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Drivers for managing sustainability-related knowledge

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As organisations try to meet sustainability challenges, they need to be innovative. This often calls for the creation, use and exploitation of new knowledge. Therefore, knowledge resources must be properly managed to enable well-informed decisions. There is, however, little empirical research on the key drivers for managing sustainability-related knowledge in the UK industrial sectors – which is the core aspect of this paper. For this study, four industry sectors: energy and utilities, transportation, construction and not-for-profit organisations were considered, based on the environmental, social and economic impact on UK society. A semi-structured interview method was used to collect industry perception, which was then analysed at both aggregate and sector levels using content analysis for inference and conclusion. The data analysis revealed four key drivers that have fuelled the need for managing sustainability-related knowledge. They are: to improve access to knowledge associated with sustainability initiatives, to identify knowledge assets associated with sustainability initiatives, to improve the flow of knowledge associated with sustainability initiatives and to capture key knowledge associated with sustainability initiatives. The paper concludes that identifying and understanding the key drivers for managing knowledge within the context of sustainability is a complex process. Before embarking on a knowledge management journey, decision makers have to understand what they would like to achieve with their knowledge management programme and what value it needs to add to their organisation in the context of sustainability.

1. Introduction

In the first part of the twenty-first century only few executives in business would doubt that economic, social and environmental sustainability issues will be defining business drivers for organisations. This is primarily due to: recent credit crunch; global economic turbulence; raising oil prices; meeting increased demands and expectations of stakeholders; protecting degradation of natural resources; the knowledge economy; managing crisis and remediation while defending the organisation; and the diminishing social and community structures (Connor and Mackenzie-Smith, 2003; Laszlo and Zhexembayeva, 2011; Renukkappa *et al.*, 2012). These complex issues involve numerous processes. They also influence many stakeholders and further help to set the tone and guide

corporate level decisions. Nevertheless, to businesses these are formidable environmental and social issues that have evolved over time and that must be addressed (Carroll and Buchholtz, 2006). To address the above issues and challenges, a sustainability principle offers business leaders a twenty-first century management framework. Sustainability is a management principle that aims to create long-term shareholder value by seizing opportunities and managing risks related to the economic, environmental and social impact of doing business (Savitz and Weber, 2006). Renukkappa *et al.* (2012) noted that sustainability has environmental, social and economic dimensions, but some approaches focus only on the environmental or social or economic dimensions, whereas others attempt to treat all three aspects simultaneously. Neubaum *et al.*

(2009) argue that sustainability in business management requires a firm's environmental and social responsibilities to be given the same weight as its economic concerns. This approach helps reshape the rules of competition, leads to new business models, and redefines and restructures market sectors, creating at the same time risks and opportunities (Deloitte, 2011).

Porter and Kramer (2011) noted that organisations continue to view value creation narrowly, optimising short-term financial performance in a bubble while missing the most important customer needs and ignoring the broader influences that determine their longer-term success. For instance, the recent Accenture global survey (Accenture, 2013) revealed that 63% of chief executive officers expect sustainability to transform their industry within the next 5 years, and 76% believe that embedding sustainability strategy into core business will drive revenue growth and new opportunities. Although many companies recognise the value of a sustainability strategy, most have not yet incorporated sustainability issues into their overall business strategy. However, even as they make progress in embedding sustainability through their business, it is becoming increasingly apparent that organisations are constrained by market expectations, and are struggling to quantify and capture the business value of sustainability. Renukappa *et al.* (2013) noted that scarcity of knowledge and expertise in the context of sustainability is, and will continue to be, a huge challenge for many organisations regardless of industry sector.

Today, organisations can succeed only if they are genuinely 'value-led' and adopt a holistic rather than a silo approach to social, economic and environmental issues. As noted by Drucker (2002), 'every single pressing social and global issue of our time is a business opportunity'. The above statement clearly conveys that organisations that successfully embrace the sustainability agenda and integrate it into their daily business operations will thrive. Sustainability is not just about doing well by doing good. It is about doing better by doing good. It is no longer just about doing business responsibly; it is about seeing social, economic and environmental sustainability challenges as opportunities for innovation and business development (Laszlo, 2003). As Kanter (2006) noted, organisations that are breaking the mould are moving beyond corporate social responsibility to social innovation. They view community needs as opportunities to develop ideas and demonstrate technologies, to find and serve new markets, and to solve long-standing business problems.

In contrast to conventional market-driven innovation, sustainability-related innovation must incorporate the added constraints of social and environmental pressures as well as consider future generations (Brundtland, 1987). Sustainability-related innovation is therefore usually more complex (because there is typically a wider range of stakeholders) and more ambiguous (as many of the parties have contradictory demands). As organisa-

tions try to meet these challenges, knowledge is increasingly being seen as important for innovation and for producing knowledge-intensive products and the services desired by the market so as to maintain competitive advantage. The management of knowledge is, therefore, increasingly considered an important source of sustainable competitive advantage (Hamel and Prahalad, 1994; Nonaka and Takeuchi, 1995).

