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The Role of Knowledge Management in Urban Sustainability Assessment

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ABSTRACT

Urban sustainability assessment is increasingly being seen not just as a technical process to determine the likely sustainability performance of build projects but as a valuable tool in the mediation between the many associated stakeholders with their differing visions, numerous requirements and variations in expertise. This emerging role presents new and considerable challenges for the management of knowledge – during its generation, flow and capture - to ensure the meaningful engagement of such stakeholders in the decision-making process.

This paper explores the role of knowledge management in aiding the delivery of urban sustainability assessment within development projects with multiple stakeholders. Outlined is an approach taken by the SUE- MoT research consortium in the development of a knowledge management system incorporated to supplement the practical application of a planned integrated sustainability assessment toolkit (ISAT). The system aims to deliver a knowledge support system (codification strategy) provided through an ICT resource for capturing, storing and transferring explicit and tacit knowledge generated during assessment. This will be integrated with a personalisation strategy developed to promote the necessary discourse between stakeholders deemed necessary to facilitate the transfer of knowledge required for assessment to function as a tool for mediation and 'social' learning. The integration of these strategies forms the basis for a wider knowledge management system that will be supplemented by a framework for managing sustainability assessment. A series of knowledge maps are to be developed to provide the foundations for understanding the contextual nature of the knowledge flow between stakeholders during assessment. This forms the basis for the development of the mechanisms provided through the system for stimulating knowledge transfer and to ensure the effective mediation of their varying priorities. The paper argues that only by engaging with the contextual nature of this flow, can effective stakeholder engagement during the decision-making process become achievable.

Key words: Knowledge Management, Sustainability Assessment, Knowledge Support System, Stakeholder Engagement, ISAT

1 INTRODUCTION

Familiarity with the concept of sustainability has increased markedly over recent years following its emergence through the Brundtland Commission (WCED, 1987), and at numerous world summits (United Nations, 1992, 2002). The urban built environment is increasingly recognised as a context of significance within which to focus attempts to implement the principles of sustainability both in terms of the processes and practices of its development. In order to achieve this, the likes of Mitchell et al. (1995) have called for the development of systems to measure, assess and monitor sustainability, so that decision and policy-makers can be regularly informed of progress towards achieving their stated goals.

An appreciation in recent years of the co-evolutionary nature of the concept of sustainability, where the environmental, economic and social aspects of development are complementary to each other, has resulted in a move away from thinking of it as purely a concept relating to conservation (Deakin et al., 2002a). Devuyst (1999) argued that the integration of these three aspects formed one of the top priorities of sustainable development, and advocated that this should be reflected in the development of sustainability assessment and its methodologies. Increasingly, such calls have been supplemented by concern for the current lack of integration between assessment and the decision-making processes at all stages of the lifecycle and scales of urban development (Lee, 2005).

Kaatz et al. (2006) argues that only when sustainability is considered an integrative concept for all of the building process, and not as an element of it, can both the concept and its implications begin to be understood. Deakin et al. (2002b) argues that whilst this is appreciated, the lack of a common framework and language within which to consider and assess sustainability has restricted the ability of practitioners to successfully interact with it through assessment. The high levels of complexity and relative nature of the concept has resulted in no one assessment tool being found or developed that is sufficiently inclusive, holistic, multidimensional and capable of addressing the environmental, economic and social issues that are core to the concept of sustainability (Brandon et al. (1997)). However, Devuyst (1999) has called for the development of such a tool, providing a truly integrated assessment of sustainability in building projects, although Bentivegina et al. (2002) argues that this remains at least 10 years away. It is apparent that whilst the achievement of a truly integrated technical assessment of sustainability is seen by many as the ‘holy grail’, there is a need to provide a bridge between this long term aspiration and the concerns of developing a useable approach to assessment for practitioners to aid the delivery of sustainability within current development projects (Lee, 2005).

