DEVELOPING A KNOWLEDGE MANAGEMENT FRAMEWORK TO PROMOTE SUSTAINABLE SOCIAL HOUSING REFURBISHMENT PRACTICES

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In the UK, new builds add, at most, 1% per year to existing building stock, representing a microcosm of the total stock. To achieve the government's ambitious carbon emission reduction targets over the next decade the existing stock must therefore be treated as a priority. However, sustainable refurbishment practices remain underdeveloped and relatively limited, particularly within the social housing sector. Despite its recognized capacity for innovation, this sector has not implemented sustainable principles at the core of its refurbishment practices despite changes in public procurement designed to encourage such principles. This is partly because of the limited and ineffective communication of information and knowledge regarding sustainability between social housing practitioners. This paper presents a methodology for developing a framework to improve knowledge management (KM) for social housing practitioners. The framework is focused on facilitating the sharing of sustainability information and knowledge during the undertaking of refurbishment projects. The paper also discusses the preliminary findings of recent research based on semi-structured interviews undertaken on a sample of social housing experts to examine the rationale for refurbishment, procurement strategies, and types of refurbishment projects. The findings identify eight main drivers for refurbishment and five social housing refurbishment (SHR) project types and they reveal that social housing providers use different competitive procurement strategies to achieve sustainable practices.

Keywords: knowledge management, project process, refurbishment, social housing, sustainability.

INTRODUCTION

The construction industry has a central role to play in the delivery of sustainable development within the United Kingdom (UK) since it has many environmental, economic and social impacts. It is estimated that 50% of all UK carbon dioxide emissions (the major greenhouse gas) are related to the lifecycle of the built environment through its development, use and decommissioning (DTI 2007). Until now the UK government strategy, based on encouraging, rather than compelling regulations, has failed to embed sustainability practices throughout the construction industry (Pickvance and Chautard 2006). Although government incentives and recommendations may have implications for all sectors of the industry, most mandatory directives remain focused primarily on the new build sector which contributes, at most, an additional 1% per year to the existing stock. It can therefore

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be argued that the government's target of delivering zero carbon new houses by 2016 only regulates a microcosm of the building stock. The remaining 99% of (existing) buildings are not currently targeted by such compulsory regulations. To achieve the government's targets for carbon emission reduction over the next decade, existing building stock must be refurbished in a sustainable manner. In particular, efforts should be concentrated on the domestic housing sector (for example owner occupiers, social housings, vacant and second home properties and private landlords). This sector accounts for approximately 27% of all UK carbon emissions (OCC 2007).

Although the majority of dwellings are owner-occupied (some 62.2% of all homes in Scotland according to the Scottish Government (2010)), several studies have advocated that the social housing sector has the potential to provide the necessary leadership for sustainable innovation and development for UK refurbishment projects (Carter and Fortune 2008, Egan 1998, Goodchild and Chamberlain 1999). This perception is supported by several observations; not least that social housing organizations such as Local Authorities (LAs) and Registered Social Landlords (RSLs) play a major role in society. Harriott and Matthews (2004) argued that the regeneration of 'poor' neighbourhoods cannot take place if the social housing sector is neglected. Indeed, the manner in which this sector is managed plays a significant role in tackling crime and antisocial behaviour. They further observed that without social housing, households with low incomes would be unable to afford a decent home in the private market and would thus be forced to live in slum housing or in overcrowded conditions. Therefore, promoting sustainable social housing refurbishment (SHR) practices would have a significant impact on society at large. In addition, the social housing sector represents a significant proportion of public procurement and is mainly supported by the UK Government's Sustainable Procurement Action Plan with its objective to be among the European Union's leaders in sustainable procurement for the public sector (Hall and Purchase 2006, SFC 2008).

As a result the procurement method is at the core of a strategy to introduce sustainable practices into the social housing sector. Furthermore, LAs and RSLs are major housing providers across UK. For example, these organizations manage some 594,000 dwellings in Scotland alone; this represents approximately 24.1% of the Scottish housing stock (Scottish Government 2010). Within this stock, 37% of housing units managed by RSLs currently do not meet the Scottish Housing Quality Standard (Scottish Housing Regulator 2009)). As a result, a large portion of the Scottish social housing stock needs to be refurbished to comply with the SHQS's minimum standard. Finally, social housings are provided by non-profit organizations with a shared primary objective to improve the life of their tenants, as opposed to the private sector whose prime aim is to be profitable (Harriot and Matthews 2004: 3). Hence, social housing providers are potentially more likely to invest (if the funding is available) in sustainable solutions and innovations for the benefit of improving the life of tenants.