Van der Spek and Kingma (2000) state that the main objective of knowledge management (KM) is to arrange, orchestrate and organise an environment in which people are invited and facilitated to apply, develop, share, combine and consolidate knowledge. This application of knowledge in turn leads to innovation in the organisation. KM will allow businesses to sense important opportunities that can result in innovations in products, services, processes and distribution channels (Storey and Barnett, 2000). Therefore, to attain the goals concerning sustainability, it is necessary to recognise the importance of intangible resources, such as people and their sustainability-related expertise.

Liebowitz (1999) states that active and dynamic implementation of KM practices is critical to enable performance, problem-solving and decision making in knowledge-intensive organisations. Managing sustainability-related knowledge brings fresh and stimulating ideas into the organisations from internal and external sources. This in turn contributes to the innovation process being defined as 'bringing new ideas to market' (Amidon, 1997). When an organisation produces a product and/or service in an innovative way, the sustainable product and/or service adds value to an organisation. This new value, in turn, fosters reputation (Rikowski, 2007).

Davenport and Prusak (1998) view knowledge as an evolving mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. They found that in organisations, knowledge often becomes embedded in documents or repositories and in organisational routines, processes, practices and norms. They also say that in order for knowledge to have value, it must include the human additions of context, experience and interpretation. Cardoso *et al.* (2012) define knowledge as an organisational resource similar to others, but with some particular characteristics, namely knowledge is inexhaustible, it grows when it is shared and used, it becomes scarce or obsolete if it is not stimulated.

Alavi and Leidner (2001) in their seminal work concluded that KM involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer and knowledge application. Similarly, Jennex (2006) defined KM as the practice of selectively applying knowledge from previous experiences of decision making to current and future decision-making activities with the express purpose of

improving the organisation's effectiveness. However, for the purpose of this research, KM is defined as 'a systematic and integrative process of coordinating the organisation-wide activities of mapping, capturing, and sharing knowledge by individuals and groups in pursuit of the major organisational sustainability (environmental, economic, and social) goals and objectives' (Renukappa and Egbu, 2007).

The ability to identify and leverage key knowledge associated with sustainability strategies plays a critical role in leading change towards sustainability. At present it is not well understood how knowledge associated with sustainability initiatives can be effectively brought together, managed and shared for effective decision making. A major challenge facing most organisations is uncovering the most effective methods of mapping, capturing, sharing and applying new knowledge en route to economic value creation (e.g. profit maximisation) by integrating corporate environmental (e.g. climate change) and social (e.g. community engagement) sustainability issues into business (Renukappa *et al.*, 2013).

Authors such as Gloet (2006), Dunphy *et al.* (2007) and Doppelt (2008, 2010) emphasised that in fostering sustainability in the so-called knowledge economy, there is a need to consider how best to make knowledgeable interpretations and recommendations to support sustainability issues across a wide range of stakeholders. Even though most businesses now recognise that sustainability is conceived as a holistic and integrative concept, there are considerable ambiguities and interconnectivities among various facets of environmental, social and economic sustainability issues. Disagreements persist regarding the 'solutions' to sustainability 'problems', and the conditions under which one alternative might be better than another. However, a primary issue for organisations is awareness of what they know related to sustainability. Even providing easy access to explicitly captured sustainability-related knowledge in artefacts such as written government policies and measures documents, corporate economic, environmental and social policy documents, and even presentations, can provide employees in organisations with tremendous effectiveness and efficiency. However, as Renukappa and Egbu (2007) noted, KM in a sustainability context is in its infancy and has the potential to address a number of challenges that organisations currently face with regard to sustainability in the UK.

Even though many authors argue that access to and effective use of knowledge is a critical element in shaping and managing change and in transitions towards sustainability, there is little empirical research on the key drivers that have fuelled the need for managing knowledge associated with sustainability initiatives in UK organisations, which is the research question posed by the authors of this paper.

2. Research methodology

Dainty (2007) noted that research methodology in a social enquiry refers to far more than the methods adopted and encompasses the rationale and philosophical assumptions that underlie a particular study. These, in turn, influence the actual research methods that are used to investigate a problem and to collect, analyse and interpret data. Gable (1994) argued that an explorative qualitative approach is better suited to study a nascent research field and gain valuable initial insights, rather than large-scale surveys. Insights from initial expert interviews also make a strong case against large-scale quantitative surveys, due to aversion in responding to questionnaire surveys, and a high tendency to give socially desirable responses, thereby threatening the validity of findings (Collis and Hussey, 2003). Given the complexity of sustainability issues and the paucity of comparable research in the area phenomenon across sectors, qualitative research methodology was adopted. Data were collected through semi-structured interviews. According to Bryman and Bell (2007) semi-structured interviews provide some flexibility and it is one of the ways to obtain a 'realistic' picture of an individual's view. A purposive sampling technique was used in order to achieve representativeness. A purposive sampling technique involves drawing samples that are both easily accessible and willing to participate in a study (Tashakkori and Teddlie, 2010).

