funds at the end of the concession period) are the true incentive for a better quality of maintenance and service.

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INTRODUCTION

The LCC information is presented as a table of building Elements and components detailing replacement frequencies, the extent of replacement and cost of replacement all estimated at procurement stage and presented in the form of a model (British Standards Institution 2008) with costs shown in Real cost terms with indexation, discount factors are added elsewhere in the PFI. The forecasting applied to this LCC model is based on a number of factors such as intended component life, in use variability, design, environmental influence and potentially many more (Boussabaine and Kirkham 2004). However there are conflicting views within the industry about whether the private sector has been able to do this effectively (HM Treasury 2012a). In existing education PFI standard forms of contract the private sector partner will take the risk on the accuracy of the LCC model. Should this model not have suitable funds to meet the contract requirements to refurbish/replace items during the life of the project, the private sector funds the shortfall of the model. Equally, if the building performs better than the model predicted, the private sector partner benefits from the savings available. This has been seen as profiteering by many sceptical of the PFI form of procurement (Whitfield 2013; HM Treasury 2012a). It has been argued, particularly by Whitfield (2013) that PFI is a way for private companies to charge in advance of works being completed thus achieving inflated profits when refurbishment work is carried out. However numerous and varied risks exist in LCC which are all difficult to calculate and can be considered similar to an insurance policy whereby the public sector client is indemnified against all of these risks. In response to this criticism against PFI, HM Treasury have revised the form of procurement and produced the PF2 form of contract in which any savings in the LCC model are shared equally between the private and public sector partners. It is important to note that at the end of the contract period (typically 25 years); the building should be handed back to the public sector as if it were in "day 1" condition with at least 5 years residual life on all elements of the building. A degree of flexibility in this condition has also been suggested (HM Treasury 2012a) as a means of counteracting the risk involved and in recent years to achieve savings under the contract. However, as no education PFIs have reached this milestone, considerable uncertainty still surrounds the process and limitations of liability.

RESEARCH METHOD

An extensive review of literature was carried out with primary research predominantly gathered from interviews in order to gather data with depth and insight into the subject area from a small number of informants (Denscombe 2003). The questions asked were developed from the literature review by means of categorisation of themes. These categories were developed from areas of the literature which required further insight and provided a foundation for qualitative analysis. Interviews were conducted with four professionals in all areas of education PFI projects – Head of Asset Management, Special Purpose Vehicle (SPV) Manager, PPP Bid Manager and a Service Provider (SP) Project Manager of three OEPFI (Operational Education PFI) projects. This selective sampling frame is intentionally limited to gather a depth of information from professional sources at all points within the client/contractor PFI industry. Each individual provided this study with experience of a number of different OEPFI projects which improved the generalizability of results. A list of questions was provided to participants beforehand to enable them to gather the necessary information prior to the interview taking place. This enabled more rounded responses and provided better data.

A Case study concerning LC Management in live environments was completed on two OEPFIs currently being delivered by a large UK construction company and a Service Provider of Facilities Management (FM) in the UK PFI market. Two further case studies were completed involving methodological processes involved in LCC. One was completed on a software platform developed in the USA and recently deployed within a UK company "VFA.Facility", the other on the very recent publication of the NRM3 which the RICS hail as the standard method for LCC. LCC exists within all PFI projects; however this study is limited to education projects. This limitation is deliberately enforced due to the fact that the nature of risk alters drastically between PFI types (such as infrastructure / healthcare) and case studies in education would not be generalizable to cover other forms of PFI.

LITERATURE REVIEW

The major (and potentially very costly) risk derived from LCC forecasting methodologies is the failure to obtain accurate cost-in-use data against which to benchmark and ascertain reliable future projections (Boussabaine and Kirkham 2004). Progress has been made in the area of standardisation of costs and information, albeit that this is of limited availability. This will

improve with the very recent publication of the RICS's methodology for LCC – the NRM3 (Green 2013), and with recent advances in software now available (VFA 2013) it has proven that theirs was a shared goal which the industry is on the verge of realising.

On the basis that risk allocation practices in PPP were found to be highly variable, Jin and Zhang (2011) proposed an interesting method using Artificial Neural Networks (ANN) to allocate risks using theory based analysis rather than the traditional method of assessing risk attitudes of the partners. They concentrated on a major risk item, namely "demand below anticipation" citing an infrastructure PPP in Australia to which this particular risk becoming a reality brought the PPP into receivership. This is less of a risk in Education PFIs as pupil numbers are far more stable than estimated number of cars using a new road. However, the success of ANN may be transferable. The drawback of this method is that it requires the use of complex algorithms to arrive at the same assumptions that a PPP consultant could conceivably determine through experience and common sense alone. Some authors have even questioned the PPP model as an effective means of risk transfer (Haran *et al*. 2013). The UK government have accepted this suggestion and concede that the result of ineffective allocation of risk in previous PFIs has contributed to higher costs passed on to the public sector (HM Treasury 2012a).

In an effort to maximise Value for Money (VfM) in PFI projects, a study into risk transfer in PPP/PFI projects was conducted in the UK during the recent PFI boom years and provides meaningful insight into the subject area (Bing *et al*. 2005). The process suggested by Bing for negotiating risk transfer within PPP/PFI procurement is shown in Figure 1. By reducing the risks transferred to the private sector partner, public sector clients are able to effectively negotiate lower costs in return for retaining risks. Bing addresses this supposition and proposes (in theory) effective means of achieving this in the form of guidance for public sector clients. This suggestion of standardisation is concurred in the UK Government Review of Education Capital (James 2011) lending credibility to the approach. Bing (2005) fails to acknowledge however, any form of LCC risk as an identifiable item on the suggested form of risk register.

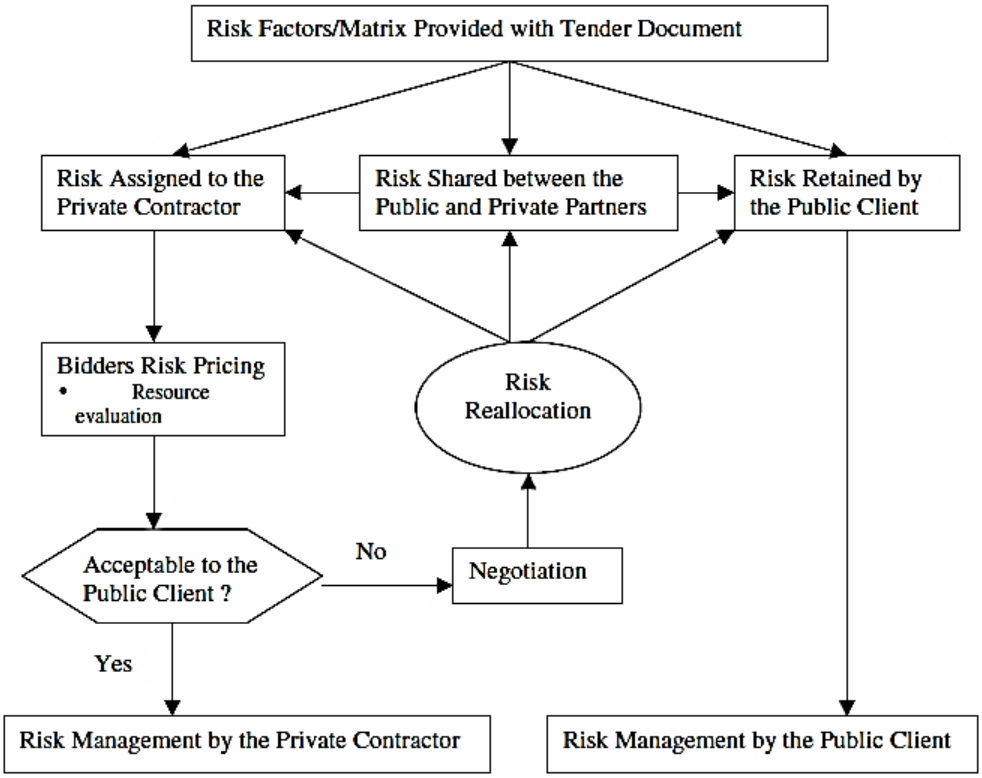

Figure 1- Risk allocation process in PPP/PFI contract procurement (Bing et al. 2005)

Development of the PF2

It is generally agreed that where there is risk in PFI, there should be reward (Adair *et al*. 2011). However, opponents to the PFI model would consider this as profiteering (Whitfield 2013), although this article is published in a socialist independent opinions magazine. It is, however, evident that elsewhere in the media that anti-PFI public opinion clearly exists (see @pplVsPFI on Twitter). The risk/reward associated with LCC in OEPFI and the suggested incentives available to both private and public partners have been the source of much discussion over a number of years recently (Haran *et al*. 2013; HM Treasury 2012b; Adair *et al*. 2011). The resulting conclusions on the allocation of LCC risk/reward made by HMT appears to be one of the notable differences between PFI and its successor as a procurement method, PF2, whereby potential savings at the end of the contract period are shared between public and private partners (HM Treasury 2012a). The private sector must now agree to take all risk

relating to LCC and benefit from, at most, 50% of the reward with the potential in some cases of 100% of the reward due to the public sector client (HM Treasury 2012b). This goes to further highlight the fact that until very recently, LCC risk has been more or less ignored. Even though PF2 will not necessarily impact the PFI contracts already in existence, there may be some governance advisory notes into lessons learnt which could be produced in the coming years.

The Risks of Forecasting and Technical Guidance on LCC

In the 1980s, Roger Flanagan and George Norman developed LCC on behalf of the RICS as a theory and practice based on early ideas from the 1970s. Having noted the importance of LCC and the potential power of information LCC could have on construction decision making, the authors highlight historical data as the most important source of information to use as a basis in LCC forecasting (Flanagan & Norman 1983). By 1989 the same authors had published a guidance reference book on the subject of turning LCC theory into practice presenting risk considerations and control measures in a simple yet effective way, much of which is still in use and referred to in later books and guidance documents. As Flanagan *et al*. (1989) write, the relative immaturity of the methods at the time of writing make "Dealing with risk and uncertainty … an art that can be made to look like a science."

In 2008, the Chartered Institute of Building Services Engineers (CIBSE) released Guide M covering maintenance and management of services assets. For many years Guide M has been one of the leading technical guidance documents relating to maintenance of the built environment including Life Cycle Management, although this interprets the control of project risks rather simply (Figure 2). At the time of study (2013/2014) the CIBSE document was due to be updated from the original 2008 edition and was limited in that it only covered Building Services items and generally ignores Building Fabric. CIBSE Guide M was re-issued in November 2014 incorporating reference to NRM 3 structured to match systems and elements of NRM. Research related to the existing documentation at the time, the 2008 version of the CIBSE guide in which Section 13 in Guide M deals with Life Cycle in detail and quotes Kirk and Dell'Isola's definitions of the three end of life factors:

Economic Life: the estimated number of years until that item no longer represents the least expensive method of performing its function

Technological life: the estimated number of years until technology causes an item to become obsolete

Useful life: the estimated number of years during which an item will perform its function according to some established performance standard

Two key themes are apparent from the definitions above; primarily of note is the repetition of the word "estimated", meaning assumptions will need to be made of these three aspects of the life of a component permitting the admission of risk surrounding uncertainty of these estimations; and secondly linking these three strands of a components life into a defined and reliable Life Cycle is almost impossible as technological obsolescence can occur at any time.

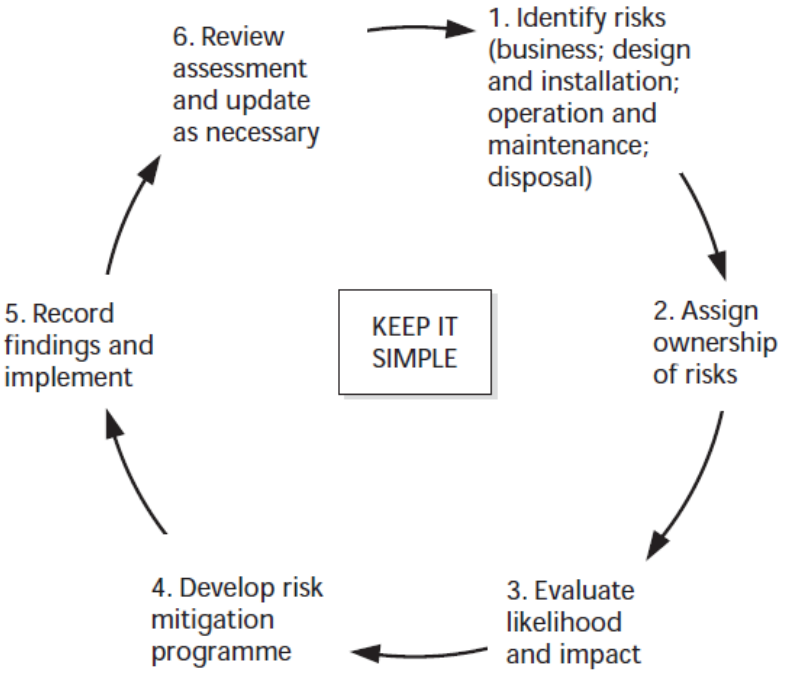

Figure 2- "The Assessment Process" (The Chartered Institution of Building Services Engineers (CIBSE) 2008)

A key point is made in CIBSE Guide M relating to the use of LCC models of particular note to OEPFI projects; namely the LCC model must be considered as a guide and should not be used prescriptively as a scope of works. Service Providers should not renew Elements of the asset solely when noted in the model for refurbishment as this could lead to possible early replacement when it is not warranted or required (The Chartered

Institution of Building Services Engineers (CIBSE) 2008). This analysis of a number of data sources to inform replacement is echoed by the BSI guidance on Life Cycle management (British Standards Institution 2013). BSI suggests the evaluation of cost for replacement with the desired quality of the asset using the Function Condition Index (FCI).