One of the main contemporary challenges facing the social housing sector and the construction industry is the development of sustainable practices to reduce environmental impacts and to improve the social and economic aspects of refurbishment projects. Although social housing providers have access to an abundance of advice and guidance on how to deliver sustainability in practice (Carter and Fortune 2007); every project is unique in terms of its nature, size or location. The following section discusses some of the current practices and challenges facing social housing projects. As a consequence (and despite having access to a wealth of

information) the contextual nature of the environment leaves social housing providers with the difficult task of having to choose some measures at the expense of others (Carter and Fortune 2007). There is therefore merit in carrying out research to investigate and improve the way that social housing practitioners incorporate sustainability into refurbishment practices (Leblanc *et al.* 2010).

SOCIAL HOUSING: CURRENT PRACTICES AND CHALLENGES

The need for an integrated management tool for sustainable development
It is generally agreed that there is a growing awareness of the concept of sustainability amongst construction practitioners. However, past studies indicate that social housing practitioners still struggle to apply the concept of sustainability in practice (Hall and Purchase 2006). Although there have been some attempts to promote sustainability in construction projects, the implications of such studies for the social housing sector remain limited. One of the major reasons for these limited implications is that there remains a gap between the theory and practice of sustainability in this context. For example, Carter and Fortune (2008) developed a decision support tool for use in sustainable building project procurement designed to help housing association practitioners prioritize and agree on the sustainability requirements of a project at various stages. Despite its relative usefulness the tool is time consuming and its use can catalyse significant changes to existing work practices. As a result, practitioners often recognize the potential of such a tool but remain reluctant to implement it in practice. In order to effectively integrate the sustainability concept into practice, there is a need to develop a tool or system that can form an integral part of the way that professionals in the construction industry currently work (Carrillo *et al.* 2000).

The need to establish a generic project process specific for SHR projects
Throughout the various phases of project processes, sustainability-related decisions are numerous and involve many practitioners. In order to efficiently manage these sustainability-related decisions, it is necessary to understand the project process. Despite the availability of various interpretations of the project process in the construction industry, no 'standard' project process has been accepted as applicable to every project type (Cooper *et al.* 2005). Often, these project processes are specific to a certain type of project or they support the requirements of particular stakeholders (Hughes 1991). Among this variety of project processes there are two recognized models: the Royal Institute of British Architects (RIBA) Plan of Work (RIBA 1997) and the British Property Federation (BPF) manual (1983) Despite their popularity these models have faced criticism of being too general or too specific (Austin *et al.* 2000). In order to overcome these criticisms some researchers have developed alternative project process models. The Process Protocol (Kagioglou *et al.* 2000) is a popularly cited example. This model seeks to represent the diverse interests of all practitioners involved in the process. However, it remains generic and has been criticized for overlooking the complexities of projects. Moreover, concern exists as to its acceptance and usefulness amongst practitioners given its generic nature. It can be said that, until now, the construction industry has failed to establish a generic project process model that is applicable for every type of project. Even if project processes, such as the Process Protocol continue to be developed towards this goal, no universally accepted reference model exists. The problem resides in designing a project process model generic enough to cover every type of construction project and specific enough to be practically applicable in each case. Khalfan *et al.* (2002) have since added a sustainability management activities zone (SMAZ) to the Process

Protocol as part of the EPSRC sponsored C-SAND project. This modification, despite being a useful addition to the model has received similar criticism to the original model. There is therefore a requirement to develop a project process model that reflects SHR practices. This project process must be recognized and understood by social housing practitioners and must form the basis to incorporate sustainability guidance into practice.

The need to facilitate access to and communication of sustainability information and knowledge amongst practitioners