For this research, four industry sectors were examined, namely: energy and utilities; transportation; construction; and not-for-profit organisations (NPOs) with specific respect to their environmental, social and economic impact on UK society. For instance, the construction industry is a significant part of the UK economy. The UK construction industry contributes about £90 billion to the UK economy in value added, comprises over 280 000 businesses and employs over 2.93 million people, which is equivalent to about 10% of total UK employment (BIS, 2013). Furthermore, the industry is key to the quality of life in terms of housing, utilities and transport infrastructure (HMG, 2009). In the UK, almost 10% of the carbon dioxide emissions arise from the production and use of building materials, and materials production. Furthermore, the UK construction industry consumes over 1.2 million tonnes of oil-equivalent energy and produces over 3620 thousand tonnes of carbon-equivalent greenhouse gases (GHGs). The construction industry produces over 78 million tonnes of construction waste per year, 17% of the UK total (HMG, 2009). The global construction market is, however, facing major transformation as businesses continue to respond to the challenges of the economic crisis since 2008, begin to shift to green and sustainable construction, and seek to take advantage of the opportunities provided by the digital economy (BIS, 2013).

The energy and utilities sector is a strategic sector of the UK economy that accounts for approximately 7.5% of GDP and

employs over 530 000 people in total, almost 2% of the UK workforce (Wilson and Homenidou, 2012). The energy and utilities sector is responsible for approximately 51% of all carbon emissions and produces 7.9 million tonnes of waste per annum (Stern, 2007). In addition, the UK energy and utilities sector consumes over 59 million tonnes of oil-equivalent energy and produces over 188 793 thousand tonnes of carbon-equivalent GHGs (Defra, 2005). The UK energy and utilities industry is under ever increasing amounts of pressure as it faces the challenges of climate change, security of supply, an ever changing economic and regulatory climate and population growth, all of which have significant impacts on energy infrastructure planning (KPMG, 2012).

The UK transportation sector is a significant contributor to economic growth and employs over 743 000 people in 200 500 organisations (Wilson and Homenidou, 2012). It is also the fastest growing source of GHG emissions and accounts for 14% of GHG emissions (Stern, 2007). The majority of these emissions are from road transport (76%) and aviation (12%). The transport sector is responsible for almost 21% of total UK GHG emissions, with carbon dioxide being by far the most prominent gas (DECC, 2013). The UK transportation sector accounts for over 40% of the total energy demand (DECC, 2012).

The NPOs sector is value-driven and principally reinvests its surpluses to further social, environmental, or cultural objectives, rather than being driven by the need to maximise profit for shareholders and owners. It includes voluntary and community organisations, charities, social enterprises and cooperatives (HM Treasury, 2006). The National Council for Voluntary Organisations Report (NCVO, 2013) indicates that the sector contributes £11.7 billion to UK gross value added (GVA), equivalent to 0.8% of total UK GVA. The NPOs sector is a major employer. An estimated 765 000 people work in NPOs. This equates to 2.7% of the overall paid workforce.

To ensure greater dependability and transferability (Creswell, 2009), a total of 59 professionals from 40 UK organisations were interviewed across the four industry sectors – energy and utilities (14 interviewees from 10 organisations), transportation (14 interviewees from nine organisations), construction (17 interviewees from 12 organisations) and NPOs (14 interviewees from nine organisations). The sample included board members, directors, advisers and managers responsible for corporate environmental, social and economic sustainability initiatives in their respective organisations. The interviews lasted between 30 and 90 minutes. The format of these interviews was face to face and the transcripts were recorded and supplemented with field notes as appropriate.

Qualitative approaches of data analysis advocate the development of interpretative aspects and categories as close as possible to the object of the study (Van Dijk, 1977). In this context,

analysis of the interviews was undertaken using content analysis. Fraenkel and Wallen (2003) noted that content analysis is a study of textual messages of human behaviour in an indirect way. This helps researchers generalise findings, predict the future, understand attitudes, values and cultural patterns of an organisation or an industry or a country. In the study, coding of the transcribed documents involved open coding of meaning units, that is, words, phrases, sentences, paragraphs, which essentially involved labelling concepts. The emerging concepts were mapped into themes. Threats to validity were minimised through triangulation of data collection methods (interviews, internal and external documents) and verification of the initial thematic codes by participants, in which they judged the accuracy of data collected, although not its conclusions. The unit of analysis adopted for this study was the UK 'industrial sector', and the embedded unit of assessment was the 'individual employee'. Research findings are discussed at both aggregate and sector levels.

3. Data presentation and analysis

In this study, interviewees were asked to list and describe key drivers that have fuelled the need for managing sustainability-related knowledge in their organisations through face-to-face interviews. Table 1 shows the four key drivers as revealed by those interviewed in this study at both aggregate and sector levels.

From the data in Table 1, it is apparent that the single most important driver for managing knowledge associated with sustainability initiatives is to improve access to knowledge associated with sustainability initiatives. This is followed by the need to identify knowledge assets associated with sustainability initiatives, to improve the flow of knowledge associated with sustainability initiatives, and to capture key knowledge associated with sustainability initiatives. Furthermore, Table 1 outlined the key drivers that have fuelled the need for managing knowledge associated with sustainability initiatives across the four industry sectors. It is evident that for the energy and utility sector to improve knowledge associated with sustainability, the most important drivers are the identification of and access to this knowledge. For the transportation sector and the NPOs sector to improve, the flow of knowledge associated with sustainability initiatives is the most important driver for managing the knowledge. However, for the construction sector to improve, it is access to the knowledge associated with sustainability initiatives that is the most important driver for its management. In the following sub-sections (3.1 to 3.4), each of the key drivers mentioned in Table 1 is discussed at aggregate and sector level.