Life Cycle models can be completed to varying levels of detail, similarly to Construction Cost Plans, Elements and Sub-Elements are used. LCC Models go further into Systems levels and Component levels (e.g. boiler) (British Standards Institution 2013). Risks increase as the levels of detail decline. The latest British Standard on LCC suggests many sources of information are required to ensure accuracy in LCC Models and advocate the component asset level of detail to reduce both uncertainty and associated risk.

Academic guidance exists on how to control risks when preparing a LCC model. Leading authors suggest that considering WLC at design stage can influence the reduction of risks and achieve an overall reduction of WLC. It is proposed that around 75-95% of the total Life Cycle Costs of a building are locked in by the time working drawing are prepared; meaning altering elements after this stage becomes far more difficult and costly to achieve (Dhillon 2010). Dhillon, however, includes construction build costs within his considerations above. The LCC/WLC relationship is best illustrated in Figure 3, reproduced from BSI in 2013 but printed initially in 2008.

In order to adequately control risks in LCC a number of things must be considered at design stage. Boussabaine and Kirkham (2004) performed a detailed study into Risk and associated control from which they ascertained a number of risk response measures. Among many, wholly adequate control measures, they advocate the use of Life Cycle experts and in some cases recommend applying a cost to the risk. The latter control measure would seek to cover risks associated with uncertainty; however one might argue that uncertainty is the prevalent risk in LCC which could potentially lead to throwing money towards a lack of knowledge rather than seeking to fill the void with information.

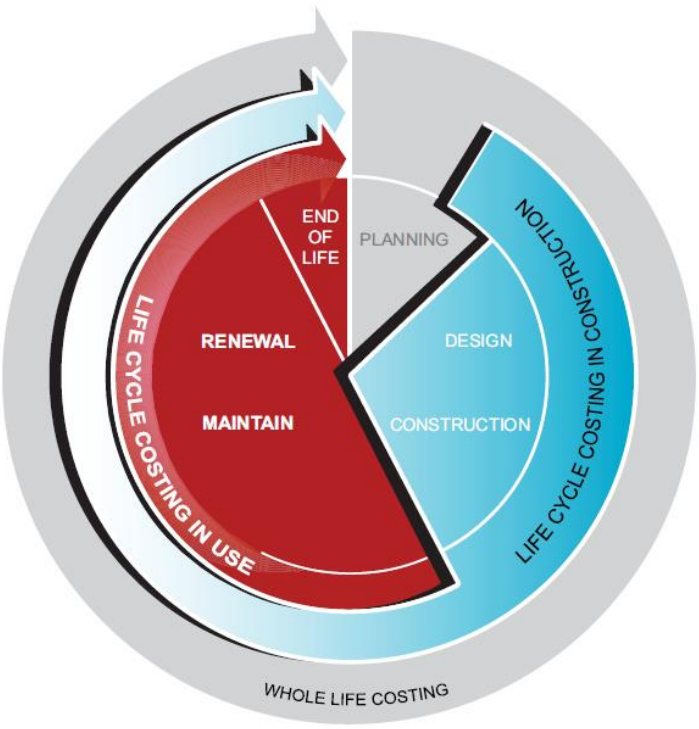

Figure 3- Life Cycle Cost planning at different stages during a building or constructed asset's lifespan (British Standards Institution 2008)

In summary the review indicates that, while protracted in the early years, significant improvements in LCC methodologies have been made over the last 8 years with industry guidance in the form of British and International standards and many industry bodies publishing advisory documents. In relation to OEPFI projects, the improvements in LC Modelling may have arrived too late as the majority of these PFI contracts would have been written before the best practice of LCC had been developed; however with developments in both LCC and PF2 forms of contract, it is evident that the next generation of OEPFI projects will benefit from improved accuracy in LCC and new methods of apportioning the associated risk.

Despite advances in industry, gaps still remain in the available Academic literature taking the form of:

- Effective identification of LCC as a risk and review of apportionment;
- In-depth understanding of the operation of PFI education projects;
- Effective LCC model risk transfer.

These gaps may be created by the lack of academic research, knowledge and expertise in LCC principles.

RESULTS

A Case Study was undertaken by the author comparing two OEPFI projects as a means of gathering targeted research from a limited situational pool of "real world" data. The Project Case Study involves analysis of an OEPFI in Sheffield and another in Derby. As both schemes are delivered by the same Service Provider, it was assumed that similar processes of PPM and Audit schemes were in place; thus planned maintenance would not differ which would allow comparisons to be made.

The Sheffield Project became operational (in terms of a completed new build school) in January 2009 as part of the BSF scheme in Sheffield. The PFI consists of three secondary schools over two sites in Sheffield. For the purposes of this Case Study, one school was studied in depth by comparing a recently completed condition survey with the Life Cycle model finished in 2007, before detailed designs were complete. The school is now in its fifth year of operation which provides a good opportunity to review the assumptions in the Life Cycle Model and observed replacement requirements of the building.

The Derby project is in its 8th year of operation and comprises of two secondary and four primary schools. This Case Study sought to compare Condition Survey data with Life Cycle models currently in place on the projects to ascertain accuracy of forecasts and define the external influences on delivering against those forecasts. For both case studies the data collected is concerned with a "moment in time" using independent condition surveys which the author reviewed and investigated for data signifying Life Cycle implications. LCC information for these schools is included in the VFA.Facility software. Original PFI Financial Close data was also reviewed. The base models from these two sources were identical, confirming that the models were estimated, reviewed by technical advisors and confirmed as fixed price agreements before the schools were built or even fully designed.

Recent additions to the VFA.Facility models became evident which relate to new and supplementary items being added to the contract. Items such as water boilers are typically added to OEPFI projects by the users at a later date which are included in the Life Cycle obligations of the Service Provider i.e. the boiler should be in good condition for the remaining 20 years of the Contract. This results in an addition to the LCC model,

proving that the models on both schools are live and continually managed entities.

Condition Surveys were completed on both schools in May 2013 and cover the following headings:

- Building Fabric (BF)
- Mechanical and Electrical (M&E)
- Furniture, Fittings and Equipment (FF&E)

All surveys were carried out by trained industry specialists and were reviewed and corroborated by external parties. The results of the surveys are presented in line with the CIBSE guide M (2008) condition index shown in Figure 4 which allows simple and objective benchmarking between projects.

CIBSE Guide M			
	1	Hazardous	Requires urgent attention, Presents a danger if left unattended.
	2	Bad	Whilst not dangerous must receive a high priority because of its bad state.
	3	Partly bad	Affected parts should receive a high priority
	4	Poor	Whilst unsatisfactory, Presents no immediate risk of failure, Replace or repair should be considered in the near future
	5	Reasonable	Satisfactory, Correct operation, Routine maintenance only
	6	Good	As New & Requires no attention

Figure 4- CIBSE Gide M Condition Index (The Chartered Institution of Building Services Engineers (CIBSE) 2008)

Upon assessing the Condition data, 95% of all assets over both schools are reported at condition 5 or above. This proves an overall “reasonable” or “good” quality across both sites. The elements of the buildings typically shown on or below poor quality i.e. in need of refurbishment or replacement under the PFI contract are reported as:

- Less than 1% of the building M&E

- Items of FF&E (mostly chairs)
- Finishes and decoration in high traffic areas

There were no noticeable differences in quality identified between the two project areas, nor could any noticeable difference in elements reported as "poor" or "partly bad" quality be identified.

This may suggest that no major breakdowns are expected between years 5 and 8 of operation. Events of LC fund drawdown have been made at both projects concerning the elements identified above meaning funds have been made available for these elements within the model. On observation of the LCC models, this is also confirmed.

Interviews with the Project Managers of the same OEPFIs were conducted to gain further insight into the management methods employed. There was obvious agreement between interviewees when discussing the accuracy of previous LCC forecasts. In each interview the message came across that it is currently too early to gauge the accuracy of LCC models when considering OEPFIs, the majority being between 5 and 10 years old. Most large items of plant will last more than 10 years even if performing below expectations, meaning that an expensive inaccuracy in forecasting may not become evident until after this point. One interviewee suggested that all risk monies should be kept as such until the very last moment possible, regardless of the value, as the cost of unexpected plant failure can be so astronomically high that releasing any funds before the end of a concession period is unwise.

It was noted by all professionals interviewed that the LCC model should not be revered as an asset replacement bible - according to which, money is expended on components at a specific date regardless of the actual need to do so. Instead models should be considered to be a live environment in which to track all asset history and forecasting including replacement, refurbishment and importantly, day to day maintenance. Without the simple knowledge of how a component is performing, a considered and informed view cannot be taken when deciding whether or not to replace it. General agreement arose that LCC Models in OEPFIs should be used as a pot, rather than a detailed scope and programme of works as the forecasts contained within the initial model were made without the detailed performance information available to Service Providers in live building environments as described above.

DISCUSSSION

New Rules of Measurement (NRM3) Publication

On the 18th of March 2014, the Royal Institution of Chartered Surveyors (RICS) published their long awaited finale to the New Rules of Measurement (NRM) suite of industry guidance – the NRM3. This research therefore addresses a period of transition towards the new documentation. The gravity of this publication cannot be underestimated. For illustration purposes, the reader is asked to consider this fact; of the billions of pounds estimated to be contracted on existing operational education PFIs (Adair et al. 2011), none have been compiled in line with an industry standard method of LCC, as one did not exist until March 2014. The initial part of the research suggests that NRM3 is a promising landmark in the construction and maintenance industry; however, as a new publication, the NRM3 faces many obstacles such as:

- Industry adoption and use of the standard may be slow and stubborn
- Evaluating the success of the method will take many years of in-use analysis

NRM3 can be summarised as follows:

- NRM3 closes the loop in the RICS standardisation suite of documents
- NRM3 represents the first publication of measurement rules and reporting rules for maintenance and Life Cycle refurbishment
- Revising the current industry methods will be a challenge for many years
- Appraising the method with analysis of data will not be possible until industry has fully adopted the process for a number of years
- NRM3 will be key to the success of BIM in WLC by linking CAPEX with OPEX in a standardised way
- Major industry clients trialling NRM3 agree the method has been successful for their projects.
- BCIS will eventually publish LCC data in the NRM3 format

The Risks of LCC in OEPFIs and the Potential Effects of PF2

The literature review concludes that the main risks in LCC for OEPFIs is of forecasting costs too low, or equally, of components not lasting as long as expected. The consequence in both instances would mean being forced to find additional funds to cover the shortfall. Of course, forecasting too high would result in financial reward for whoever owns this risk. Forecasting cannot be 100% reliable and that a key purpose of PPP evident from literature is the transfer of risk from public sector to private sector. A general principle that can be derived from the review is that the person most able to control or mitigate the risk should be liable for it. A problem with this allocation of LCC risk is evident in the literature which refers to excessive gains made in underspend against the LCC model. To avoid excessive gains, a profit share mechanism should be in place so that the client, as well as the Service Provider benefit from savings and underspends in the LCC model achieved through good planned maintenance and asset management over the concession period of the PFI – such as the process in place for PF2 described in Section 4. In disparity to this statement however, the PF2 model benefits the client without balancing the burden of risk on the service provider. In addition to this, Service Providers may be punished further by increased risks relating to LCC resulting from the "Lean Procurement" method utilised for the PF2 (DLA Piper LLP 2012). In "Lean Procurement" situations, the provision and agreement of detailed information vital for an accurate Life Cycle model can be overlooked in favour of reducing procurement time resulting in less detail from which to forecast. As noted throughout this study, BIM may improve this in future.

During the Case Study into VFA.Facility, it became evident that the system was designed around the very ethos that LCC forecasting can, and should, change over time. To use VFA.Facility is to control live maintenance and asset information which is continuously updating both cost and performance sources, the output of which is a forecast of LCC presented in a model. There is a real risk that forecasts will not be accurate, the risk control measure employed in this argument is to trade off the successes (assets outperforming forecasts) with the losses (assets underperforming against forecasts) and to hold all reserves of money available to the very end to ensure the risk of future unforeseen failures can be afforded. Key to this is the belief that the only important financial number is the total sum of the LCC fund.