Debates regarding the development of such an integrated approach have highlighted the value in considering its evolution from a purely technical process, and to move towards its consideration as a mechanism for mediating between and involving stakeholders in the decision-making process. Lutzkendorf and Lorenz (2006) argue that sustainability assessment should

be considered as a proactive tool for instilling sustainability into decision-making, by promoting discourse between stakeholders around the principles and implications of sustainability, as opposed to purely a reactive technical process. Kaatz et al. (2006) argues that achieving stakeholder engagement in the decision-making process provides the opportunity for a shared understanding of sustainability to be developed and applied to the contextual requirements of the building project. The potential exists for such an approach to increase the practitioners understanding of sustainability both conceptually and of its implications, and therefore aid the development of a framework and language within which sustainability can be commonly addressed (Deakin et al., 2002b). However, in developing such an approach, recognition is required of the potential role played by knowledge management strategies in aiding the facilitation of the knowledge transfer necessary for achieving the desired environment for mediation and 'social learning' between stakeholders during assessment.

The SUE- MoT (Sustainable Urban Environment- Metrics, Models and Toolkits) research consortium has set out to develop a comprehensive and transparent framework that encourages key decision-makers to systematically assess the sustainability of urban developments taking into account scale, lifecycle, location, context and stakeholder values. Central to the research program is the development of an integrated sustainability assessment toolkit (ISAT) that is reflective of the requirement to integrate the environmental, economic and social dimensions of sustainability during assessment. The ISAT represents a toolkit for aiding in the selection of tools appropriate to the scale, lifecycle, location, context of the development project and to integrate their outputs where appropriate in a meaningful manner. It is placed at the heart of knowledge management system, setting out a structure that aids the engagement of stakeholders throughout, thus promoting the flow of knowledge and discourse between them during assessment. The ISAT plans to provide a framework for sustainability assessment within which tools can be considered, and added to when they are developed.

In response, this paper highlights the main findings from the scoping phase of the research and outlines the significance of placing the application of the toolkit, within a wider knowledge management system. Building on the above discussion, the paper will discuss knowledge management, its role in the assessment context and outline the requirements for developing a suitable knowledge management system, prior to presenting the approach proposed for the development of the ISAT.

2 ROLE OF KNOWLEDGE MANAGEMENT IN AN ASSESSMENT CONTEXT

Egbu and Botterill (2002) interpreted knowledge management as the 'processes by which knowledge is created, acquired, communicated, shared, applied, and effectively utilised and managed, in order to meet existing and emerging needs, to identify and exploit existing and acquiring knowledge assets'. Sanchez et al. (1996) argues that in order to understand the function of knowledge management it is necessary to distinguish the terms data,

information and knowledge. Data is understood as representing decontextualised facts and figures (Vestal, 2005); information as organised or contextualised data (Vestal, 2005); and knowledge as adding value to the information by providing selectivity and judgement to its use (Sanchez et al., 1996). Egbu and Botterill (2002) interpreted Sanchez et al.'s understanding of knowledge, as originating and existing within the minds of the individual, consisting of truths, beliefs about causal relationships held by individuals within a group. In addition, it is recognised that organisations or groups hold knowledge that exists in varying forms, and that it is understood by more than one individual (Egbu, 2004). Matsumoto (2005) stressed that the primary means of developing knowledge was through its acquisition over time through experience. However, Kasvi et al. (2003) was critical of project-based environments for allowing knowledge to become fragmented and lost for learning, due to the failure to achieve the management of the capture, storage and transfer of the knowledge generated.