3.1 To improve access to knowledge associated with sustainability initiatives

In this study, 93% (55 of 59) of the interviewees asserted that a key driver for managing knowledge associated with sustain-

Sl. no	Driver that has fuelled the need for managing knowledge associated with sustainability initiatives	Number of interviewees cited across sectors				
		Total number of interviewees cited (N = 59)	Energy and utility (N = 14)	Transportation (N = 14)	Construction (N = 17)	NPOs (N = 14)
1	To improve access to knowledge associated with sustainability initiatives	55 (93%)	14 (100%)	13 (93%)	16 (94%)	12 (86%)
2	To identify knowledge assets associated with sustainability initiatives	52 (88%)	14 (100%)	13 (93%)	14 (82%)	11 (79%)
3	To improve the flow of knowledge associated with sustainability initiatives	48 (81%)	12 (86%)	14 (100%)	9 (53%)	13 (93%)
4	To capture knowledge associated with sustainability initiatives	40 (68%)	13 (93%)	11 (79%)	10 (59%)	6 (43%)

Table 1. The key drivers that have fuelled the need for managing knowledge associated with sustainability initiatives at both aggregate and sector levels (N = 59)

ability initiatives in their organisations is to improve access to that knowledge. For instance, in the current study, one of the interviewees stated that

In our organisation, finding who has the right sustainability-related expertise to solve critical business problems is hard. The experiential sustainability-related knowledge that people carry around in their heads is scattered across the company (i.e. all over Europe and USA), and it is nearly impossible to find the right people unless they are already part of the employee's personal network. When employees cannot find the right sustainability expertise or solution, they must either spend time and effort to recreate that solution or settle for something sub-optimal.

Analysis of the above statement reveals the need to improve access to knowledge to ensure that decision makers have adequate and relevant knowledge at their fingertips. Staab (2001) suggested that often an organisation creates so much explicit and tacit knowledge associated with sustainability initiatives that effectively organising it is a daunting task. The distributed nature of organisations makes it very hard to get a clear and complete overview of the knowledge associated with sustainability initiatives that is available within them. According to KPMG (2003), six out of 10 employees find accessing undocumented knowledge a major problem. Therefore, professionals find it difficult to access core knowledge for highly knowledge-intensive activities, such as problem solving and decision making. This situation calls for KM to increase the visibility of knowledge assets and hence facilitate and accelerate the process of locating relevant expertise or experience.

At the sector level, overwhelmingly 100% (14 of 14) of the interviewees from the energy and utility sector, 94% (16 of 17) from the construction sector, 93% (13 of 14) from the transportation sector and 86% (12 of 14) from the NPOs sector noted that the improvement of access to knowledge associated with sustainability initiatives is the key driver for managing knowledge in their organisations. From the above results it is clear that, for the energy and utility sector to improve access to knowledge associated with sustainability initiatives is the most important driver for managing knowledge compared to the other sectors in this study.

In today's globalised economy, an organisation's knowledge base is quickly becoming its only sustainable competitive advantage. As such, this resource must be protected, cultivated, and shared among organisational members (Dalkir, 2005). In the context of sustainability, knowledge is required for more effective and efficient decision making regarding issues such as carbon dioxide emissions reduction, employee well-being, resource efficiency, sustainable procurement initiatives and exposure to a variety of risk factors, both internal and external. Until recently, companies could succeed based on

individual knowledge of a handful of strategically positioned workers. Increasingly, however, competitive advantage can be gained by making individual knowledge available within the organisation, transforming it into organisational knowledge.

Hunt (2003) and Leblanc and Thomson (2012) suggest that a knowledge map may provide a possible answer to the challenges of how to locate new forms of useful knowledge, and to identify the flow of knowledge within and across organisations, including new directions for training employees, linking sustainability experts, innovative sustainability techniques and technologies, stimulating and facilitating knowledge sharing, and establishing useful links with external stakeholders. Essentially, a knowledge map improves efficiency and effectiveness of accessing critical knowledge enroute to the re-use of ideas and processes. For example, climate change now touches at the very heart of political and economic structures. It challenges business readiness to change from the current carbon dioxide-high economy to one of significantly reduced or zero emissions. It also challenges businesses' ingenuity. The solutions are out in the market, but business needs to home in on them, thoroughly explore them and put the best ones to use. Knowledge maps zoom in on information that already exists in organisations or within network actors.