The Specification/Risk Relationship
The term "sweat the asset" was present in most interviews. The term relates to Service Providers maintaining components and assets well, and achieving an overall increase in the functional value of that asset by decreasing the frequency of changes required. An example of this could be changing filters more frequently to extend the functioning life of ventilation plant. It was conceded that the future promise of unspent LCC funds could be an influence on this action but suggested that a more significant incentive may be that the better an asset performs and over a longer period, the more successful the perception of the Service Provider within the (relatively intimate) PPP market.

Technical Guidance in LCC Modelling and the impacts of Standardisation
Interview questions asked by the Author probed the methods used by the industry professionals in forecasting LCC. The responses concurred with literature and proved the use of technical guidance on the following points:

- The starting point/ideal lifespan
- The manufacturers role and reliability
- That the client's brief is key
- Source reference data (CIBSE Guide M, SFG20, BSI, ISO 55000, BCIS)
- Influences to factor into forecasts

Further confirmation in the use of technical guidance is provided by evidence found in case studies. Both OEPFI projects reviewed as part of a case study contained references to the technical guidance data noted previously and the Life Cycle Management software, VFA.Facility, had a clear link to ISO 55000 and lifted costs directly from the BCIS cost database. There was an issue with all forms of technical guidance noted in the literature and echoed by interviewees relating to discordance and conflicting standards within the array of technical guidance on the subject. Standardisation was missing and in a key milestone for both this study and the LC and Maintenance industries (NRM3 was published on the 18th of May 2014).

Comparing LCC data between two or more OEPFIs in the case study was possible due to the fact that costs and reports were in the same standard format as they are managed by the same Service Provider. Nevertheless, there was general recognition between interviewees that standardisation has not yet been achieved across the OEPFI marketplace. All opinions

regarding a move towards standardisation and the release of NRM3 were expressed with strong positivity. A member of the British Cost Information Service (BCIS) informed the Author during the NRM3 Case Study workshop that the BCIS is poised to gather and publish standardised, "real world" data on Life Cycle replacement frequencies and costs. The gathering and publication of this type of data has been called for in a variety of literature sources where the shared goal to improve LCC forecasts seems to be possible, with the ability to benchmark information from real world data sources. Interviewees concurred with the literature when inferring the desire for data which;

- was based in real life situations,
- is freely available; and
- provides the opportunity to benchmark assumptions.

Benchmarking is a method of reducing uncertainty but there are difficulties; firstly the proposed BCIS LCC database is only voluntary so would need the full support of industry if it is to succeed. Secondly, it will take time for the NRM3 standard to filter into wider industry use and then more time for the results to be suitably matured to publish.

CONCLUSIONS

The Author has reviewed Life Cycle Management information from OEPFIs in the form of LCC Models, Condition Surveys, annual reports, contractual clauses and management software responsible for the tracking of such information. It is concluded that reviewing at 5 and 8 years respectively is too early in the life of the OEPFIs to make a full assessment of the accuracy of LCC forecasts, however it suggests potential downgrading of this risk due to the success and impact of the risk control measures observed. A definitive conclusion may only be possible once a significant amount of OEPFIs have run to completion.

A review of academic literature and government publications on both PFI and PF2 discussed the allocation of risk confirming LCC adequacy risk is either with SPV or Service Provider but has been known to be traded between the private sector partners. The importance of LCC adequacy risk has not been highlighted until recently and is addressed in the PF2 sharing mechanism; however the interview research concluded that this sharing mechanism may not be entirely adequate and that more research is required once PF2 has been operational for a number of years.

The Author concluded that the party with the Life Cycle Cost risk will support a higher quality specification as a driver to extend asset life. However the author found no evidence that the incentive for this was due to ownership of LCC adequacy risk and concluded that reputation was the key driver towards extending asset life and driving for quality wherever possible was standard industry practice regardless of LCC risk. The Author further concluded that current industry guidance is widely in use within the industry. Practitioners agreed that the standardisation brought in through the NRM3 will be of great benefit to LCC forecasting methods by enabling the benchmarking of real world cost data and by uniting the various strands of industry guidance into a unified language and reporting standard on LCC.

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"CHANGING HABITS OF A LIFETIME": AN INVESTIGATION OF THE FACTORS THAT INFLUENCE BEHAVIOUR CHANGE TO REDUCE DOMESTIC ENERGY CONSUMPTION

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Concerns about the impact of climate change are increasingly relevant and problematic to modern society. Since the establishment of the Climate Change Act in 2008, the UK is committed to reducing carbon dioxide emissions by at least 80%, by the year 2050, from 1990 levels. Improving the way in which energy is used in the domestic sector has the potential to play a major role in the achievement of this overall target. This exploratory study uses in-depth interviews and focus groups to investigate the values, motivations and routes to engagement of UK homeowners in adopting pro-environmental behavioural changes. The findings suggest that the greatest barriers homeowners feel prevent them from adopting a lower carbon lifestyle are issues related to a lack of money, time and a perception that their actions are insignificant. Typically, concern for the environment and future generations are drivers of environmentally beneficial behaviour. However, people are generally unaware of any relevant initiatives or schemes to aid them in becoming more energy efficient. The results suggest that people are generally energy conscious, but not energy knowledgeable. Therefore, there is an opportunity for effective

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communication to bridge this gap in inspiring collective change in reducing energy consumption through behaviour modification.

Keywords: Environment, Behaviour Change, Barriers, Motivation, Energy Use.

INTRODUCTION

Addressing climate change is a challenging prospect, not least because any attempt at having an effective response depends largely on modifying social practices (Shove, Pantzar & Watson 2012). As human populations continue to grow, the current drive towards reducing energy consumption and emissions, such as CO_2 and other greenhouse gases, has led to an increased focus on household energy efficiency and conservation behaviours. This implies that within the context of energy, a change in attitudes and behaviours is necessary (Owens & Driffill 2008) in accelerating a transition to a more sustainable lifestyle (Energy Saving Trust 2014).

The consumption of energy is a consequence of deeply ingrained behaviour that interlinks with many other features of a person's life, such as work and family. Domestic energy consumption is a complex issue, principally related to the physical attributes of a person's home, the energy systems (e.g. electrical appliances) which these homes contain, and the consumptive behaviour of the occupiers.

Improving the way in which energy is used is a measure that can be adopted by everyone in all aspects of their life. This research explores the mechanisms by which individuals can be provided with the means and motivation to reduce their energy consumption through behaviour modifications in a domestic environment. This study also aims to establish the form and type of information that both encourages and enables homeowners to adopt greater pro-environmental behaviour. It is important to understand not only attitudes toward the environment, but also the motives and values that form the basis for those attitudes. Examining both attitudes and associated motives can lead to a better understanding of environmentally related behaviours and new ideas about ways to encourage energy conservation in a domestic setting.

RESEARCH METHOD

In order to evaluate the opportunities and constraints in encouraging environmentally beneficial behaviour amongst homeowners, four objectives were established;

1. To examine the energy saving practices of homeowners and the barriers that limit this behaviour;
2. To ascertain the primary motivators for existing pro-environmental behaviour amongst homeowners;
3. To evaluate the impact of local initiatives in promoting energy conservation;
4. To determine which methods of communication and incentives would be the most effective in encouraging energy conservation amongst homeowners.

The research project utilised methods that were designed to obtain qualitative data from two semi-structured interviews with professional practitioners, combined with data gathered from targeted focus groups. For the purpose of this research, it was determined that due to prior knowledge and experience of the researcher, homeowners living in Worcestershire was the most appropriate population to sample. This small-scale research intended to explore complex and subtle phenomena, as well as opinions and feelings. As such, this involved probing a relatively unexplored topic that focussed on the energy consumption of homeowners within Worcestershire; this also offered a route to the discovery of new ideas. Although the sample may not necessarily reflect the characteristics of the wider population, it does have some "semblance of representativeness, at least in terms of the qualitative diversity of the population being studied" (Veal, 2011:251). Permission was sought in advance from participants that focus group discussions would be recorded on video.

A purposive, convenience sampling approach was adopted for the practitioner interviews using professional contacts established during the researcher's industrial work placement.

The findings from the interviews were used to support the accuracy and direction of the topics discussed within the focus groups. The incorporation of this form of data collection added clarity to the research project through the generation of relevant, real-time and professional thoughts and opinions. The interviews took place online through email correspondence.

There was an element of convenience sampling to gain initial engagement with the target population and snowball sampling was used to build the

number of participants for the focus groups. A total of nineteen participants were randomly divided into two groups of six and one group of seven.

In structuring the data analysis, the technique suggested by Miles and Huberman (1994) consisting of three key stages was adopted: data reduction; data display and conclusion drawing/verification.

LITERATURE REVIEW

The 2008 Climate Change Act established the world's first legally binding climate change target, with an aim to reduce the UK's CO_2 emissions by at least 80% by 2050 - from the 1990 baseline (Great Britain, Climate Change Act 2008). As reported by the Department of Energy and Climate Change (DECC) (2014), 29% of final UK energy consumption is accounted for by the residential sector. Therefore, although there is no specified target reduction from this sector, reducing domestic emissions represents a major opportunity in the achievement of the overall target (Palmer and Cooper 2013). As such Schultz (2014:107) claims "environmental problems have their origins in human behaviour, and as a result, any solution to environmental issues will require changes in behaviour."

The Intergovernmental Panel on Climate Change (IPCC) assessment of the most current science on climate change stresses the urgent need for a societal response (Whitmarsh, O'Neill & Lorenzoni 2011). Thus, a significant contribution to reducing CO_2 emissions could be accomplished by encouraging consumers to reduce and adapt their patterns of energy use at home (Great Britain, Houses of Parliament 2012). The government recognises that if this target is to be successfully met, it is imperative that consumers' values and attitudes towards pro-environmental behaviour in home energy use are influenced into becoming more sustainable. Therefore, the focus of this study is private homeowners.

The 'Value-Action' Gap

A common theme within the literature is the issue that very often an individual's values and beliefs do not translate to their associated actions or what may be seen as 'pro-environmental behaviour'. Blake (1999) refers to this as the 'value-action' gap which is a featured obstacle experienced by a large proportion of homeowners.

In order to better understand and explore the factors contributing to the 'value-action' gap, a range of theoretical frameworks has been developed. One of the oldest models of pro-environmental behaviour is the linear

progression model (See Figure 1), by Burgess, Harrison & Filius (1998, cited in Kollmuss & Agyeman 2002).

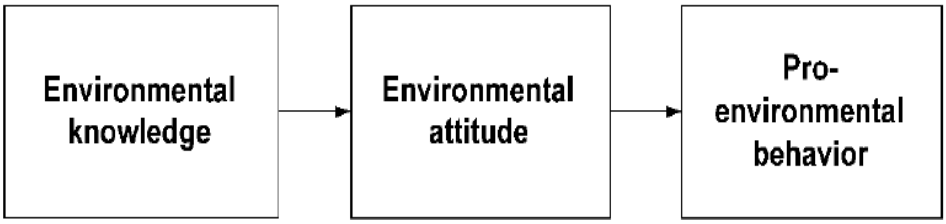

Figure 1: Early model of pro-environmental behaviour (Kollmuss & Agyeman 2002)

This assumes that there is a straightforward transition from better education and improved environmental knowledge, leading to greater environmental awareness and concern which automatically results in pro-environmental behaviour. These rationalist models have been referred to as (information) 'deficit' models (Kollmuss & Agyeman 2002). It could be argued that the most prominent flaw with this type of model is that it fails to recognise the constraints associated with the 'value-action' gap. Lucas *et al*. (2008) stress that there is not a clear correspondence between attitudes and behaviour, as it is a complex and non-linear relationship.

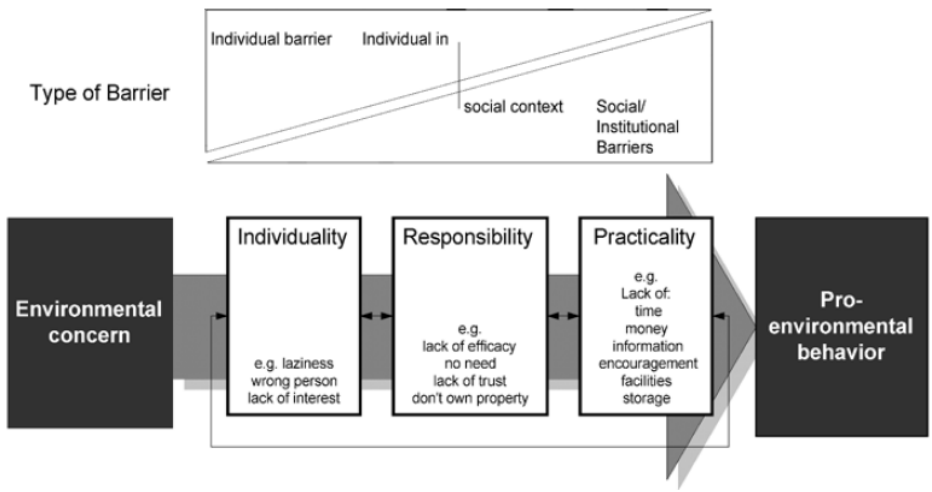

Figure 2: Barriers between environmental concern and action (Blake 1999)

Blake's model (See Figure 2) emphasises the interconnected relationship among variables, identifying three barriers to actions - individuality,

responsibility and practicality. An investigation of the numerous theoretical frameworks developed to explain this gap revealed several barriers to pro-environmental change (Blake 1999; Bell *et al*. 2001; Flynn, Bellaby & Ricci 2009; Markle 2013 & Schultz 2014).