Fong (2003) and Kasvi et al. (2003) identified the construction project environment as presenting limitations on the natural processes of accumulating and transferring knowledge, due to its unique one-off, temporal, multi-party, multi-disciplinary nature. The limitations of this environment are problematic for sustainability assessment given that it represents its predominant context for implementation. This is a situation complicated by the high degree of uncertainty regarding both its conceptual foundations and practical implications, due to a general lack of experience and poor knowledge base regarding assessment tools, methodologies and the absence of a recognisable framework within which it operates. Slater and Gann (2003) identified that developing the knowledge base of a team was essential to their ability to successfully solve problems as they arise. Given this rational, it is possible to suggest that through the development of an individual's level of experience of both the concept of sustainability in practice and through involvement in its assessment, they will improve in their ability to understand and interact with its practical implications during decision-making. Forgber et al. (1997) argued that by developing sustainability assessment in a manner that increased participation compromised the ability of the design team to manage their knowledge due to the pressures placed on already complex and demanding communication pathways. The approaches advocated by the likes of Kaatz et al. (2006) depend heavily on these pathways, as they represent the channels of discourse necessary between the stakeholders to facilitate the mediation of their views and positions. Wilkins (2003) argued that the quality of discourse between stakeholders has a significant baring on the promotion of 'social learning' regarding sustainability and its implications, which he observed as occurring as a consequence of both participation and the exchange of experiences between stakeholders during assessment. It is clear that knowledge management has a role to play in the development of approaches that focus on achieving either of these goals, as they are dependent on the facilitation of the flow of knowledge between individuals, in order to achieve its effective transfer.

3 DEVELOPING A KNOWLEDGE MANAGEMENT SYSTEM FOR SUSTAINABILITY ASSESSMENT

Egbu (2004) observed that over the past decade, multi- nationals have invested considerable sums developing knowledge management systems, so they can interact with the complexity and range of considerations involved in managing knowledge. Kasvi et al. (2003) identified that in developing any knowledge management system, it should be based upon two basic strategies, personalisation strategy (where knowledge is seen as tied to those who develop it and is shared through personal interaction) and a codification strategy (based on the codification of knowledge and storing it in artefacts and databases where it can be accessed). Understanding the distinctions between these strategies provides the basis within this research, for developing a knowledge management system that can aid the delivery of the approach set out by the SUE-MoT consortium.

Stakeholder engagement is a mechanism by which a personalisation strategy in line with Kasvi et al.'s (2003) understanding can be delivered. Through the development of mechanisms for encouraging discourse between stakeholders, it is possible to argue that these represent the pathways and channels sought by Kasvi et al. (2003) to enable the transfer of knowledge held by an individual and transferred to others. The practice of 'social learning' described by Wilkins (2003) is dependent on the effective nature of this transfer. However, it is felt that through discourse, individuals become exposed to the experience held by other stakeholders regarding sustainability and its assessment, in addition to sharing together the experiences encountered during an assessment. Such an understanding aligns itself with Shelbourn et al.'s (2006) understanding of the subjectivist approach to knowledge management, where knowledge is identified as linked to human experience and the social practice of 'knowing'. Given the subjective nature and predictive inaccuracy of the outputs of many assessment tools (Wilkins, 2003), facilitating discourse between stakeholders has the potential to create an environment within which trade-offs regarding sustainability can be made in a transparent and context reflective manner. As a consequence, in developing a knowledge management system reflective of this context, there is a need to provide mechanisms that facilitate the access and participation of stakeholders in the channels of discourse regarding sustainability, its assessment and its practical implications, in addition to maximising the transfer of knowledge between individuals during it.

Due to the current levels of uncertainty and lack of experience of sustainability assessment, it is necessary to supplement this through the development of a knowledge support system that can capture the experience and expertise developed by individuals during assessment, in order that it can assist those involved in future assessments. Such a system aims to address the need for a codification strategy to knowledge management identified by Kasvi et al. (2003). Such a resource provides an environment which can aid collective learning, without the need for individuals to actively engage in channels of discourse with those holding it. The transient nature of the project environment has created a need for a resource that can capture an individual's knowledge and experience, so it can be drawn upon when they are no longer involved in or part of the discourse surrounding the assessment.