3.2 To identify knowledge assets associated with sustainability initiatives

In the current study, 88% (52 of 59) of the interviewees noted that another key driver for their organisations to manage knowledge in the context of sustainability is the need to identify internal and external sources of knowledge assets associated with sustainability initiatives. The most often cited reasons for identifying these sources of knowledge is to initiate management systems such as the ISO 14001 system, energy management system and employee health and safety to name a few. For example, one of the interviewees in the current study stated that

Recently we have identified the knowledge gaps for deploying ISO 14001 system in our firm. By doing so, we have developed a map mainly focusing on what environmental sustainability related knowledge assets are available within our firm, who knows what and where it is located and how missing knowledge needs to be filled.

The aforementioned view of the interviewee clearly suggests that organisations are managing knowledge associated with sustainability initiatives in order to identify knowledge assets that are available within the firm to address various sustainability issues. The process of linking business goals and strategies together with organisational knowledge resources is where the power of knowledge mapping lies. Identifying or

highlighting existing knowledge associated with sustainability initiatives is a critical step in KM. Organisations that audit and map their sustainability-initiatives-related knowledge assets and as a consequence know what information they already hold can gain many benefits (Burnett *et al.*, 2004; Vestal, 2005). Mapping knowledge associated with sustainability initiatives provides a way of organising knowledge that is operational as well as replicable. It is a means of reducing barriers in accessing knowledge associated with sustainability initiatives. Knowing who to call, who knows what key facts and figures related to sustainability issues, or who has the know-how or the skill to analyse, diagnose, or recommend appropriate solutions in a particular sustainability domain is a challenge.

At the sector level, overwhelmingly 100% (14 of 14) of the interviewees from the energy and utility sector, 93% (13 of 14) from the transportation sector, 82% (14 of 17) from the construction sector and 79% (11 of 14) from the NPOs sector noted that the identification of knowledge assets associated with sustainability initiatives is an important driver for managing knowledge in their organisations. Issues related to sustainability cut across many boundaries, as they are both trans-disciplinary and trans-organisational in nature. In dealing effectively with sustainability issues, a wide range of internal and external knowledge assets need to be taken into consideration (e.g. issues across organisations, industry sectors, national boundaries, national and international institutions and regulatory agencies). Therefore it is not surprising that for the energy and utility, transportation and construction sector organisations the integration of external knowledge assets with internal knowledge assets associated with sustainability initiatives is a more important driver than for the NPOs sector.

Many existing KM studies are, arguably, focused on internal KM processes, and somehow seemingly neglect the interface between internal and external assets and knowledge processing issues (Anumba *et al.*, 2005). Quickly connecting employees to other employees with specific sustainability expertise for guidance, instruction, or discussions about a sustainability issue can decrease learning time, increase employee satisfaction, prevent reinvention-of-the-wheel activities and produce better sustainability-related solutions. Sustainability experts' maps can be used to identify employees to participate in short-term or long-term projects, to provide training in their area of sustainability expertise and to consult on specific business questions.

3.3 To improve the flow of knowledge associated with sustainability initiatives

Accelerating knowledge flow in organisations is a fundamental research issue in the field of KM (Bontis *et al.*, 2003). Nonaka and Takeuchi (1995) examine how Japanese companies, in contrast to western companies, have been successful in mobilis-

ing knowledge assets both within and outside an organisation. They describe organisational knowledge creation as a continuing interaction and exchange. To enhance the knowledge flows between people in order to stimulate innovative thinking, organisations should first conduct a knowledge audit and develop a knowledge map of the sources, sinks and flows of the knowledge within the organisation (Liebowitz, 2005).

To address sustainability issues, organisations need to acquire and make use of knowledge about the environmental (e.g. waste reduction), social (e.g. social responsibility) and economic (e.g. resources efficiency) issues. For example, organisations need to achieve a better understanding of the flow of materials and energy in their production systems and better information on waste sources and uses. Capturing this knowledge and how to use it will allow broader re-use opportunities and greater potential for waste minimisation. The real value of KM emerges when employees share their interpretations and insights about better process and materials management (Egbu *et al.*, 2005).

In the current study, at the aggregate level, 81% (48 of 59) of the interviewees echoed that another key driver for managing knowledge in the context of sustainability within their organisations is to improve the flow of knowledge associated with sustainability initiatives within and between stakeholders. For example, one of the interviewees in the current study noted that

Recently, we have developed a knowledge flow map to understand the way knowledge is used during disaster management and then make recommendations as to how the organisation's regional and main office can strengthen ways of working during emergency incidents like tsunami, terrorist's attacks or even during earthquakes.

Analysis of the above statement clearly suggests that one of the key reasons for organisations managing knowledge in the context of sustainability is to improve the flow of knowledge associated with sustainability initiatives. As noted by the interview, knowledge maps can help in identifying barriers to the flow of knowledge. For example, often 'green products' draw on used components; these are then tested, re-engineered and reassembled into 'new' products while ensuring that the process and the products do not have adverse social and environmental effects. However, to produce a re-engineered product as good as, or better than new, and to meet the new sustainability challenges requires some new knowledge. Knowledge maps can quickly connect experts with each other or help novices identify experts promptly. As a consequence, knowledge maps can speed up the knowledge-seeking process and facilitate systematic knowledge development because they connect insights with tasks and problems.