Barriers to Pro-Environmental Behaviour

In addition to the barriers already discussed, there are many other factors that contribute to inaction. The Department for Environment, Food and Rural Affairs (DEFRA) (2008) identified a range of common barriers. The first were external, practical limits such as demands on time, shortage of money or difficult working patterns. The second was the view that changing behaviour would have an adverse effect upon lifestyle, for example, by affecting time or restricting freedoms – and, especially convenience. The third barrier was habitual behaviour – reluctance to spend time and effort on change. The fourth concerns self-image, lifestyle and a reluctance to appear to identify with a 'green' minority. This addresses the dominant social paradigm (DSP) which Emery (2012:39) refers to as the "collection of norms, beliefs, values, and the habits that form the most commonly held world view within a culture, which govern the way people do things." Thus, establishing a society where sustainable behaviour is seen as the norm would propel consumers into embracing change for the 'greater good'.

The fifth barrier was scepticism about climate change, mistrust of messages about climate change and disbelief about the individual's role in contributing towards it. Finally, while the existence of climate change may not be disputed by some, the ability to effect change through individual actions was seen as ineffective, resulting in a feeling of disempowerment and apathy.

As stated by Great Britain, Cabinet Office (2011), people have a tendency to 'discount the future', suggesting that they would prefer a smaller reward today over a larger reward in the long run. This particularly acts as a barrier for homeowners, as undertaking energy efficiency measures often involves an associated initial cost that can be quite substantial. This rules out excluding the considerations related to the achievable energy savings in the future.

Motivators for Pro-Environmental Behaviour

A common theme evident from the literature implies that if the right tools are used to address the barriers associated with pro-environmental change, these could be turned in to drivers of change. Tabi (2013:980) asserts:

> "There are two approaches in the literature to reducing consumption and environmental load; voluntarism (increased awareness through campaigns, education-related drives and increasing their willingness to live an environmentally-friendly lifestyle) and structural (address living conditions and circumstance that lock consumers into living unsustainable lifestyles e.g. working conditions, size of homes, family size etc."

As stated by Lucas (2008:456 adapted from DEFRA, 2006) "policy makers in the UK are beginning to reach a consensus about the need to develop policies that can have an active, significant and lasting impact on [pro-environmental] behaviours…"

This led to the establishment of various initiatives and schemes designed to offer financial incentives which aim to alleviate any potential disempowerment homeowners may have towards being able to obtain such energy saving measures. In this way, policy and technological change have the potential to impact significantly on improving the environment. However, individual commitment can make a difference too (Bell *et al*. 2001). Therefore, if current targets are to be met, a combination of the three - appropriate policy, technological change and individual commitment, is imperative and all of these require effective communication.

Encouraging Pro-Environmental Behaviour Change through Communication

The United Nations Environment Programme (UNEP) and Futerra (2005:6) claim that "public awareness and concern about environmental and social issues is growing." Flynn, Bellaby & Ricci (2009:162) agree, by acknowledging that "people express strong support for environmentally sustainable policies." However, they also note that individuals lack commitment towards altering their own behaviour but if provided with the appropriate information, they will be more likely to adapt. This is backed by Bitchard & Thurairajah (2013) who assert that a great proportion of homeowners may be motivated to adopt a more sustainable lifestyle through a combination of relevant information, incentives and norm-based

influences. A study carried out by Mansouri, Newborough & Probert (1996) supports this notion as their findings revealed that the general public are both interested in receiving information about the impacts concerning household energy consumption and expressed a willingness to modify their behaviour.

Research carried out by Pierce, Schiano & Paulos (2010) suggests that domestic energy-consuming interactions can be characterised as unconscious or habitual, (as opposed to rational decision-making). In light of this, Futerra (2011:4) suggests that:

> "Once you've woken or 'unfrozen' people from their sleepwalking behaviour, you can convince them to change. But once they've adopted the new behaviours, you need to find a way of 'refreezing' them, so the positive behaviour becomes an unconscious habit again."

In order to have the best chance to meet desired targets, sustainable development needs to be made approachable and understandable. One approach for integrating modified behaviour is the '3 Cs Principle', in which Emery (2012:229) suggests "consumers are more likely to be persuaded to act by communications which are clear, credible and comparable with other sustainable claims." This has the potential to encourage lasting societal change if coupled with UNEP and Futerra's (2005) top three communications for successfully engaging the public. The first emphasises the importance of tightly defining target audiences. Hargreaves (2011) and Abrahamse *et al*. (2007) clarify this by stating that the most effective campaigns are those tailored to target audiences. It must also be ensured that the information source for public campaigns and energy advice is trusted (European Environment Agency 2013). The second tool for engagement is to be inspiring by using the drama associated with the challenge and the excitement that comes with the solutions. The third communication underlines the importance of translating complex messages into ones that are both relatable to the targeted audience and practical in stimulating a response. This is fundamental in moving the impacts associated with climate change into people's 'locus of control'. As Kollmuss & Agyeman (2002) and Futerra (2011) comment, unless people believe their altered behaviour will make a difference, it is unlikely that even financial incentives and efforts to increase environmental education would succeed in bringing about change. This is qualified by Barr (2006:50) who claims "those who feel that environmental action is likely to have an impact are more likely to act."

The overall aim of this study is to identify to what extent the models and frameworks discussed may be applied in practice to bring about lasting pro-environmental changes in homeowners' behaviours which are critical to reducing domestic energy consumption. The study investigates strategies to motivate and support continuing reduction in energy usage and, in particular, the most effective communication tools. It is hoped that ultimately the findings of this study may in some small way contribute to the body of work seeking to reach the UK government's 2050 emissions target.

RESULTS

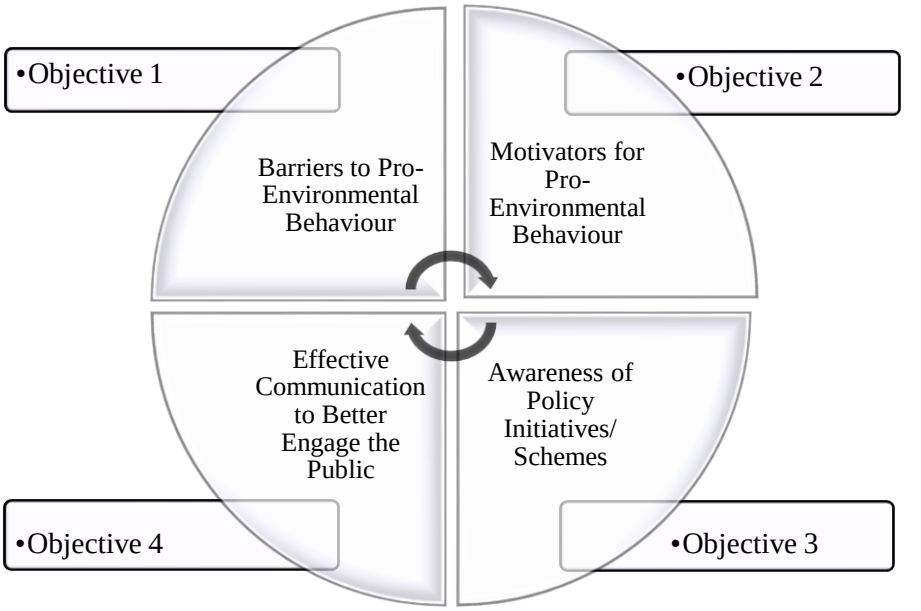

Figure 3: Diagram demonstrating the interrelatedness of the research objectives and research themes established from the findings (Source:Author)

Figure 3 illustrates the interlinked relationship between the themes embedded within the research aims. The key research themes, barriers, motivators, awareness and communication are displayed as headings. Each theme formulates the direction of research and emphasises the interdependency of the themes in meeting the objectives of this study. Objectives 1 and 2 identify the barriers and motives which explain current behaviour. Objective 3 reflects the resources that may be drawn on to

support behaviour change and objective 4 represents the means of engaging the public in increased pro-environmental behaviour.

Participants' Energy Saving Practices

At the beginning of each focus group, the participants were asked to rate their level of pro-environmental behaviour by using a scale of 1-5 (with 1 being not very much and 5 being the most). This was indicative of how much effort they considered they were putting into managing their energy use (Figure 4).

Figure 4: Level of pro-environmental behaviour involvement amongst the study participants (n=19)

Interestingly, two of the participants who were in the same group, rated themselves at opposite ends of the scale although they expressed very similar justifications. This being that their home encompassed a variety of energy saving measures, such as double glazed windows and loft/cavity wall insulation. Participant A from Group 1, who rated themselves as '1' explained that despite the adopted energy saving measures, "in terms of extra stuff we don't do it."(Group 1, Participant A). Conversely, because of the energy saving measures alone, participant F saw themselves as a '5', irrespective of the fact that they do not participate in any additional environmentally beneficial behaviour. This shows just how differently people in comparable situations can perceive themselves.

To establish a basic level of understanding for their environmentally beneficial practices; the participants were asked to state in which ways they try to save energy within their home.

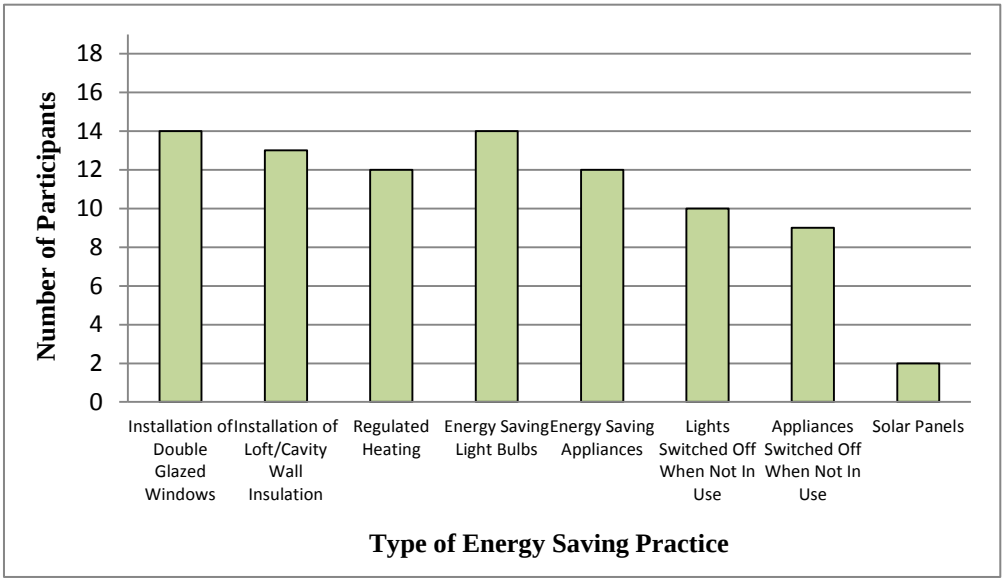

Figure 5: Participants' energy saving practices (n=19)

Many of the participants have benefited from the installation of energy efficient measures into their homes, such as improved loft and cavity wall insulation, double glazing and improvements to the energy efficiency of heating systems. Due to the adoption of such measures, one participant exclaimed that their "bills for energy have been halved over the last year and a half" (Group 1, Participant F).

Barriers to Pro-Environmental Behaviour

In general, the results appeared to be consistent with the assumption that individuals experience a range of obstacles when it comes to participating in pro-environmental behaviours.

Cost

The most common barrier to reducing energy consumption was due to a finance related issue, labelled 'cost' during the coding process. Blake's (1999) model categorises this as a 'practicality' barrier. Financial concerns were also referred to by both of the practitioners. The Community Energy and Resilience Project Manager recognised the influence money constraints can have on the effectiveness of their schemes, "the programmes are very much driven by the funding available to deliver them." This reasserts the importance of initiatives being suitably funded in order to strengthen the success of achieving substantial energy reductions.

Time

The dominance of time constraints being a barrier to environmentally beneficial behaviour was stressed by the majority of participants. One participant in particular expanded upon this:

> "Mine is time, in the fact that I just can't be bothered sometimes and that's purely because of raising young children, the last thing you want to do is to check that everything is turned off. I think I would do it more if I didn't have three young children." (Group 3, Participant C).