Wong (2003) identified Information and Communication Technology (ICT) as the indisputable enabler for implementing such a knowledge support system, as it offers 'rapid search, access and retrieval of information, and can support collaboration and communication pathways'. Shelbourn et al. (2006) was critical of current approaches using ICT systems, for taking a purely objectivist approach, and consequently ignoring the subjective dimension of knowledge. Knowledge is recognised to exist in two principle forms; explicit which is documented and public, structured, fixed-content, externalised and conscious (Duffy, 2000 cited by Egbu, 2004), and tacit which is personal knowledge used by individuals to perform their work and to make sense of the world (Mohamed et al., 2006) that is informal and difficult to communicate. Egbu and Botterill (2002) were critical of a failure in current ICT approaches to interact with the tacit knowledge that reflects the situation and context within which it is found. Although, explicit knowledge such as assessment outputs and associated documentation proves useful, it is the tacit knowledge connected to the experience gained during the selection, implementation and interpretation of particular tools when placed within the context that they existed, that will prove valuable for aiding the levels of uncertainty during future assessments. Mechanisms aimed at the facilitation of both forms of knowledge require to be considered in the development of a knowledge support system.

Within, this paper resistance was placed on calling the knowledge support system as it was interpreted, a knowledge management system, as only by developing it in tandem with the stakeholder engagement mechanisms, can it be truly regarded as an approach to knowledge management. The development of a wider knowledge management system reflective of this would rely heavily on the integration between the codification and personalisation strategies outlined by Kasvi et al. (2003), with many of the mechanisms designed to facilitate the discourse between individuals, interlinking with the capture and transfer mechanisms required to enable the knowledge support system's delivery through ICT to function. Kasvi et al. (2003) argued that the failures of many approaches to knowledge management were rooted in the inability to effectively combine the development of a codification strategy with that of a personalisation strategy, during the development and delivery of a knowledge management system. Cushman et al. (2002) agreed with this, and called for knowledge management systems to be developed to reflect a constructionist approach, 'where subjectivist and objectivist approaches are interlocked in a reciprocal social relationship' (Schultze, 2000).

4 DEVELOPING A KNOWLEDGE MANAGEMENT SYSTEM SUPPORTIVE OF THE ISAT

This research aims to develop a knowledge management system that delivers the functionality to enable those using ISAT during a sustainability assessment, to access and transfer the knowledge and experience of others, whether they be a part of the same project (i.e. through discourse, or the knowledge support system) or part of a previous project (i.e. through the

knowledge support system). Given that the toolkit is to be developed as an ICT application, it is sensible for the knowledge management system to be presented and managed through the same ICT system. The research will focus on the development of the ISAT (with the approach outlined in El-Haram et al., 2007) aimed at displaying to the user the functionality of both the toolkit and the knowledge management system within an integrated platform. In order to develop a system that is meaningful, there is a requirement to ensure that both elements are developed sufficiently to reflect the contextual nature of the assessment. Through the research an understanding will be established regarding where the knowledge during an assessment resides, its nature and requirements for ensuring its flow. The nature of this understanding will provide the basis for developing mechanisms to facilitate stakeholder engagement in order to promote the appropriate channels for discourse (personalisation strategy), and to develop the capture, storage and transfer mechanisms required for the knowledge support system (codification strategy), delivered through an integrated ICT system that reflects the needs of the individuals involved and the context under assessment.