At the sector level, overwhelmingly 100% (14 of 14) of the interviewees from the transportation sector, 93% (13 of 14)

from the NPOs sector and 86% (12 of 14) from the energy and utility sector noted that one of the key reasons for their organisations to manage knowledge in the context of sustainability is to improve the flow of knowledge associated with sustainability initiatives within and between key stakeholders. However, apparently only 53% (nine of the 17) of the interviewees from the construction sector noted that managing knowledge in the context of sustainability is driven rather weakly by the need for improving the flow of knowledge associated with sustainability initiatives with key stakeholders. This is surprising, as construction organisations are dependent on the exchange of knowledge associated with sustainability initiatives across intra-company interfaces or with key project stakeholders such as clients, architects, engineers and contractors in the search for best possible solutions for sustainability problems.

3.4 To capture knowledge associated with sustainability initiatives

Employees change jobs more readily in today's working environment. When they leave they take their key knowledge and experience with them, leading to knowledge attrition in the organisation. According to Dalkir (2005), organisations are now focusing on managing knowledge through KM programmes and systems, rather than persuading employees to remain in the organisation.

In the current study, at the aggregate level, 68% (40 of 59) of the interviewees noted that capturing knowledge associated with sustainability initiatives is one of the key drivers for managing knowledge in their organisations. This is not surprising given the fact that knowledge-capture techniques are used to protect the firm's loss of knowledge due to worker's departure or retirement. For instance, one of the interviewees noted that

We have implemented knowledge capture initiative in our organisation. The very purpose of this initiative is that before an employee retires or leaves the organisation, we ask them to fill a questionnaire, participate in exit interviews, and to write down key sustainability-related contacts. By doing this not only do we attempt to retain his/her knowledge, we also see this as an opportunity to gain from the investments that have been made in the development and training of that individual.

Analysis of the above statement reflects the increasing fluctuation of the workforce as well as the growing importance of knowledge as a strategic asset. Systematic capturing and sharing of key sustainability-related knowledge makes strong business sense for organisations (Egbu *et al.*, 2005). Today's most pervasive knowledge capture associated with sustainability initiatives results from the constant movement of people from project to project inside organisations, as well as the

changing sustainability-related fiscal/regulatory measures. Employees and especially new members of staff are facing steeper, longer learning curves and at the same time employers are looking for faster revenues and higher productivity.

At the sector level, 93% (13 of 14) of the interviewees from the energy and utility sector and 79% (11 of 14) from the transportation sector noted that capturing knowledge associated with sustainability initiatives from the internal and external sources is the key driver for managing knowledge in their organisations. For the construction sector, 59% (10 of 17) of the interviewees noted that capturing new environmental or social sustainability-related regulation/legislation associated with knowledge is the key reason for managing knowledge in their organisations. However, only 43% (six of 14) of the interviewees from the NPOs sector echoed that the key driver for managing knowledge associated with sustainability initiatives in their organisations was to protect their organisation from loss of knowledge due to employees' departure and to capture employees' undocumented knowledge.

Analysis of the above results clearly suggests that, for the energy and utility, transportation and construction sector organisations, capturing knowledge associated with sustainability initiatives from internal and external sources is the most important driver for managing knowledge compared to the NPOs sector. Knowledge loss due to employees' retirement or departure and time to build new sustainability-related competency issues for new members of staff have driven NPOs to capture knowledge associated with sustainability initiatives.

4. Conclusion

Increasingly, the efficient management of knowledge is being seen as an important part of developing sustainable practice (Renukappa and Egbu, 2007). To improve organisational sustainability-related performance, executives have to recognise and better understand the key sustainability-related knowledge assets available within and across organisations. It is critical for organisations across sectors to understand the key drivers before managing knowledge associated with sustainability initiatives. Identifying and understanding the key drivers for managing knowledge associated with sustainability initiatives is a complex process. As revealed in the current study, the key drivers for managing knowledge associated with sustainability initiatives are broad, but four key drivers stand out. They are: to improve access to knowledge associated with sustainability initiatives; to identify knowledge assets associated with sustainability initiatives; to improve the flow of knowledge associated with sustainability initiatives; and to capture key knowledge associated with sustainability initiatives.

At the aggregate level, this study revealed that the most important key driver for managing knowledge associated with sustainability initiatives is to improve access to that knowledge. At the sector level, it is evident that the key drivers for managing knowledge associated with sustainability initiatives vary across the four industry sectors. For the energy and utility sector improved access to knowledge associated with sustainability initiatives and identification of those knowledge assets are the most important drivers for managing knowledge associated with sustainability initiatives. For the transportation sector and the NPOs sector improving the flow of knowledge associated with sustainability initiatives is the most important driver. However, for the construction sector it is improving access to knowledge associated with sustainability initiatives that is the most important driver.