Powerlessness

A sub-theme which emerged from the findings and also falls under the 'barriers' category has been labelled just that, 'powerlessness.' In a similar vein, this has been referred to as 'lack of efficacy' in the literature by Blake (1999) and Barr (2006). Many of the participants expressed frustration, "I think my bit counts for nothing when you think about countries like China and America" (Group 2, Participant C), "we are such minor players" (Group 1, Participant B). This is an area distinguished within the literature, supported by Flynn, Bellaby & Ricci (2009) who reiterate that individuals may feel their actions to be insignificant in comparison to other impacts, such as industry.

The responses from participants when asked to clarify any other constraints that prevent them from saving energy, were shown to be 'lack of awareness', 'attitude', 'convenience' and 'aesthetics'. It is well-known that households tend to primarily use energy for comfort and convenience. A participant from Group 1 clarified this by stating that:

> "You live your life at a bit of a pace therefore you want your home to just work for you and I suppose a lot of what we do is purely about convenience and comfort. We're not used to not being comfortable." (Group 1, Participant C).

Roughly a quarter of participants revealed an aversion to embracing certain energy saving measures for reasons associated with aesthetics.

Consciousness of climate change issues among research participants did indeed appear high. However, as the literature and findings from this study suggest, there is a significant disconnect between the attitudes a participant possesses and any changes in behaviour. This notion reflects the studies carried out by Blake (1992), Kollmuss & Agyeman (2002), Barr (2006) and Lucas (2008) who assert this is particularly clear in relation to energy reduction.

It became apparent throughout the discussions that lack of knowledge regarding new technologies and behaviour strategies was a strong factor in preventing participants from saving energy. "We could do more to consciously save energy than we do at the minute, but I don't know where we need to do it" (Group 2, Participant B). This suggests that if better informed, residents may be encouraged to alter their behaviour.

Motivators for Pro-Environmental Behaviour

As the focus group discussions progressed, the participants described their reasons for reducing their energy consumption.

Environmental Concern

A large proportion of participants expressed their concern about the impacts inflicted upon the environment in association with homeowner energy consumption, referred to in the transcripts as 'environmental concern'. In alleviating energy usage, the adoption of modified behaviour types requires a certain amount of conscious effort, at least until new habits have formed. The participants' responses mirrored the findings from research by Stern (2000) and Steg (2008) who emphasise the link between a person's environmental concern and their associated behaviours. However, the findings did reveal that although participants acknowledged their concern for the environment, this did not stimulate sustainable behaviour.

A minority of participants (2/16) who were particularly apathetic towards better managing their household energy seemed to be influenced by their views concerning climate change. A participant from Group 1 stated that climate change is a…

> "Waste of time. A lot of the climate change information has been spun. You can't believe anything that you read because you get one reasoned argument then you get a counter argument." (Group 1, Participant A).

This correlates with DEFRA (2008) who acknowledge scepticism as a barrier for change.

Intergenerational Equity

When questioned about their motives towards reducing their individual energy consumption, many participants expressed concern for the threats that younger generations may have to face. This pattern was coded as 'intergenerational equity'. One participant stated "I'm very conscious about the effect we might be having on future generations, it certainly

worries me." (Group 2, Participant B). This view espouses optimism for long-lasting behaviour change. The theory offered within the work by Bedford *et al*. (2010) on home energy use promotes the idea that behaviour traditions are passed from one generation to another. In this way, if householders were to modify their current energy consumption behaviour, it is likely that these practices will be conveyed to later generations, thus ensuring the longevity of environmentally beneficial behaviours. The Sustainability Consultant referred to a project called ECO Communities which made use of school homework projects to collect basic energy data. Guidance was then offered to encourage and support householders in reducing their energy consumption. The Sustainability Consultant remarked upon "parents who had been incredibly motivated by the work they did through the projects – leading to a number of exciting new developments on family homes." There is real potential for this to be replicated across similar communities with school aged children. For example, more than half of the study participants fell into this category. Approaches like this can also harness many young people's natural enthusiasm and desires to engage in pro-environmental behaviour, thereby offering an opportunity to motivate parents to save energy.

Feedback

Measures that provide feedback have the potential to substantially raise energy awareness and change consumers' attitudes in relation to consumption patterns; this is an example of a 'reflective practice' as termed by Pullinger, Lovell & Webb (2014). In this sense, when homeowners receive feedback about their efforts to reduce their energy use, they may, as a result of the positive consequences attached to their behaviour, be motivated to conserve more energy; Abrahasme *et al*. (2005) support this. An increasingly popular form of instantaneous feedback of consumption patterns can be gained through the use of a Smart meter. This notion was discussed by participants and labelled 'feedback'. A few of the participants believed "smart meters are quite useful - you can actually visually be told how much you're using at a time." (Group 1, Participant A). This real- time display encouraged several participants to conserve energy. For example, in relation to boiling the kettle, participants were careful to boil only the quantity of water that was needed instead of wasting energy through overfilling. Although these types of practices may be small, their cumulative effect has the potential to lead to noticeable energy savings.

Awareness of Policy Initiatives/Schemes – How Effective is Current Communication?

According to the Sustainability Consultant, "there needs to be that sense of momentum and shared priority that extends through government and society and business". At a domestic level, the government have launched a number of policies with the intent to empower householders to actively save energy.

Lack of Awareness

To establish occupant awareness of such energy reduction schemes either at a national or local level, the residents involved in this study were asked to comment on their familiarity with any initiatives or schemes. The results were somewhat surprising, with there being a shared idea among almost all of the participants that they "haven't heard of any, so if the council are offering schemes, it hasn't reached us" (Group 3, Participant C). Mention of national policies was also invariably scarce.

Trust

Throughout the literature, it became clear that public perceptions related to 'trust' highly influenced their willingness to participate in schemes to reduce their energy consumption. There was unanimity amongst the participants who articulated an aversion and scepticism towards propositions related to saving energy as they believed there to be a hidden agenda. The findings, however, revealed a higher level of trust towards the local authority, with participants saying that they would "like to think that the Councils in Worcestershire would have the residents' best interests at heart" (Group 3, Participant G). This supports the opinion of the Sustainability Consultant who stated:

> "People power is where things will change…but those grass roots movements also need the involvement of local / national and international bodies/governments etc".

Thus, for the public to even consider the possibility of modifying their behaviour in an effort to reduce their energy consumption patterns, a foundation of trust is fundamentally important.

Social Norm

The findings reveal that with regard to those involved in this study, a sense of 'virtue ethics' is a more prominent driver than consequentialism to behaving in a more pro-environmental manner. In this way, participants were more concerned about maintaining their moral character rather

judging the rightness or wrongness of their individual actions by the associated outcome itself. In order to promote and achieve energy-conscious behaviour, it is necessary to encourage a shift in what are referred to as social pressures (Kollmuss & Agyeman 2002). A participant from Group 2 included "nobody criticises you for using too much or too little, you don't get penalised, you don't get embarrassed, you don't get shown up." (Group 2, Participant A). In this sense, it seems possible to stimulate a change in mentality by projecting behaviours into society in the hope that they might eventually be adopted as the new 'norm'. A participant from Group 2 supports this notion, "it would just become habit so wouldn't seem like an out of the ordinary thing to do." (Group 2, Participant B). A participant from Group 3 added, "I would probably change my behaviour, but then I'm a rule follower." (Group 3, Participant B). Another participant from Group 3 exclaimed "it is interesting that efforts to alter behaviour are essentially an attempt at changing habits of a lifetime." (Group 3, Participant F). Stern (2000) and Emery (2012) reiterate this concept, claiming that the general predisposition attached to social norms heavily influences a variety of behaviours. Facilitating the introduction of pro-environmental behaviours has the opportunity to alter what is seen as the social norm. With this, there is the potential for long-term behaviour change to occur. The transformation of collective conventions through reinforcing positive change is fundamental to locking people into consumption patterns with improved outcomes for resource consumption and the environment.

Effective Communication to Better Engage the Public

Community

An interesting and somewhat unexpected aspiration amongst many of the participants was the desire to affirm a sense of belonging and identity within the community. This theme was labelled 'community' and seems to indicate that the participants' lack of trust in governance on a national scale is not shadowed at a local level. Residents were keen to demonstrate that "we do what we can to benefit ourselves but it is also nice to feel like you're helping the local authority in some way" (Group 2, Participant F).

It is essential, therefore, to develop a more collaborative relationship between homeowners and the local councils to ensure a more positive response to environmentally beneficial initiatives.

Communication Deficit

The research indicates that homeowners are interested in receiving information concerning household energy use and the associated

environmental impact, and that if provided with the right means, are willing to modify their behaviour to reduce their usage and consequential environmental damage. This supports the findings revealed by Mansouri, Newborough & Probert (1996). A participant from Group 3 clarifies this by adding "I think getting information to me that is relevant to me in the place that I live, making it local, making it easy, making it quick. That's what's important." (Group 3, Participant C). This is also supported by Hargreaves (2011) and Abrahamse *et al*. (2007) who emphasise the importance tailored information has on encouraging public approval.

Communication Tools

A final, overarching theme was coded as 'communication tools'. This links the other three dominant themes; as barriers have the potential to be turned into motivators by encouraging is approval of policy initiatives and behaviour modification through effective communication.

When asked to state which form of communication would be most effective in influencing residents to save energy, a high proportion of participants saw email, social media and leaflets as being the most popular. Establishing which forms of communication are accepted by the target audience is crucial in ensuring that limited resources are being used efficiently. Moreover, participants stated that they would like the information to be from a local source, which further embeds their community trust. A participant from Group 1 said "if the council directly emailed me, I'd read it." (Group 1, Participant A). Another participant, from Group 3, chose social media and explained that they "would probably join a group that was related to Worcester – `this is Worcester` or something like that." (Group 3, Participant E).

A perception concurrent across the study was the impact 'word of mouth' has on the uptake of energy saving strategies. A participant from Group 2 said that "if a neighbour had something done and they told me about it, then I would look into it." (Group 2, Participant F).The Community Energy and Resilience Project Manager acknowledges this, "seeing the work being completed on another property is also key."

Summary of Discussion of Results and Analysis

The previous section identified the main responses which emerged from participants on the following themes:

- barriers to pro-environmental behaviour
- motivators for pro-environmental behaviour
- awareness of policy initiatives/schemes, and
- effective communication to better engage the public'.

The themes are interrelated (as shown in Figure 4). They encompass elements which help to explain the findings of the research and also correlate with the research objectives.

New findings have been identified, some, for example, which are associated with the participants' needs to feel that they remain an integral part of the community and to reinforce their connections with the local authority.

CONCLUSIONS

This project has examined homeowners' approaches to energy consumption and conservation. It did so by identifying the most successful means of engaging homeowners in reduction of energy consumption through behaviour modifications.

In examining the energy saving practices of homeowners and the barriers that limit this behaviour, this research revealed that all participants incorporated some energy saving practices into their daily lives. However, and despite reflecting UNEP and Futerra's (2005) recognition of increased awareness of environmental and energy issues, this research shows that this is not translated into more sustainable energy behaviours in the home, demonstrating the 'value-action gap' concept.

The most common barriers preventing participants from saving energy were shown to be 'cost', 'time' and 'powerlessness'. For some, at least, it may be that scepticism over climate change offers an excuse not to act. Effective communications are critical in breaking down these barriers. Unless there is greater appreciation of the interconnectedness between all societal components it will become increasingly difficult to inspire sustainable collective change in reducing energy consumption.

Prior to the group discussions, participants generally felt disengaged and somewhat unaware that their habitual daily routine led to behaviours that avoidably consumed energy. However, feedback following focus group

discussions revealed that the vast majority of the participants had been encouraged to improve their behaviour and seek solutions with their newly acquired knowledge.

Participants were unaware of relevant schemes put in place at either a local or national level. This research also highlighted the importance of 'trust' and 'social norms' in influencing homeowner acceptance and the success of governmental schemes.

The results show that many of the participants are energy conscious, but not energy knowledgeable. They are aware of the importance of low energy use, but are insufficiently motivated to carry out energy-saving measures in their homes. For this reason, it is of great importance that the efficiency of communication with local residents is prioritised. In order for the public to be empowered and engaged in addressing their energy consumptive patterns, they need to be provided with insightful and targeted information. This research suggests that this information would best be facilitated through the use of direct 'emails' from a trusted source (e.g. the local authority), 'social media' in some form of a group with a community focus, and 'leaflets' that were informative and relevant to the occupier. This group of residents took pride in the City of Worcester and were keen to support the work of the local authority.

Improving channels of communication could promote greater collaboration and strengthen connections between the residents and the local authority. It could also improve links between residents. Collectively, this would significantly increase the impact of positive energy saving and other supportive pro-environmental behaviours.

In order to engage consumers in the process of translating barriers into motivators, the research findings underline the desire for, and importance of, meaningful and clear communication and ongoing feedback as the main tools in strategies to promote well-informed and long-lasting changes in behaviour in the context of a threatened environment.