4.1 Knowledge mapping

Knowledge mapping is a technique that has been adopted in knowledge management to achieve such an understanding, and has been used by multi-nationals commonly to understand where knowledge resides within their organisations, and the nature of its transfer between those who hold it (Vestal, 2005). When applied to this context, the adoption of this technique has potential to provide the basis for understanding the knowledge relating to both sustainability and its assessment, currently held by individual stakeholders involved during assessment. This will allow an appreciation to be developed of both the traditional and optimal mechanisms by which knowledge is transferred between them within an assessment context. The research acknowledges the variety of contexts within which sustainability assessment can be applied (i.e. variations in lifecycle, scale, etc), and identifies that in order to reflect these variations a series of knowledge maps are required to be produced. The generation of the knowledge maps provide an understanding of who is involved during an assessment, what their role is within it, what knowledge they bring, what knowledge they require, its preferred method of transfer, and the nature of the relationship between them. A number of techniques are considered during the knowledge mapping process with qualitative interviews with those traditionally involved in sustainability assessment forming its basis. In addition, techniques such as social network analysis (SNA) or organisational network analysis (ONA) (Vestal, 2005) are considered to try to understand the nature of the relationship between the different stakeholders. It is expected that this will aid in the development of appropriate mechanisms for the facilitation of their knowledge needs during assessment, and in the development of the interface for the knowledge management system.

4.2 Developing a sustainability assessment management framework

Understanding the nature of the context within which the ISAT is to be applied, is important given the variations in both the assessment tools applicable and the stakeholders involved at the different phases of the development lifecycle. These are considerations that require to be reflected in the knowledge management system, in order to replicate the contextual nature of the knowledge requirements of those involved. The SUE-MoT consortium is of the opinion that the contextual variations in implementing individual assessments at a variety of different phases in the development lifecycle, are better understood and delivered if they are considered within a wider sustainability assessment management framework, similar to approaches taken by the C-SAND research consortium in the development of their Sustainability Process Protocol Framework (Khalfan et al., 2002). By adopting such an approach, sustainability is then viewed as a concept that requires both consideration and management throughout the different phases of the development lifecycle, and thus allows for the individual assessment to be structured and considered within this wider management framework. In presenting the user of the ISAT with a framework advocating the management of sustainability throughout the development lifecycle, and identifying the process of managing this in relation to recognisable phases of design and construction, it is hoped that this will aid in the education and encouragement of the adoption of such an approach in practice. The provision of this framework provides the opportunity to generate knowledge maps that are reflective of the nature of assessments implemented during the different phases of the development lifecycle.

The research will develop a management protocol for managing sustainability assessment within development projects, by identifying the application of ISAT during its implementation at individual assessment points and to consider these within the framework of an overall assessment. Table 1, displays a broad outline of the protocol as it stands, and illustrates it as being developed along recognisable project lifecycle phases (i.e. planning, design, construction, facilities management, decommissioning). The planning and design phases have been broken down to reflect those of the RIBA plan of work phases (RIBA, 1999). These phases were selected in place of those of the Process Protocol (Aouad et al., 1998) used in the C-SAND sustainability framework (Shelbourn et al. (2006). Following consultation with practitioners, the RIBA was identified to display greater levels of familiarity in the U.K. context. This is particularly relevant when trying to reduce the levels of uncertainty potentially caused through the application of the ISAT due to its novelty.

Table 1: SUE-MoT's sustainability assessment protocol

Phases		SUE-MoT's sustainability assessment protocol
Planning and Design	**Inception**	Develop a sustainability vision for the project Establish and define sustainable project goals Identify relevant sustainability issues Set sustainability goals and issues priorities based on context
	Feasibility	Review sustainability priorities Review sustainability issues and goals and set sustainable targets Develop and implement procedures to monitor/ record sustainable targets Identify the certification and testing measures for sustainability assessment you will require Review all existing sustainability directives and policies to ensure compliance
	Outline proposals	Re- evaluate sustainability targets required to meet project goals Create a plan to achieve sustainable goals, coordinate with project work plan Assess need for a preliminary sustainability assessment
	Scheme design	Implement sustainability action plan in the schematic design Implement preliminary sustainability assessment
	Detailed design	Continue and evaluate sustainability action plan Monitor and ensure that sustainability objectives and targets are maintained Conduct detailed sustainability assessment
Construction		Continue and evaluate sustainability action plan Monitor compliance with sustainability goals/ targets
		Assess to ensure that sustainability features are constructed and installed
		Assess sustainability of completed building
Facilities management		Continue and evaluate sustainability action plan
		Monitor compliance with sustainability goals/ targets Implement systems to monitor sustainability performance during occupation and post- occupation
Decommissioning		Monitor compliance with sustainability goals/ targets
		Continue and evaluate sustainability action plan