Most of the time organisations across sectors evaluate KM initiatives as 'ineffective'. This is because KM initiatives were implemented without fully understanding the drivers and the objectives that had to be met at the outset. Before embarking on a KM journey, decision makers have to understand what it is that they would like to achieve with KM and the value it needs to add to their organisation in the context of sustainability. It is also necessary for decision makers to recognise and use a blend of information and communications technology (ICT)- and non-ICT-based KM techniques and technologies. It is advisable to use conventional, simple, low cost and easy to use with minimum training needs KM techniques and technologies. The present paper concludes that identifying and understanding the key drivers for managing knowledge associated with sustainability initiatives is a complex process. The scarcity of knowledge and expertise associated with sustainability initiatives is, and will continue to be, a huge challenge for many organisations regardless of industry sector. Therefore, training and education related to the management of knowledge associated with sustainability initiatives will help leaders, managers and change agents to understand better how to craft and implement various sustainability-related strategies for competitive advantage. Given that the research reported in this paper is largely exploratory in nature, the results presented here are only tentative and of limited value for the purpose of generalisation. Therefore, additional research with more elaborate and better articulated designs is called for, to explore further the complex mix of key drivers that have fuelled the need for managing knowledge associated with sustainability initiatives.

REFERENCES

- Accenture (2013) *The UN Global Compact-Accenture CEO Study on Sustainability 2013*. Accenture Consulting, New York, NY, USA.
- Alavi M and Leidner DE (2001) Knowledge management and knowledge management systems: conceptual foundations and research issues. *MIS Quarterly* **25**(1): 107–136.

- Amidon DM (1997) *Innovation Strategy for the Knowledge Economy: The Ken Awakening*. Butterworth-Heinemann, London, CRC Press, California, USA.
- Anumba CJ, Egbu CO and Carrillo PM (eds) (2005) *Knowledge Management in Construction*. Blackwell Publishing, Oxford, UK.
- BIS (Department for Business, Innovation and Skills) (2013) *UK Construction: an Economic Analysis of the Sector*. BIS, London, UK.
- Bontis N, Fearson M and Hishon M (2003) The e-flow audit: an evolution of knowledge flow within and outside a high-tech firm. *Journal of Knowledge Management* **7**(1): 6–19.
- Brundtland G (1987) *Our Common Future: The World Commission on Environment and Development*. Oxford University Press, Oxford, UK.
- Bryman A and Bell E (2007) *Business Research Methods*. Oxford University Press, Oxford, UK.
- Burnett S, Ilingworth L and Webster L (2004) Knowledge auditing and mapping: a pragmatic approach. *Knowledge and Process Management* **11**(1): 25–37.
- Cardoso L, Meireles A and Peralta CF (2012) Knowledge management and its critical factors in social economy organizations. *Journal of Knowledge Management* **16**(2): 267–284.
- Carroll BA and Buchholtz KA (2006) *Business and Society – Ethics and Stakeholder Management*. South-Western, Cincinnati, OH, USA.
- Collis J and Hussey R (2003) *Business Research: a Practical Guide for Undergraduate and Postgraduate Students*. Palgrave Macmillan, Basingstoke, UK.
- Connor R and Mackenzie-Smith P (2003) The leadership jigsaw – finding the missing piece. *Business Strategy Review* **14**(1): 59–66.
- Creswell JW (2009) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Sage, Thousand Oaks, CA, USA.
- Dainty ARJ (2007) A call for methodological pluralism in built environment research. In *Third Scottish Conference for Postgraduate Researchers of the Built and Natural Environment (PRoBE)*, Glasgow Caledonian University (Egbu C and Tong M (eds)). Glasgow Caledonian University, Glasgow, UK, pp. 1–10.
- Dalkir K (2005) *Knowledge Management Converting Theory into Practice*. Butterworth-Heinemann, Boston, MA, USA.
- Davenport T and Prusak L (1998) *Working Knowledge – How Organisations Manage What They Know*. Harvard Business School Press, Boston, MA, USA.
- DECC (Department of Energy & Climate Change) (2012) *Energy Efficiency Statistical Summary*. DECC, London, UK.
- DECC (2013) *2011 UK Greenhouse Gas Emissions – Final Figure*. DECC, London, UK.
- Defra (Department for the Environment, Food and Rural Affairs) (2005) *Securing the Future Delivering UK Sustainable Development Strategy*. The Stationery Office, London, UK.
- Deloitte (2011) *Sustainability in Business Today: A Cross-industry View*. Deloitte Consulting LLP, London, UK.
- Doppelt B (2008) *The Power of Sustainable Thinking: How To Create a Positive Future for the Climate, The Planet, Your Organization and Your Life*. Earthscan Publishing, Oxford, UK.
- Doppelt B (2010) *Leading Change toward Sustainability: A Change-management Guide for Business, Government and Civil Society*. Greenleaf Publishing, Sheffield, UK.
- Drucker P (2002) *Managing in the Next Society*. Harper Collins, New York, NY, USA.
- Dunphy D, Griffiths A and Benn S (2007) *Organisational Change for Corporate Sustainability*. Routledge, London, UK.
- Egbu CO, Hari S and Renukappa SH (2005) Knowledge management for sustainable competitiveness in small and medium surveying practices. *Structural Survey Journal* **23**(1): 7–21.
- Fraenkel JR and Wallen NE (2003) *How to Design and Evaluate Research in Education*. McGraw-Hill, New York, NY, USA.
- Gable G (1994) Integrating case study and survey research methods: an example in information systems. *European Journal of Information Systems* **3**(2): 112–126.
- Gloet M (2006) Knowledge management and the links to HRM Developing leadership and management capabilities to support sustainability. *Management Research News* **29**(7): 402–413.
- Hamel G and Prahalad CK (1994) *Competing for the Future*. Harvard Business School Press, Cambridge, MA, USA.
- HMG (Her Majesty's Government) (2009) *Low Carbon Construction Innovation and Growth*. Department for Business, Innovation and Skills, London, UK.
- HM Treasury (Her Majesty's Treasury) (2006) *The Future Role of the Third Sector in Social and Economic Regeneration: Interim Report*. HM Treasury, London, UK.
- Hunt DP (2003) The concept of knowledge and how to measure it. *Journal of Intellectual Capital* **4**(1): 100–113.
- Jennex ME (2006) *Knowledge Management in Modern Organizations*. Idea Group Publishing, Hershey, PA, USA.
- Kanter RM (2006) Innovation: the classic traps. *Harvard Business Review* **84**(11): 73–83.
- KPMG (2003) *Insights from KPMG's European Knowledge Management Survey 2002/2003*. KPMG Consulting, London, UK.
- KPMG (2012) *Green Power 2012: The KPMG Renewable Energy M & A Report*. KPMG, London, UK.
- Laszlo C (2003) *Sustainable Company: How to Create Lasting Value Through Social and Environmental Performance*. Island Press, Covelo, CA, USA.
- Laszlo C and Zhexembayeva N (2011) *Embedded Sustainability:*