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A STUDY INTO RECRUITMENT AND SELECTION FOR THE BUILT ENVIRONMENT DISCIPLINES.

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Recruitment and selection is a complex process attempting to mee**t** the future needs of a company within the current operating parameters and facilitated by human interactions. The literature studied identified no definitive description of ‘employability' in the Built Environment disciplines, only a linkage between certain discrete attributes which correlate with an applicant successfully gaining employment. Certain methods of recruitment and selection target particular individual attributes, but those qualities which are valued are difficult to systematically assess, indeed methods used for graduate recruitment and selection in the Built Environment disciplines were more complex than anticipated. As graduate employees are expected to continue to be developed by the company many methods assess the graduate's potential fit into a team. A mismatch in the perception of the relative importance of skills or competencies was found between recently employed graduates and industry recruiters. Recruiters actively sought candidates who demonstrated that they had 'client readiness'. Graduates do not necessarily see that the struggle to gain employment is a consequence of the difficult economy or how they project themselves during selection. The publication of graduate employability statistics and the increased levels of student indebtedness will no doubt act to enhance the importance given to employment outcomes.

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Key Words: Education, Skills, Recruitment, Personnel

INTRODUCTION

The subject of employability of graduates is debated currently within literature, which has highlighted differential strategies for recruitment and selection within the UK. There is general consensus that certain methods of recruitment and selection target certain individual attributes. There is evidence of a country wide shift in selection methods driven by IT facilitated communication. What is currently less well known is the means of recruitment and selection specifically used for built environment students and the underlying rationale for these. The research aim was to determine the chronological application and examine the rationale for utilisation of recruitment and selection procedures applied by a number of employers. This was achieved by outlining the requirements of graduate skills both generally and specifically in terms of the built environment disciplines. The relative importance of the skills was then examined within the context of the selection procedures, as applied to recent graduates from the perspective of both employers and graduates. This allowed the examination of the methodologies of selection and their application to the identification of a candidate's alignment to the employer's required skills, or competencies of graduates within the specified subject areas.

LITERATURE REVIEW

Skills are defined by Leitch (2006:6) as "capabilities and expertise in a particular occupation or activity" which may include "literacy and numeracy …team working or communication… or specific skills [for a particular occupation]..." One of the common measures of achievement in a skill is a qualification, but there is a growing body of research which suggests that there is a mismatch between supply and demand of skills. The UK Commission for Employment and Skills (2009) discussed many of the potential problems with meeting proposed economic performance targets for the UK by 2020 in terms of skill development and there has since been considerable debate as to whether the UK Higher Education (HE) sector equips students and graduates with the skills they need to be able to access graduate jobs. A skills mismatch has been reported by several authors, including Bellcurve (2009) using an EU labour force survey in 2008; finding that lack of match between requirements for graduate skills in the labour market was one of the main factors behind

graduate unemployment and employee dissatisfaction, particularly in the built environment disciplines.

Overview of Graduate Key Skills

Purcell *et al*. (2012:64) suggest that recruiters continue to state that there is an inability to recruit appropriate talent in particular graduate vacancies; 54% of recruiters stated that they found it increasingly difficult to find graduates with the right skills. The Confederation of British Industry reported that half of their surveyed companies had a lack of confidence in their ability to fill graduate-level posts in the following years. Yet many graduates still report that they are unable to find graduate vacancies and thus there is a net underutilisation of skills (*ibid*:66).

The challenges in the graduate market can be summarised as follows;

- challenges of UK economic requirements (UK Commission for Employment and Skills 2009:7-9)
- changes in the undergraduate HE market leading to student led course demand (Lambert Review 2003:107),
- the requirements to meet future challenges, incorporating flexibility in workforce skills (Witt & Lill 2010),
- uncertainty related to curriculum and delivery (Pegg *et al*. 2012: 20; Tibby, 2012:3; Poon *et al.* 2011: 484; Corominas 2010:43; Newman 2009:1),
- the transition of graduates to work (Wilson Review 2012:2l; Purcell *et al*. 2012:xxii; Pegg *et al.* 2012: 35; Lambert Review 2003:7),
- student expectations of the qualification as a means to work in the face of rising debt (Pegg *et al.* 2012: 6; Purcell *et al*. 2012:xviii; Confederation of British Industry 2011:7UK Commission for Employment and Skills 2009:36).

Several authors have highlighted a shift in the views of the external stakeholders including increased comparison between institutions (Howarth & Stafford 2005:3; Beer 2012:4) increased competition between Higher Education Institutes (HEIs) to engage with industry (Heesom *et al.* 2008:34) and a perception that industry needs are not met (Leitch Review 2006:11; Lambert Review 2003:7). Interpersonal effectiveness or ability of a person to work well with others is seen to be increasingly identified with graduate employment (Tomkins, 2012:1). Finally there is a difference reported in the literature as to the defining qualities of a 'graduate' in terms of the skills and abilities which they should be expected to have on

entering work and the need to have the capacity to develop these further over time.

The UK Construction Industry

The Fairclough Report (2002:15) identified issues with the supply of professional skills for the built environment and that these needs for the sector had not been met. Amaratunga *et al.* (2010:31) confirmed the significant changes experienced by the UK construction industry over the past decade, with new forms of procurement, partnering arrangements, increased use of design and build with more integration between design and production, more specialisation and a new culture of health and safety and suggested that this compounds with the skills shortages of people with the necessary technical and managerial skills to work within the industry to reduce construction output. Atfield & Purcell (2010:6) found that students entering the fields of architecture, building and planning showed a strong alignment between taught subjects and long-term career plans, with vocational students looking for work earlier in their final year (*ibid*:2). Purcell *et al.* (2012:76) reported that graduates in Building would be expected to be employed primarily as 'experts' where their specialist HE knowledge was of direct use in the course of their daily work, followed by employment as a 'communicator' or finally as a 'strategist' with an evaluative or co-ordinator role. This finding is echoed in the work of Bhattacharjee *et al*. (2013) which demonstrated that construction employers valued oral and written communication of graduates. The labour market requirements of the construction industry are dynamic in nature, relating to population demographic fluctuations, and the nature of the market; the introduction of new technologies; the fragmentation of the industry and the economic recession (Amaratunga *et al*. 2010:36). In 2010/2011 the Higher Education Careers Services Unit (2012) reported that 65.90% of graduates in Architecture and Building entered employment six months after graduation, for 2011/2012 a figure of 65.6% was reported (Higher Education Careers Services Unit, 2013).

The Futuretrack Study (Purcell *et al*. 2012:141) found a correlation between student perceptions of their skills and the types of employment they wanted. In the area of Architecture, Building and Planning between Stage 3 (still at university) and Stage 4 (post-graduation) those agreeing that the skills they had on their undergraduate course had made them more employable fell by more than 10 per cent. While a vocational degree was generally of benefit in gaining employment, the advantage of this was less in those professions which had been worst hit by the recession (*ibid*:157).

According to Unistats (2014) 80% of SHU Built Environment graduates in Building Surveying (BS), Construction Project Management (CPM) and Quantity Surveying (QS) graduates were in employment in a professional or managerial job within 6 months of the completion of the course.

The Confederation of British Industry (2009:8) defined employability skills as: "a set of attributes, skills and knowledge that all labour market participants should possess to ensure that they have the capability of being effective in the workplace, to the benefit of themselves, their employer and the wider economy." Butcher *et al*. (2011:39) state that there is a key difference between 'employability' and 'employment' and that employers need to be involved in order to make the best use of graduate talent for the benefit of students, employers and the economy. According to Higher Education Academy (2012) an accepted definition of employability is "a set of achievements, skills, understandings and personal attributes, [which] make graduates more likely to gain, implement and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy." Alternately it is seen by Pegg *et al* (2012: 5) as "… not about lists of categories of skills.. [It refers to]… 'Skilful practices in context'… and an approach to personal development and career planning that is included within the notion of employability."

While many of these generic graduate skills are required across the built environment subject areas, TargetJobs (2013a:33-41 and TargetJobs 2013b:22-52) identify that those graduate professional roles which fall under the category of 'Built Environment' need different skills. An employer needs to be able to select the optimum match of a candidate to meet the business needs of the organization and this has led to the development of a number of practical measures being applied, which allow value judgments to be made in the face of increased applicant numbers (Tomkins 2012:2). For recruitment to industry some form of communication of desired skills is still commonly used by companies in the information circulated to undergraduates, Such skills are given by Kibler (2013:10-11) in Table 1.

Amaratunga *et al.* (2010:34) state that employers seek individuals with both specific and generic skills. The specific skills relate to the job performed and generic skills which are essential to perform effectively and efficiently within any kind of job. KSAOs (Knowledge, Skills, Attributes and Other characteristics) are attributes and not behaviours which can be directly observed (Brannick, Cadle & Levine, 2012:122), and these are created by genetics and the environment (Ployhart, 2012:673). Human

factors outlined by Murphy (2012:31) encompass the four domains of individual differences; ability (mainly cognitive, although physical abilities are often important); personality; interests; and self-evaluations, which are established in a biological base although the reasons behind these are not always well understood.

Skill	Evidence by
Communication	Application forms and CVs. Use of positive words to highlight energy and enthusiasm during interview.
Teamwork	Demonstrate understanding of effective teamwork for example membership of society or club, previous positions of responsibility
Commercial awareness	Ability to answer questions about current industry affairs, discussions on commercial issues may occur at interview
Time management	Demonstrate that you have successfully juggled academic work, part-time employment, or society membership
Problem solving	Demonstrate the ability to adopt common sense approaches to problem solving under pressure
Enthusiasm	Demonstrate proactivity by finding practical experience and keeping up to date

Table .1 *Six essential skills for construction jobs (modified after Kibler 2013:10-11)*

There are many recent models of graduate employability which go beyond the simple listing of skills. One such model is that proposed by Hinchliffe & Jolly (2011:563), who suggest that the traditional model of graduate employability comprising skills, competence and attributes may no longer be valid as a fixed identity. They propose a four stranded concept of graduate identity comprising value, intellect, social engagement and performance and highlight that different employers will value different facets of this identity to a differential extent. They opine that a simple skills approach cannot do justice to the complexity of graduates mostly because this requires an assumption that performance is always measurable and observable. Graduate recruitment is however an exploration of current identity, with a view to judging whether a person is capable of both assuming that role and potentially being further shaped by the employer (*ibid*.:564-565). The study found that personal attributes such as honesty, integrity and trust were expected at appointment, ahead of any other skill competence. Strands of the graduate identity (value, intellect, social engagement and performance) were also considered. All graduates were expected to be able to present ideas clearly, both verbally and in writing. The ability to demonstrate cultural and social awareness were expected and may be ranked ahead of IT skills. It was also found that some employers were prepared to wait up to a year for the technical skills to develop unless

particular specialist skills were required at appointment (*ibid*. 2011:570). The expectation of employers that newly hired graduates would become self-directed learners was also found by Bhattacharjee *et al.* 2013.

A further model is the 'CareerEDGE' (Sewell & Pool, 2012: this 1) which considered Career (development, learning) Experience (work and life), Degree Subject (knowledge, skills and understanding), Generic Skills and Emotional Intelligence which all feed into a reflective and evaluative cycle which underpins their self-efficiency, self confidence and self-esteem which in turn leads to employability.

The Recruitment Process

Recruitment is the process which precedes selection in which new talent is attracted to the position and then screened to determine their likely fit to the organisation. The key objective of HR is adaptation of a strategic approach to recruitment and retention of staff to produce an effective and competitive organisation (Taylor 2010:2). Obtaining information about the job requirements prior to candidate selection is a very common (perhaps universal) practice (McPhail & Jeanneret 2012:417). Ployhart & Schneider (2012:49) state that the classic model personnel selection requires the identification of KSAOs which are deemed important for effective individual job performance. These are then used in personal selection. However, job analysis using this methodology is seen as giving a relatively fixed description of the job at a particular time which may not necessarily meet future employer objectives (*ibid*:51). Amaratunga *et al.* (2010:34 cites Gilleard 2010) that when recruiting graduates employers mainly look for a good degree; specific skills; generic transferable skills; experience; and personal attributes, whereas Hinchliffe & Jolly (2011:582) believe that "underpinning the employability specifics is the generation of evidence of a 'capability set' which is a combination of functionings."

Taylor (2010:159) states that "the terms recruitment and selection are… distinct human resource management activities" and that recruitment involving the seeking of applications from potential employees and selection of the techniques which are used to decide which of the potential candidates may be best for the job. Classic model personal selection requires the identification of KSAOs which are deemed important for effective individual job performance, these are then used in personal selection (Ployhart & Schneider, 2012:49). Analysis of the duties in a systematic way enables objective recruitment and selection to minimise the potential for subjective judgements and ensure that the selection process is fair (Taylor 2010:132). Selection processes are focused on demonstrating

the validity of the procedures which enable the identification of people with an appropriate fit to the job requirements in terms of their knowledge, skills and abilities (Ostroff & Zhan, 2012:252). Increasingly literature highlights the importance of the so-called 'soft skills' for example Benhart & Shaurette (2014) discussed the need of industry for graduates who could communicate in person, to an audience and over the telephone which are attributes difficult to assess by paper application. Job analysis using this methodology, however, is seen as giving a relatively fixed description of the job at a particular time, which may not necessarily meet future needs (Ployhart & Schneider, 2012:51).