5 SUE-MoT'S APPROACH TO DELIVERING A KNOWLEDGE MANAGEMENT SYSTEM SUPPORTIVE OF THE ISAT

Figure 1 provides a schemata for the development of the discussed approach, incorporating the features of the ISAT (outlined in El-Haram et al., 2007), and its integration with the components of the knowledge management system, structured to reflect the phases of the sustainability assessment protocol. Developing the ISAT around this structure aims to assist the user of the system in the delivery of sustainability assessment over a development project's lifecycle.

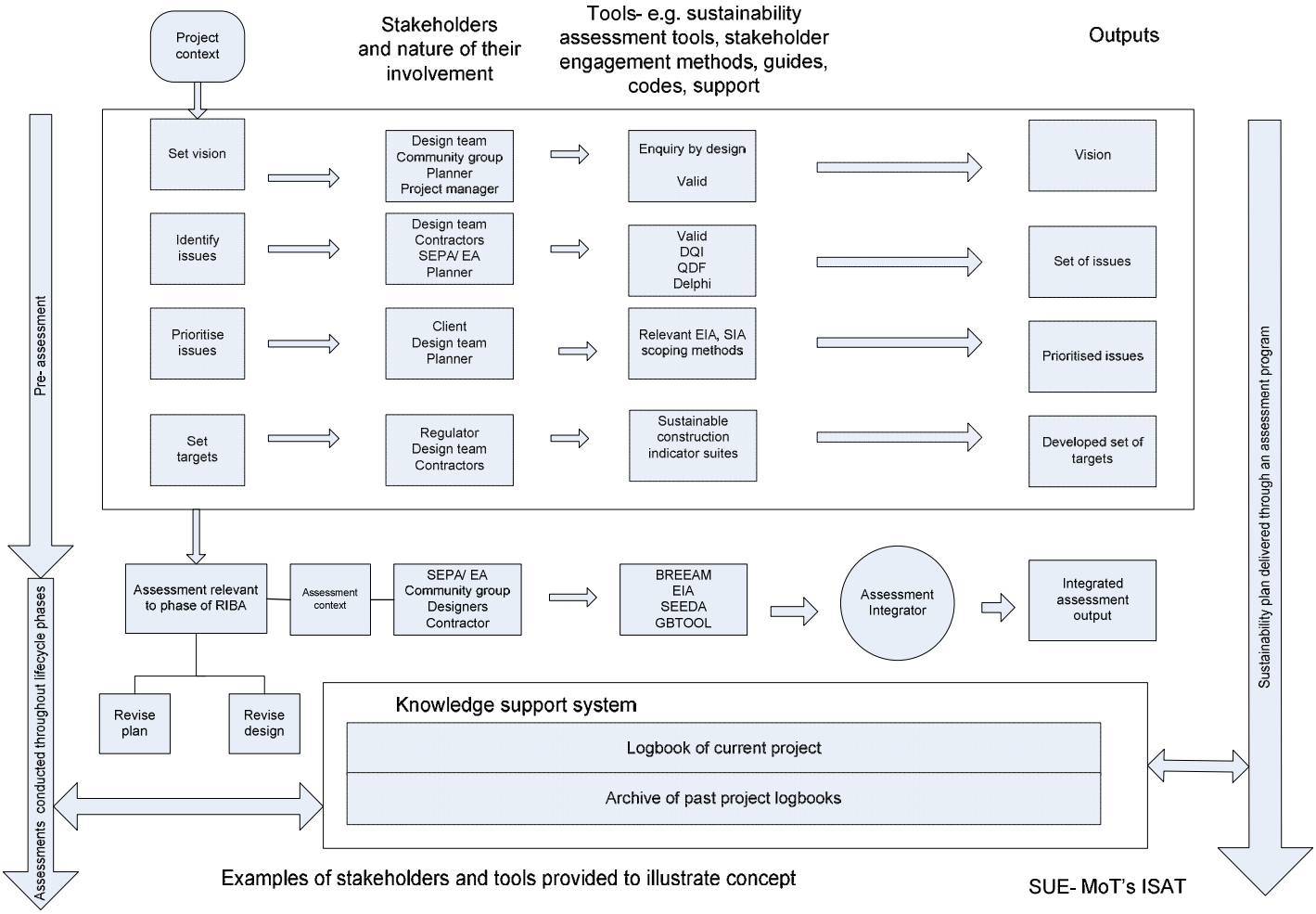

Figure 1: Schemata illustrating the integration of the toolkit and the components of the knowledge management system forming SUE-MoT's ISAT system

The protocol presented in Table 1, outlines the need when managing sustainability assessment within a development project, to conduct a number of activities aimed at establishing what the sustainability vision, issues, priority issues, and targets of the project are, prior to conducting an assessment of its performance. These activities have been referred by the SUE-MoT consortium as being pre- assessment by nature, and identified that they occur during the inception, feasibility and outline proposal phases of the RIBA plan of works. The outcome from the pre- assessment activities was identified to build towards a sustainability program which feeds into a wider sustainability plan, setting out the criteria against which the sustainability performance of the development will be assessed during the remainder of the project. By promoting the consideration of the protocol through the system, it is anticipated that encouragement will be provided to those managing the project, to actively plan and structure assessment points, where the sustainability performance can be measured and considered. The likelihood is that the identified assessments will coincide with natural decision-making points where sustainability implications apply in the development process i.e. location, site, materials selection, construction method, use of building, maintenance etc. The system will be developed to encourage its user to go

through and assist them during pre-assessment, so that each assessment conducted thereafter is informed by its output. The protocol outlines that for each assessment conducted two options are presented; either to adjust the design or construction method to satisfy the criteria set out in the sustainability plan, or to revise the sustainability plan in light of the contextual circumstances