Providing sustainability-related guidance at each project stage may help practitioners better identify and consider sustainability issues at the project level. Yet such guidance does not facilitate the search for relevant sustainability information and knowledge to assist in the decision making process. To bridge the gap, a system for the effective communication of information and knowledge required for sustainability activities must be designed and implemented. Ineffective communication in construction projects as a consequence of the fragmentation of the industry comprising various project parties from different backgrounds has been recognized as a major obstacle to the exchange of sustainability information and knowledge (Sommerville *et al.* 2004). As a result, there is a need to improve the way that social housing practitioners access, store and communicate sustainability-related information and knowledge which will then lead to improved sustainable refurbishment practices.
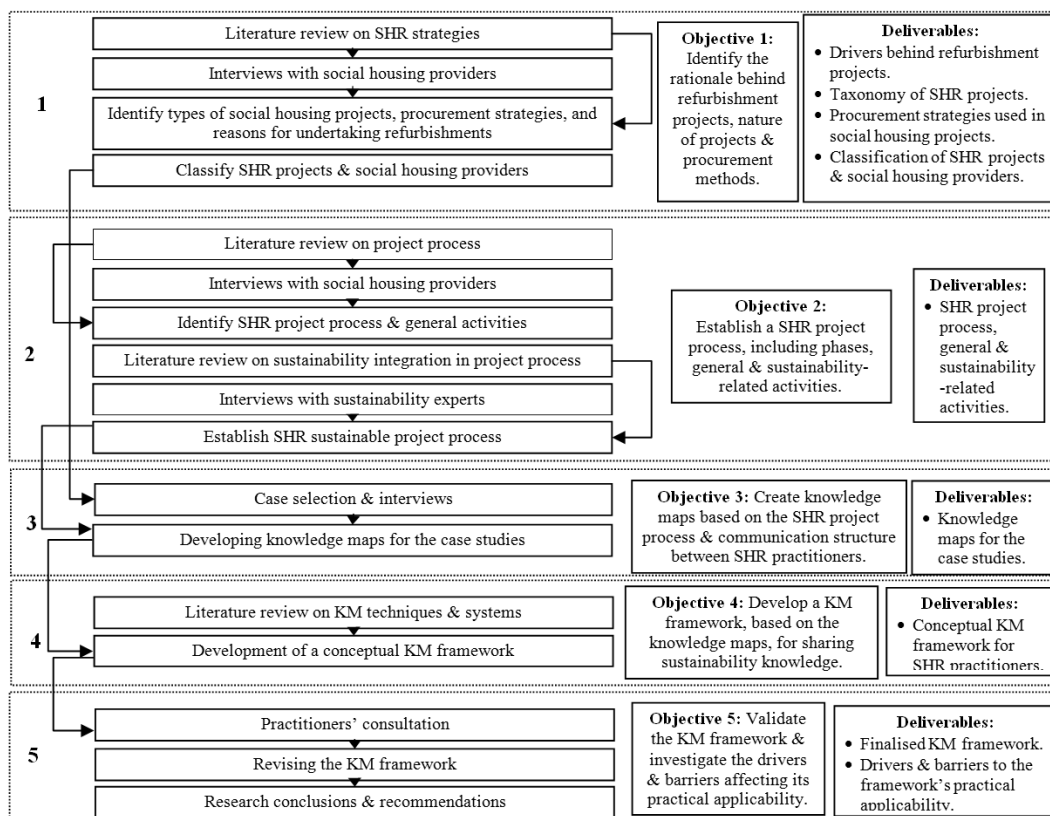

Figure 1: Research design, objectives and deliverables

DEVELOPING A KM FRAMEWORK

In view of the requirement to improve the communication of sustainability information and knowledge the development of a generic social housing project process detailing all specific SHR project phases and related activities merits attention. Such a project process would provide the basis for the development of a

KM framework to improve the sharing of sustainability-related information and knowledge between social housing practitioners. The methodology to develop the proposed KM framework is structured into five phases: exploring SHR practices (1), investigating SHR project process (2), mapping SHR project knowledge flow (3), improving the management of sustainability knowledge (4) and improving the KM framework's practical applicability (5) (Figure 1). The rationale behind each phase and the activities involved are explained in this section. It should be noted that although the focus of the proposed framework is Scottish social housing providers, the methodology presented herein may be replicated and applied to other UK regions and abroad.

Phase 1: Exploring the SHR practices
In Scotland, a large number of RSLs and local authorities manage the social housing stock and across these are a number of different refurbishment projects, representing a large number of refurbishment strategies. In order to effectively improve SHR practices, it is important to gain a greater baseline understanding of the sector's structure and to identify social housing providers and the types of refurbishment projects they manage.

During this phase, a comprehensive literature review is necessary to acquire information on the practices and strategies generally employed by social housing providers. This should be followed by a series of interviews with the Scottish providers to obtain information on: 1) the drivers for refurbishing properties and the procurement strategies used; 2) the main categories of refurbishment projects; and 3) the actual practices based on refurbishment projects undertaken within the last two years. Findings from the literature review and interviews would provide an improved understanding of the current strategies and practices of SHR providers. A table linking refurbishment projects and social housing providers can also be constructed, revealing the landscape within which the variations in SHR projects are delivered.