The Selection Process

The selection process follows from recruitment and is required to use a variety of methods to allow matching the requirements of the organisation, using the application processes to meet the required resource outcome (Taylor, 2010:132). McPhail & Jeanneret (2012:420) summarised a variety of variables which influence the assessment design within an organisational context as follows:-

- "business needs/objectives,
- culture/climate/values,
- mission/business strategies,
- change initiatives,
- position competencies,
- assessment history"

Personnel selection researchers use a variety of methods to assess individual difference, which invariably use several different constructs. There is significant variation in the measure and understanding of validity of methodologies such as interview, biodata, simulations and individual assessments (Schmitt & Ott-Howard 2012:944).

Assessment may be considered in order to establish the following;

- "fit job/role,
- fit with manager/executive leadership,
- fit to team/peers,
- fit to organisation (unit/whole)" (McPhail & Jeanneret 2012:417)

The status and reputation of the institution attended may alter employability by positive or negative filtering (Pegg *et al* 2012: 7). The importance of degree classification on employability was highlighted by

Purcell *et al*. (2012:28) who found there was a clear link between graduate employment and degree classification, with only 20% of graduates gaining a first class degree in non-graduate jobs compared with 50% those of graduates with a third class degree. The exponential expansion of web-based assessment over the past decade (Scott & Lezotte, 2012:485) allows the use of online algorithms which filter against a specified candidate description, for example rejecting all 2:2 or below degree classifications (TargetJobs 2013a:14). Both Hinchliffe & Jolly (2011:577) and Lowden *et al*. (2011:17) suggested that the main attributes and skills stressed by stakeholders included a good degree from a good university for verifying intellectual ability and quality assurance; work experience to aid realignment to their new job and in addition participating in extracurricular activities. Lowden *et al*. (2011:17) considered reflective skills of awareness of how their experience contributes to the overall learning and how these skills are transferable, where Hinchliffe & Jolly (2011:577) stress the importance of broad-based experience possessed by graduates who had made the most of all the opportunities available to them including volunteering, societies and events, which demonstrated values.

Research Method

The approach to a research problem inevitably involves certain philosophical assumptions both to allow comprehension of the subject and suggest that the research is constructed in a certain way (Gill & Johnson 2010:187). The researcher is not a passive observer, but is actively responding to the stimuli and utilising their own 'social construct,' based on their own view of reality, to organise and interpret the data to produce meaning (Gill & Johnson 2010:195-198).

The research paradigm adopted was that of Realist research which accepts that an objective truth may be derived while recognising that there is a subjective influence even on knowledge collected systematically (Fisher *et al.* 2010: 17). As data would be collected from human participants by both interview and survey it was important to understand the theoretical framework and conceptual structure of the underlying research, in order to focus the questions adequately (Robson 2011:250). While the survey lent itself to non-parametric quantitative methods, qualitative methods were used on the interviews. It is recognised that while qualitative analysis gives richness and detail within the data, allowing contradictory opinions and the possibility of alternative explanations a disadvantages is that it may not be representative, that interpretation relies on the self-awareness of the

researcher, that analysis is time-consuming and risks oversimplification (Denscombe 2010: 304).

Sheffield Hallam University (SHU) Research Ethics Policy and Procedures state that research involving human participants is subject to ethical review (Sheffield Hallam University, 2013). Adherence with the SHU Ethical procedures is a pre-requisite to research dealing with human subjects and is subject to agreement by peers.

Aims

To determine the chronological application and examine the rationale for utilisation of recruitment and selection procedures as applied by a number of employers, within the Built Environment subject disciplines.

Objectives

- To outline the requirements of graduate skills generally and specifically in terms of the Built Environment disciplines
- To describe theories on employability and early career development
- To illustrate the selection procedures as applied to recent graduates from the perspective of both employers and graduates.
- To examine whether there is a perception of skill or competence mismatch between recent graduates and the requirements of industry and how these skills or competencies are identified/quantified during recruitment
- To evaluate emerging methodologies of selection and their application to the identification of a candidate's alignment to the employer's required skills, or competencies of graduates within the Built Environment disciplines

The adopted sampling strategy was based on a convenience sample of previous students and approaching employers known to have interviewed or selected previous SHU graduates. The research was carried out in the following stages. A focus group method was carried out with members of staff in the Built Environment Division at SHU who had an interest in recruitment and selection. This allowed the identification of key areas for exploration. A detailed literature review was carried out on graduate skills, recruitment theory, methods of recruitment and selection, assessment of hidden attributes and the links between selection methods and underlying traits and skills. The area for research was focused, and qualitative and semi quantitative questionnaires using Likert scale and open questions was devised, piloted and revised. Ethical review was then carried out and peer

reviewed. Sample frames for the graduates were established and the questionnaire was distributed. Initially social media was used to request data from graduates in an attempt to widen the sample population but this was not successful and the greatest response was from Alumni from the 3 previous years. One of the key issues encountered was in the expiry of e-mail accounts on file. Following the return of the questionnaires the resulting data was analysed using SPSS. In all there were 88 returns, 81 from SHU and 7 from other universities with respondents reflecting on 176 applications. Emerging themes were identified and a semi-structured interview schedule was created, piloted and revised and a number of recruitment specialists approached. Ultimately 11 interviews were carried out, audio recorded and transcribed where possible or extensive notes taken. Notes or transcriptions were returned to participants for review and to allow any corrections or redactions and then the data was Data analysed in Nvivo.

RESEARCH FINDINGS - SURVEY

Statistical analysis showed a strong skew in respondents towards employed respondents, greater than expected based on KIS data which states that 80% of graduates would be employed within 6 months. While the sample population was drawn predominantly from 3 year of graduate students this could be expected and was seen as important in subsequent data analysis, as the experiences reflect the views of students who have ultimately been successful in the recruitment process and not the views of the students who have failed to be selected. The data suggests that respondents generally considered the process which resulted in their current appointment and up to two other assessments at which they had been rejected. Perhaps unsurprisingly the SHU alumni responses dominated the sample population and therefore data analysis focussed on these. The results are not therefore necessarily generalisable to the whole population of UK built environment graduates.

Statistical analysis isolated the following significant outcomes from the data analysis.

In terms of the value placed by certain degree disciplines on named KSAOs;

- QS (Quantity Surveyors) value numeracy, customer care/business focus and time/self-management more than both Building Surveyors (BS) and Construction (Project) Managers (CPM),

- BS and CM value creativity and resilience more than QS,
- BS place higher value on specialist IT skills than CPM or QS,
- CPM place higher value on leadership than BS or QS.

Graduates highlighted the following aspects as being perceived to be key to gaining graduate employment:

- Fit within the company,
- Having a positive attitude,
- Writing skills,
- Having contacts,
- Qualifications,
- Experience,
- University they graduated from,
- Professional body recognition,
- Application of course skills.

Statistical analysis highlighted significant differences within graduate perceptions for the listed KSAOs (see Table 2)

KSAOs given statistically significant lower values	**KSAOs given statistically significant higher values**
creativity	achievement
customer care	analytical skills
emotional intelligence	business focus
enterprise	communication
leadership	planning
specialist IT skill	team skills
	time management

Table 2 Differences in perception of graduates to listed KSAOs

The findings demonstrate that graduates recognise the benefits of their own qualification classification, their work experience history, the links that their institution has with industry on a formal basis, and the importance of their extracurricular activities.

Additionally graduates identified the following in open questions:

- The alignment of personal skills and values to the business,
- Confidence,
- Flexibility,
- Use of initiative.

RESEARCH FINDINGS - INTERVIEW

Detailed interviews were carried out in person with 8 individuals involved in recruitment and selection of built environment graduates, and additional interviews by electronic means brought the total to 11. All transcripts were returned to participants for verification and then responses were coded within NVIVO to create categorised nodes. Ranking these according to the number of sources highlighted within each node, the number of coding references and the number of words was used to give a measure of relative importance, verified by analysis of the textural content as shown in Figure 1.

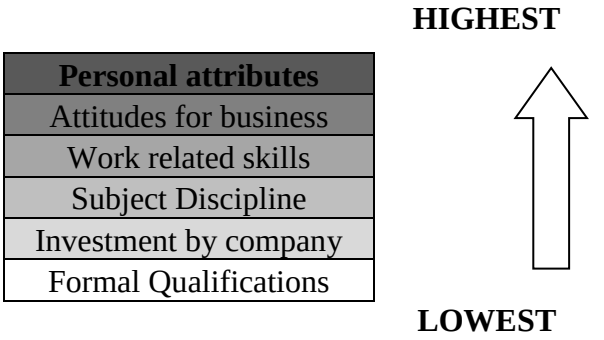

Figure 1 Final ranking of categories of skills and attributes which are considered most important during selection

Personal attributes

Communication skills have been considered to be a combination of personal attributes. However recruiters also considered under 'work related skills' some aspects of communication as evidenced by formal qualifications. There is also a strong correlation with personal attributes which are seen as beneficial to the business (flexibility, adaptability, problem solving, results orientation); with integration (personality, fit); and performance (time management, confidence). The personal attribute which did not appear to have a direct link to other aspects was differentiation – the attributes that made a graduate 'stand out' and explained their decision making process, demonstrating what they could bring to the future role. Recruiters wanted the graduates to demonstrate this from past experience. One interviewee stated that they considered that "A bright, chirpy and cheerful demeanour is helpful, where they are comfortable and happy at work and come there with a clear purpose."

Attitudes for business

Certain personal attributes were deemed to be important for business, namely the ability to communicate, team working and being flexible. The specific 'fit' of attitude has been separately identified as knowledge, skills or behaviours which are expected specifically within a working environment and are actively sought. In some cases this is so important that employers ask candidates to spend a week in the office as a final selection method to see if the 'fit' to the company or team is appropriate. Seeing opportunities for business, having a career focus with realistic expectations and understanding the company were identified, but 'client readiness' was particularly stressed and examples of graduate behaviour at interview which encouraged a candidate to be rejected were given including failure to evidence external facing 'client readiness' for example by inappropriate personal presentation (including items such as jeans and piercings) or having a blasé or arrogant attitude. Personal presentation at the interview was viewed as important "Have they come to the assessment suited and booted? …it doesn't matter where you get your suit from, you can get it from the local charity shop, but there's no excuse for not turning up in a suit. Or smart."

Some specific examples of what recruiters said they looked for included candidates who were 'clued up' about themselves and their subjects; who could look for business opportunities and implement them; would be able to deal with clients over the phone or in person in a professional manner; and most importantly would 'Fit' with the team and with the company ethos as the "Pace of work is much faster. It is about people and engagement". One recruiter particularly looked for graduates who were honest about both their leadership and group working skills "while industry wants some leaders…they don't all want leaders ..[recruits] have to be able to facilitate others."

Work related skills

Work experience is valued both in terms of demonstrating previous track record of attributes required (notably demonstrable work ethic) and particularly if it has relevance to the role applied for which also shows a commitment to the career. There was some sympathy with the plight of graduates in the current economic climate in getting appropriate work experience as one interviewee commented "… poor construction students, I feel so sorry for them, for the students, because all of the recruiters have cut back on their formal placements, ...[these are now] … hard for them to get. Some of .. [the companies].. only do …[placements for]… the people that they are sponsoring now" There was no expectation of RICS/CIOB

competencies at graduate recruitment level, although companies looked for cognate graduates to come from an appropriately accredited course.. Findings indicate that IT skills are now expected of employees as standard and are not specifically verified. Networking skills were seen as "key to getting a good work placement, which in turn may assist them to get a graduate job" and may be linked to perceptions of applicant motivation and tenacity.

Subject Discipline

Subject discipline related topics are largely associated with the expectations of alignment of subject specialism to future role. In the case of cognate degree holders the named disciplines were sought for specified roles. Where non-cognate degree holders were accepted (notably in the Real Estate disciplines) specific skills or attributes linked to their degree subject were targeted which related directly to business specific requirements. Examples given were Law or Economics students or English graduates for their report writing skills. Employers in the Construction sector focussed on identifiable discipline specific skills far more than Real Estate employers. In both Construction and Real Estate, candidates were expected to have knowledge of the industry and some recruiters stated that they were often unpleasantly surprised by the low level of knowledge and understanding of some candidates.