found in practice. Although those managing the project process are not compelled to consider or follow the protocol in practice, it aims to stress the significance of building sustainability into the processes of managing the project through assessment. This is an approach advocated both by Lutzkendorf and Lorenz (2006) and within the C-SAND research (Shelbourn et al., 2006), and adds value to the application of the ISAT at each point of assessment.

5.1 Delivering a personalisation strategy to KM within the system

The delivery of a personalisation strategy in line with that outlined in section 4 is represented primarily by the second column (Stakeholders and nature of their involvement) of Figure 1. Around each of the activities of pre-assessment and assessment, the system aims to provide the user with a set of identified stakeholders and a description of the nature of their involvement, reflective of the context in question. The knowledge maps generated during the research will form the basis for delivering this information, with the maps presented to the user in order to supplement their understanding of the dynamics regarding the achievement of effective knowledge transfer. The system will display with which stakeholders the associated knowledge resides, who requires it and the preferred pathway for its transfer. This will be presented to the user in a manner that is tailored for the context within which the ISAT is being considered. In addition, the system will suggest to the user any tools or mechanisms that have been identified through the research as aiding stakeholder engagement and knowledge transfer though discourse. Displayed will be both established stakeholder engagement tools and mechanisms identified during the research, in addition to any that have been developed as part of the research. These will be stored with the assessment tools within the tools database (outlined in El-Haram et al., 2007), and these are represented in their display in the third column (tools) of Figure 1. The user of the system will then apply the suggestions made to identify for themselves who is to be involved, select the most suitable methodology for their requirements and implement them in practice. By aiding the user to understand the knowledge requirements surrounding the use of the ISAT over the course of a development project, it is hoped that they can create an environment where discourse can lead to an exchange of knowledge between stakeholders that encourages both the mediation and ‘social’ learning sought.