Preliminary findings
8 social housing practitioners were selected for interview based on their knowledge and expertise of the research topic. 5 interviewees (numbers 2, 3, 4, 5 and 6) were involved in Glasgow local housing forums which aim to facilitate local engagement between housing providers and other professionals in relation to strategic housing planning and other associated community matters. 3 interviewees (number 1, 7 and 8) were employed by Glasgow Housing Association (GHA). Interviews were structured around a series of open ended questions to allow interviewees to posit unprompted arguments and opinions. The interviews were tape recorded and transcribed before being analysed using a grounded theory approach (Strauss and Corbin 1990). The grounded theory method consisted of reducing raw data into codes and concepts designed to stand for categories in an emergent manner (Hari *et al.* 2005).

- Drivers for refurbishment: The findings suggest that the main motivations of social housing providers to refurbish properties are to provide good quality social housing and to maintain stock in good condition to extend the life span of domiciles. Social housing organizations also refurbish stock to bring it up to a modern standard (minimum SHQS). These findings align with the principle aim of social housing, which is to provide decent accommodation at a lower price than in the private sector (Harriott and Matthews 2004). Pressure from long waiting lists and loss of income from vacant properties are two of the reasons provided for refurbishing void properties. A further driver behind

Table 1: Drivers for refurbishment cited by the interviewees

Drivers for refurbishment	Interviewees								Total
	1	2	3	4	5	6	7	8	
Providing good quality social housing	X	X	X			X			4
Maintaining the stock in good condition to extend its life		X				X	X	X	4
Bringing houses to a modern quality standard (minimum SHQS)	X	X		X					3
Void properties related issues			X			X			2
Good alternative to new build		X							1
Protect city heritage					X				1
Lack of money for new build							X		1

the refurbishment of occupied properties is to offer new build quality while preserving city heritage. Finally, the findings suggest that there are economic drivers for refurbishing properties since some social housing providers do not have sufficient funds to build new housing units. Table 1 summarizes the drivers for refurbishment cited by the interviewees.

- Procurement strategies: The findings suggest that SHR projects are generally procured in a competitive manner and that variations in the competitive procurement strategies exist. Interviewee 2 stated that social housing providers call for bids for every major project and tend to agree to longer contracts for cyclical refurbishment projects. In addition interviewees 1 and 7 observed that some social housing organizations procure their projects once every four years. This suggests that the length of refurbishment contracts varies according to the social housing provider and the type of project. The KM framework should therefore be able to reflect variations in the across competitive procurement strategies and the type of refurbishment project undertaken. Moreover the competitive procurement strategies used by a majority of social housing providers for their refurbishment works can be criticized for maintaining a strong focus on price which is only sustainable criterion. Therefore social housing providers should develop sustainable competitive procurement strategies for refurbishment works based on the UK Government's Sustainable Procurement Action Plan (Hall and Purchase 2006). Further investigation of a larger sample would be useful to validate these findings and to identify the various procurement strategies used by social housing providers.

- Classification of refurbishment projects: The majority of interviewees (6 out of 8) cited two categories of refurbishment project; internal and external works. These two categories are by their nature very broad and cover a range of works. External works include re-cladding, windows, roofing and gutter work inter alia. Internal refurbishment projects concern all the work undertaken inside a property such as re-wiring, renewing bathrooms and kitchens amongst others. Interviewee 5 also cited the adaptation of properties to accommodate special needs tenants as an internal work. Half of the interviewees cited environmental work as a type of refurbishment project. Such works include the grounds, paths, bin storages, benches, shelters, garden fences and gates. Three interviewees identified the conversion of properties as legitimate refurbishment projects. Conversion projects concern non habitable properties converted into social housing. Finally, two out of eight interviewees cited the structural and fundamental type of refurbishment projects. This category refers to the refurbishment of properties in the advanced stages of decline. The

Table 2: Main categories of refurbishment projects cited by the interviewees

| Refurbishment projects | Interviewees | | | | | | | | Total |
	1	2	3	4	5	6	7	8	
Internal	X	X	X		X	X		X	6
External	X	X	X		X	X		X	6
Environmental	X		X			X		X	4
Conversion	X	X	X						3
Structural/fundamental		X			X				2

five main categories of refurbishment projects cited by the interviewees are illustrated in Table 2.

Phase 2: Investigating the SHR project process

The broad coverage and complexity of the sustainability concept makes it difficult to apply in practice. As Hall and Purchase (2006) suggest, the majority of social housing providers are aware of sustainability policies but continue to struggle with the application of such policies to work practices. One of the reasons for this may be that ensuring the sustainability of a project is a complex task which often requires additional work. Moreover, there is currently no formal guidance available to ensure that sustainability is considered at every step of the refurbishment process. The literature review reveals no generic refurbishment process for social housing which defines in detail the associated project phases and their activities. Hence, there is a need to investigate the existing SHR practices and develop a generic process, which can then be used as a base to provide appropriate guidance on how to incorporate sustainability at every project phase according to the activities involved.