- the Next Big Competitive Advantage*. Greenleaf Publications, Sheffield, UK.
- Leblanc H and Thomson C (2012) Paradigm interplay to develop a sustainability related knowledge management strategy. In *Proceedings of the 28th Annual ARCOM Conference, 3–5 September 2012, Edinburgh, UK* (Smith SD (ed.)). Association of Researchers in Construction Management, London, UK, pp. 1145–1155.
- Liebowitz J (1999) *Building organizational intelligence: A knowledge management primer*. CRC Press, Boca Raton, FL, USA.
- Liebowitz J (2005) Linking social network analysis with the analytic hierarchy process for knowledge mapping in organisations. *Journal of Knowledge Management* **9**(1): 76–86.
- NCVO (National Council for Voluntary Organisations) (2013) *The UK Voluntary Sector Almanac 2013: The State of the Sector*. NCVO, London, UK.
- Neubaum DO, Pagell M, Drexler JA, McKee-Ryan FM and Larson E (2009) Business education and its relationship to student personal moral philosophies and attitudes toward profits: An empirical response to critics. *Academy of Management Learning & Education* **8**(1): 9–24.
- Nonaka I and Takeuchi H (1995) *The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, Oxford, UK.
- Porter M and Kramer M (2011) Creating shared value. *Harvard Business Review* **89**(1/2): 62–77.
- Renukappa S and Egbu C (2007) The key challenges associated with mapping sustainability-related knowledge for organisational competitiveness: an empirical study. *CIB W102 3rd International Conference – Information and Knowledge Management – Helping the Practitioner, Stuttgart, Germany, 16–18, October*, pp. 22–32.
- Renukappa S, Egbu C, Akintoye A and Goulding J (2012) A critical reflection on sustainability within the UK industrial sectors. *Construction Innovation: Information, Process, Management* **12**(3): 317–334.
- Renukappa S, Akintoye A, Egbu C and Goulding J (2013) Carbon emission reduction strategies in the UK industrial sectors: an empirical study. *International Journal of Climate Change Strategies and Management* **5**(3): 110–130.
- Rikowski R (2007) *Knowledge Management: Social, Cultural and Theoretical Perspectives*. Chandos Publishing, Oxford, UK.
- Savitz AW and Weber K (2006) *The Triple Bottom Line*. Jossey-Bass, San Francisco, CA, USA.
- Staab S (2001) Human language technologies for knowledge management. *IEEE Intelligent Systems* **16**(6): 84–88.
- Stern N (2007) *The Economics of Climate Change: Stern Review*. Cambridge University Press, Cambridge, UK.
- Storey J and Barnett E (2000) Knowledge management initiatives: learning from failure. *Journal of Knowledge Management* **4**(2): 145–156.
- Tashakkori A and Teddlie C (2010) *Handbook of Mixed Methods in Social and Behavioural Research*. Sage, Thousand Oaks, CA, USA.
- Van der Spek R and Kingma J (2000) Achieving successful knowledge management initiatives. In *Liberating Knowledge* (Reeves J (ed.)). Caspian Publishing, London, UK.
- Van Dijk TA (1977) *Text and Context: Explorations in the Semantics and Pragmatics of Discourse*. Longman Publishers, London, UK.
- Vestal W (2005) *Knowledge Mapping: The Essentials for Success*. APQC Publications, Houston, TX, USA.
- Wilson R and Homenidou K (2012) *Working Futures 2010–2020: National Report*. Cambridge Econometrics/Warwick Institute for Employment Research, London, UK.

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