5.2 Delivering a codification strategy to KM within the system

In addition to providing a personalisation strategy to knowledge management, Figure 1 displays components that represent the delivery within the system of a codification strategy. The system aims to provide the user with the functionality to be able to log the outcome of each phase of the pre-assessment (e.g. a statement of the sustainability vision set by the

stakeholders) and of each assessment (i.e. an assessment output). This acts as a means of capturing the explicit knowledge associated with the output, and it is stored with all the outputs in a logbook with the intention of documenting the sustainability assessment of the development project during every lifecycle phase (represented in figure 1). This provides the function of aiding the user specifically in the context of generating the sustainability plan (as they are able to access all the outputs of the pre-assessment activities), but also with the individual assessment outputs, in capturing and storing the outputs of each for consideration later in the process. In creating a record of the explicit outputs, there is a need to address the concerns outlined within this paper regarding the value of supplementing this with the capture and storage of the tacit knowledge that is generated surrounding it. The logbook provided, will be developed with the functionality for individuals involved to record their reactions and impressions associated with their experience of either the pre-assessment activities or of each assessment, perhaps styled in an assessment diary or journal. This aspect aims to be developed to allow for the social environment within which the explicit outputs are generated to be captured and stored, in order that they can be considered in the future in context. Providing the capability to capture and store both the explicit and tacit knowledge generated, and structuring it within a project logbook charting and recording the management of the sustainability assessment over the lifecycle of the development project, creates the capacity for this knowledge to be accessed and transferred to other individuals, either involved at a later point of the same project, or even by those involved in another (access permitting). The archived logbooks from previous projects represented in Figure 1, embody the storage of logbooks for access during future projects, and aims to enable the user of the system to access the knowledge specific to the context within which they are operating. The development of these features represents the delivery of the functionality of the knowledge support system discussed in section 4.

The research will develop the mechanisms involved in achieving both a personalisation and codification strategy within a knowledge management system that provides these features, in a manner that allows the user to interact with the system in a contextualised manner reflective of their needs.

6 FUTURE RESEARCH

An ICT system will be developed over the next 1.5 years to deliver components required to achieve the integration of the ISAT and the knowledge management system. The tools database outlined by El-Haram et al. (2007) will be supplemented by stakeholder engagement mechanisms identified and developed through the research, in addition to the mechanisms required to provide the knowledge management system described in this paper. An interface for the system will be established that is compatible with the contextual requirements of the user. The knowledge maps will provide some insight into understanding these requirements, in addition to the verification received by piloting the system with a sample of potential users throughout its development where meaningful.

7 CONCLUSION

The evolution of sustainability assessment as a tool for aiding the mediation between stakeholders and as a vehicle for promoting an environment for achieving 'social learning' or 'education empowerment' regarding sustainability, its implications and assessment, is an aspiration that relies heavily on knowledge management strategies to facilitate the transfer of knowledge necessary for its success. Outlined was an approach taken in the development of a knowledge management system geared towards the facilitation of these objectives, within the practical application of the planned ISAT. The need to develop an approach to delivering a personalisation and a codification strategy to knowledge management that is compatible with the requirements of the ISAT was outlined. The paper described a personalisation strategy that focused on achieving a facilitating environment for knowledge exchange and learning between stakeholders, achieved through the provision of assistance towards achieving access and participation within the channels of discourse surrounding the assessment. The codification strategy was represented in the development of a knowledge support system where both the explicit and tacit knowledge generated during an assessment is captured, stored and transferred for its application as a resource in the future. Knowledge mapping was identified as a methodology that can provide an understanding of the contextual nature of the knowledge and its transfer between stakeholders during assessment. This provides the basis from which appropriate mechanisms can be developed to facilitate the delivery of these strategies in a manner that is reflective of the contextual requirements of those needing them. The paper argued that these strategies were best delivered within an integrated knowledge management system, supporting the delivery of the ISAT within a framework for managing sustainability assessment and presented/ managed through the interface of an ICT system.

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