This phase should begin with a literature review of the existing project process models in order to understand their similarities and differences. Interviews with social housing practitioners should be undertaken to identify the typical phases and related activities of SHR projects. The literature review and interviews would enable the establishment of a generic process that is generally used by SHR practitioners. Next, a literature review on sustainability best practices must be conducted to identify the sustainability-related activities in typical construction projects, followed by a series of interviews with sustainability experts to portray the activities specific to SHR projects. Findings from the literature review and the interviews would help inform the development of a social housing sustainable refurbishment process.

Phase 3: Mapping the SHR project knowledge flow

Effective communication of information and knowledge among social housing practitioners is key to successfully implementing sustainability in practice. Sustainability-related knowledge can be explicit (codified and digitized in books, documents, reports, white papers, spreadsheets, memos and databases) and tacit (personal, context specific and therefore hard to formalize and communicate) (Awad and Ghaziri 2003). The manner in which social housing practitioners manage such knowledge within their projects is currently unknown. There is therefore an opportunity to investigate the communication structure and the nature of the knowledge exchanged amongst social housing practitioners.

Knowledge mapping is a technique often used by multinational organizations to understand where knowledge resides in their organizations and to understand the nature of its transfer between those who hold it (Thomson *et al.* 2009). In this research context, the knowledge mapping technique provides the basis to understand the flow of information and knowledge between SHR practitioners. Case projects can

be selected from the information obtained in Phase 1 in order to investigate the flow of sustainability-related knowledge between social housing practitioners and to develop knowledge maps. These knowledge maps can be developed based on the social housing sustainable refurbishment process established in Phase 2.

Phase 4: Improving the management of sustainability-related knowledge
The knowledge maps developed in Phase 3 illustrate the flow of knowledge between SHR practitioners during sustainability-related activities. The next step is therefore to improve this knowledge flow by providing appropriate advice and guidance to social housing practitioners. There is also a need to capture this knowledge in order to be able to reuse it for other projects.

A literature review on the existing KM studies would therefore help to identify the appropriate KM techniques and tools for social housing practitioners. The literature review findings and the knowledge maps would provide a base to develop a KM framework for sharing sustainability-related knowledge during SHR project process. The framework provides advice and recommendations to practitioners on where to access and how to communicate sustainability-related knowledge during the sustainable refurbishment project process. The framework will also store and make sustainability-related knowledge re-accessible for exchange and use during a refurbishment project.

Phase 5: Improving the KM framework's practical applicability
This phase validates the practical applicability of the conceptual KM framework. A select number of social housing practitioners participating in this research should be invited to attend a series of professional workshops to obtain their opinions and suggestions regarding the applicability of the framework in practice. Based on their feedback, the conceptual framework should be revised, and the research conclusions and recommendations drawn

CONCLUSIONS

This paper argues that the successful integration of sustainability into SHR practices relies on the effective communication and management of relevant information and knowledge. An approach for the development of a KM framework that can facilitate and improve the sharing of sustainability-related knowledge between social housing practitioners has been presented. Preliminary findings from the first phase of the framework development have also been discussed. The proposed framework offers guidance and advice on how to access, store, and share sustainability-related information between social housing practitioners. The improved management of such knowledge can help social housing organizations to define effective long-term sustainable refurbishment strategies and establish project priorities. Such an improvement will also help to improve the development of sustainable specifications at the project level.

It is acknowledged that several challenges to the successful implementation of the proposed framework exist. First, as is the case with any new system, the framework must be integrated into practice. The challenge is to convince practitioners of the usefulness of the framework. Second, the information shared must be reliable and useful to other practitioners involved. Practitioners must be able to trust sources and to correctly interpret the information and knowledge presented. Thirdly, the difficult and specific nature of refurbishment projects complicates the type of information and

knowledge to be shared (Egbu 1999). Therefore it is crucial to efficiently structure and organize the knowledge to be shared between practitioners.

The successful implementation of the proposed KM framework may not necessarily guarantee the immediate establishment of sustainable refurbishment practices. This is partly because current limited government funding for refurbishment works means that social housing providers must rely on rent and private funding as primary income sources. Such limited support has a strong impact on several important aspects, such as innovations and their diffusion, use of new technologies and research related to sustainable solutions. The complex problem of sustainable development apparently does not possess one unique solution. However, the improvement of sustainability-related knowledge sharing between stakeholders is considered a significant part of the equation.

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