Investment by company

Companies acknowledged that there was a significant investment made in recruiting a new graduate. As such several skills were named as able to be remedied by additional training post recruitment. Indeed early career training could be seen to be expected by most respondents, as employees are largely encouraged to gain professional qualifications. Being keen to learn and develop was linked to this aspect, and two of the interviewees stressed that graduates do not have to be correct all the time. An indication of likely aptitude for further development is gained from reference to applicant track record, with some employers referring not just to degree classification but to A-level or GCSE results. Others saw life experiences as a more important measure of likely future performance. Numeracy is generally not specifically assessed for most roles, historic qualifications (e.g. maths) may also be considered for verification if appropriate and it was seen that numeracy issues could be addressed if perceived as a problem. Written English was seen as the key weakness for many applicants, and this generally led to de-selection at CV stage rather than being addressed by later training.

Recruitment techniques

The large numbers of applicants necessitates sifting of application forms/CVs followed by informing successful candidates that they will pass to the next stage. There may then be a further sift, for example by phone interview, or by a second read of the forms by business managers to decide who to call to interview, or assessment centre where senior managers may become involved. The interview was used to gauge skills which could not be fully assessed by application form or CV but is also seen as more personal and thus assessment of personality fit may override other positive attributes. Differentiation was said to be easier to assess at interview than from a CV or application form. Interviewers say that they attempt to understand the candidate in a deeper way which may include assessment of how a candidate thinks or breaks down thought processes, for example by using hypothetical questions, asking for examples of managing conflict and of being resilient. Assessment centres were commonly used where there were higher numbers of candidates, interviews where candidate numbers were smaller.

This data represents a very small set – so results are indicative rather than generalisable and will need to be confirmed with further research work, however the initial indications are as follows.

KSAOs identified in the work which may be looked for at CV or application form then not assessed further:

- Resilience,
- Specialist IT skills,
- Tenacity,
- Time/self-management.

KSAOs looked for at CV or application form which may then be verified by further selection processes:

- Ability to continue to develop,
- Client readiness,
- Differentiation,
- Team working,
- Work ethic,
- Work experience.

KSAOs identified as not looked for at CV or application form but only during later selection processes:

- Analytical thinking or problem solving,
- Commercial awareness,

- Communication skills - verbal,
- Fit,
- Personality,
- Relevant technical knowledge for their discipline,
- Written skills.

Identifiers used at CV or application form level are useful from an initial filter point of view but the ones verified by two or more methods indicate higher importance. The assessment of 'Client readiness' can be seen to be placed centrally to the selection process. Adaptability and flexibility were commonly excluded, as it was said to be difficult to judge in advance of hiring, as graduates say what they think interviewers want to hear. Figure 2 gives a diagram of which KSAOs are assessed by each selection method.

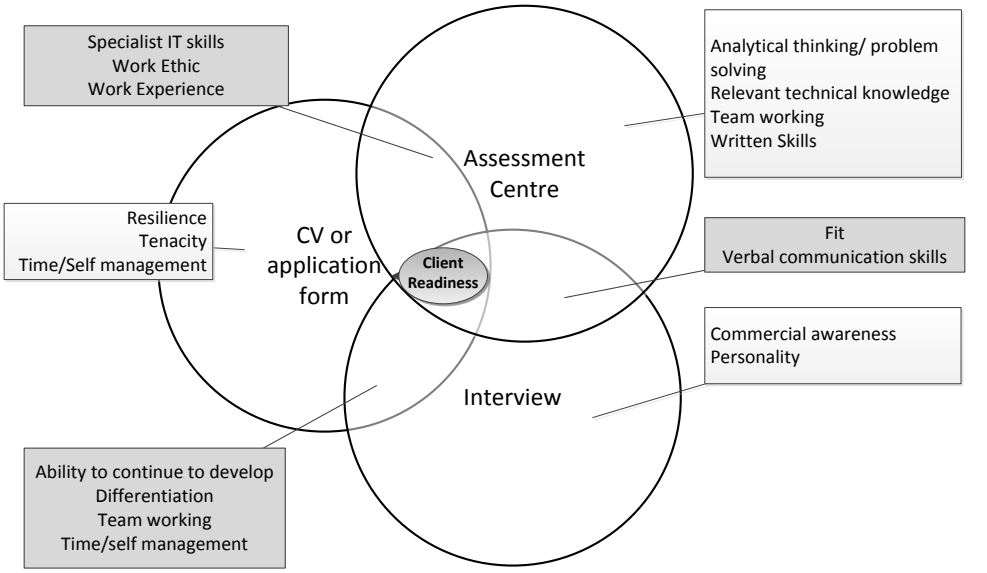

Figure 2 Venn diagram showing where interviewees identify the assessment of applicant skills and attributes may occur (source: Author)

The importance of good performance in all stages of the selection process was summed up by two of the interviewees "An application is really answering the employers question of 'are you worth meeting?' …"an impressive and persuasive CV … bodes well" but [at interview].. "there is still a sense that … [graduates] are owed a job.. they come..[across as].. far too arrogant … and can be quite… disrespectful of the assessment process."

DISCUSSION & CONCLUSION

This initial work focused on the experiences of Sheffield Hallam University Alumni and their employers. The findings were compared to the literature relating to recruitment in general to establish any emerging trends.

KSAOs identified in the literature and in which both questionnaire and interview agreed and rated highly were

- Commercial awareness,
- Verbal communication

KSAOs where the ratings were moderately high in the Questionnaires and Interviews were;

- Achievement/results orientation,
- Literacy/Written communication,
- Personality/positive attitude,
- Planning/organising,
- Problem solving/analytical thinking,
- Time/Self-management.

KSAOs identified in the literature and in which both questionnaire and interview agreed and rated moderate were;

- Customer care/business focus,
- Flexibility/adaptability,
- Resilience,
- Team skills/Teamwork,
- Work experience.

A number of KSAOs were rated moderately low by both sets of respondents;

- Creativity,
- Enterprise skills,
- Numeracy.

Finally the following KSAOs were rated consistently low by both Interviews and questionnaire;

- Emotional Intelligence,
- IT skills,
- RICS / CIOB competencies.

It should be noted that although rated 'low' these skills are not necessarily valueless in employer terms. In terms of emotional intelligence this aspect

was commonly not currently assessed by the techniques used, IT skills were ‘expected’ and therefore not formally assessed and professional body competencies were expected to be gained during early career years. Additionally graduates identified that the alignment of their skills to the business, confidence, flexibility and use of initiative were important which appears to strongly align with the requirement of 'client readiness' highlighted by the recruiters.

Literature stressed the requirements of flexibility and adaptability, the student desire to improve their employability during their time at University, and a perceived lack of linkage between students/employers and HE with reported skills shortages in several areas. The study indicated that while flexibility may be important it was difficult in practice to judge at selection, and therefore other skills were considered to be of greater value for the execution of the selection process. There is no single common view on what constitutes employability generally and there is a measurable (statistically significant) difference in perception between recruiters and graduates regarding the relative values of identified KSAOs.

May be Underestimated by Graduates	
Achievement/results orientation Creativity	Literacy / Written communication Commercial awareness Enterprise skills
May be Overestimated by Graduates	
Emotional Intelligence IT skills (general e.g. MS office) IT skills (specialist e.g. CAD) Numeracy Planning/organising	Problem solving / analytical thinking Resilience RICS / CIOB competencies Team skills/Teamwork Time/Self-management
Graduates and Employers agree on importance (no significant difference)	

More important	**Moderate**	**Lower Importance**
Verbal communication Personality/positive attitude Commercial awareness	Customer care / business focus Work experience	Flexibility/adaptability

Table 3 Summary of differences between KSAOs highlighted by graduates and recruiters

There was also agreement on the importance of interpersonal skills, positivity in outlook and understanding of the industry. The ‘skills’ looked for may not be skills in the purest sense (for example work experience) but

act as evidence for several underlying KSAOs which are deemed desirable (Table 3).

Key points arising from this work are summarised as follows;

Value placed on course;

- Literature states that graduates feel that the difficulty in getting a job is due to deficiencies in their course,
- Qualification alone (grade or institution) is not necessarily a deciding factor in gaining employment,
- Personal and interpersonal skills were valued by recruiters.

Student attributes from outside course;

- Some desirable aspects were difficult to judge during recruitment and selection process,
- Work experience whether relevant or general was valued as an indicator and as evidence of having of several other positive attributes.

Recruitment

- A combination of written and personal interactions were the most commonly used to assess graduates.

Subsequent development;

- There was evidence of the expectation of recruiters to invest in their graduates post recruitment,
- Both specific and generic skills are valued to a lesser, or greater, extent dependent on the role in the company.

This work identified the following themes;

- Literature and recruiters state that skilled graduates are currently in surplus,
- There is little literature on how Built Environment discipline graduate skills and competencies are specifically assessed by the recruitment process,
- Graduates from Built Environment courses generally enter employment within this sector,
- During recession there is enhanced competition for jobs and a commensurate low success rate for applications,
- Different graduate roles require different skills and competencies and knowledge bases, values or other attributes,
- Recruiters expect that graduate employees will be trained further, and will recruit according to specific company requirements,

- The recruitment methods available allow discrimination of different factors between candidates, to aid selection. There is much emphasis on assessing fit, which may account for the favouring of interviews as a key component of the selection process where numbers are low enough to facilitate this,
- RICS competencies are developed post-employment and therefore may not form part of recruitment and selection criteria,
- Graduates are expected to continue to develop. Graduate identity or adaptability may form part of the recruitment requirements,
- Graduates need to understand the industry, and be able to demonstrate this.

Candidate knowledge, skills or attributes particular to the industry role, were identified to understand how graduate recruitment and selection was rationalised and undertaken, and to what extent the graduate skill requirements were met. Recruitment and selection is a complex and personal process which involves the interaction of several individuals within a framework defined by company requirements and ethos, and overlain by the financial climate.

There is no definitive description of 'employability' in the Built Environment disciplines but there is a linkage between identifiable attributes which tend to correlate with success in gaining employment. Recruiters in the Built Environment disciplines try to assess the way in which an applicant would 'fit' into the team, business unit or company. Some of the aspects identified in the literature as desired by the company (for example flexibility and adaptability) are difficult to assess during selection procedure and can only be judged fully when the candidate is in post. Where attributes are difficult to assess, indirect methods are used which include looking at past employment or exam track record.

Further training after employment is expected by employers and graduates especially where a professional qualification is advantageous. In terms of the KSAOs which were identified and the linkages which may be drawn from analysis of the data, Figure 3 shows the linkages of these and their overlap with each other to simplify the key aspects informing recruitment of a built environment graduate.

Students do not necessarily see that the struggle to gain employment is a factor of the difficult economy or personal deficiencies, but believe that the course is somehow letting them down. This is of great importance when considering the levels of student indebtedness resulting from the rise in tuition fees.

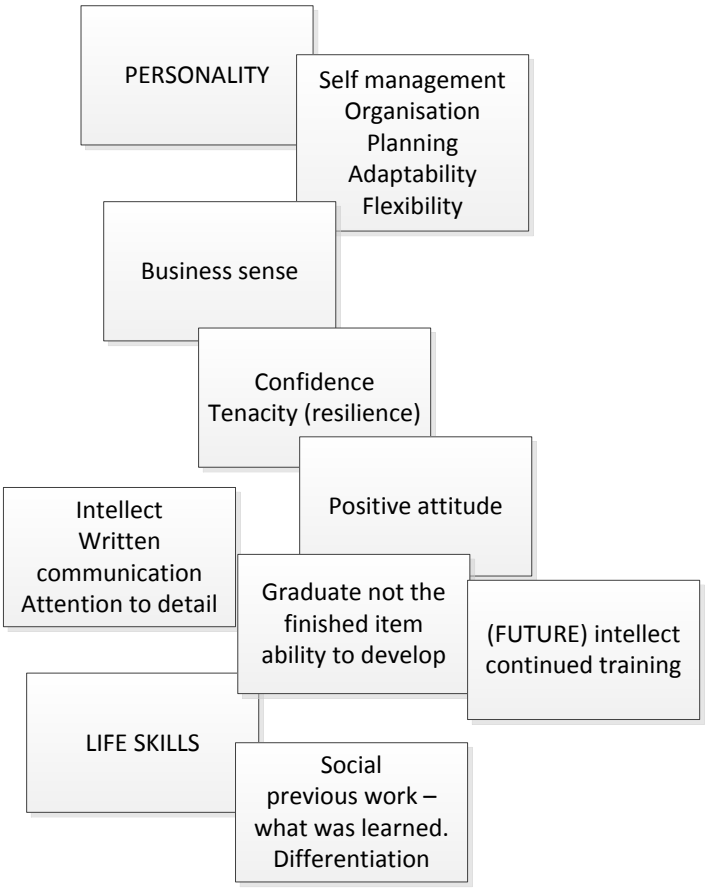

Figure 3. Interrelated skills and attributes (source: Author)

In summary this initial work indicates that the processes of selection utilised by companies within the construction industry does not always target candidate knowledge, skills or attributes particular to the industry role, but seeks an optimal package where deficit in one characteristic may be compensated by another positive aspect. The full picture of the graduate journey towards recruitment is not shown by this initial study, and this would form a useful piece of future work.

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