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Developing a business case for knowledge management: the IMPaKT approach

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There is a wealth of literature on the role of knowledge management (KM) in business improvement. Those with responsibility for implementing KM in organizations are often required to demonstrate its benefits. The need to convince senior management and other stakeholders about the business benefits is increasingly recognized as crucial in justifying a KM strategy and the resources to support its implementation. A three-stage approach (the IMPaKT framework) – underpinned by an industry survey and case study findings – is presented for developing a business case for KM. The framework facilitates: (1) an understanding of the strategic context of business problems and their knowledge management implications; (2) the planning and alignment of KM strategy to address business problems or objectives; and (3) an evaluation of the impact of KM on business performance in terms of effectiveness and efficiency. Key findings based on industrial application and further development of the framework are discussed. Evaluation shows that the framework could significantly facilitate the implementation of a KM strategy in construction organizations.

Keywords: Knowledge management, business performance, construction organizations

Introduction

The significant growth in knowledge management (KM) literature in the past few years is a reflection not only of the growing interest to academics and practitioners but also of its strategic importance to modern organizations. Whilst the term 'knowledge management' is relatively recent, the practice of KM is nothing new. The new elements relate to the nature and complexity of KM practices, and the challenges created in the knowledge-based economy where businesses are required to be innovative and to continuously improve products and services. Knowledge management is defined as 'any process of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organizations' (Scarborough *et al.*, 1999). The transition to knowledge-based organizations is increasingly recognized, in varying degree, by many sectors and industries. A survey of organizations, mainly from manufacturing, retail/wholesale, utilities, telecommunication and financial services revealed that 43% have a KM initiative, and one in ten considered it to be transforming the way they do business (KPMG Management Consulting, 1998).

Corporate spending on KM activities is expected to increase significantly over the next few years. Leading US and UK analysts predict that the market will be over US$12 billion by 2004, and the stage is finally set for large organizations to start serious investments (IDC, 2003; Ovum, 2003). Management consulting firms, whose primary product is knowledge, are among the first to invest (Hansen *et al.*, 1999). Others, including construction organizations, are beginning to follow as knowledge is considered to be a major source of competitive advantage.

Chevron Oil claims to have made savings of $150 million per year in energy and fuel expenses by proactive knowledge sharing of its in-house energy use management. The potential benefits to be gained from KM are gradually being recognized in construction. For example, a leading engineering consultancy orgnization highlighted that feedback from their legal department shows that the single largest cause of loss of money within the firm was a failure to agree the

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appropriate contract terms up front. The knowledge manager argued that a KM system such as the collation of a legal Intranet page, pushed to the desktop at appropriate times in projects, could provide an effective solution (Sheehan, 2000). A leading firm of solicitors developed a stand-alone hypertext system for the standard form of international construction and engineering contract (FIDIC) with context-sensitive expert commentary provided by specialist lawyers (Terrett, 1998). It is reported that such a KM system could lead to significant savings from legal costs often associated with construction projects.

Demarest (1997) argued that firms without KM systems would be unable to maintain a competitive advantage and will lose market share to those firms practising knowledge management. KM provides benefits in a variety of ways, which needs to be clearly understood and identified. This includes, for example, process and product improvements, money saved as a result of improvement in the location, sharing and accessing of different types of knowledge, or money earned through new or repeat businesses for responding to customers needs quickly etc. However, there are also costs associated with it, which needs to be considered before implementing a strategy.

Davenport *et al.* (1997) argued that KM is expensive and is likely to get support in organizations where it is linked to economic benefit or competitive advantage. A major challenge for those with responsibility for KM is, therefore, to be able to convince senior management and other stakeholders that the benefits far outweigh the costs. A business case is essential if reassurance is to be provided to senior management, to motivate employees and to maximize participation and commitment to KM.

Many organizations have recognized the need for a business case methodology for KM, but this has not been adequately addressed. This paper presents a framework (IMPaKT) as a basis for developing a business case for KM. It starts with the research objectives and methodology. KM in the business context and its application to construction is discussed. The stages of the framework for '**I**mproving **M**anagement **P**erform**a**nce through **K**nowledge **T**ransformation' (IMPaKT) are described, and the findings from an evaluation workshop based on the application of the framework are presented. It is concluded that the framework could significantly facilitate the adoption of KM strategies in construction organizations.

Research objectives and methodology

This research is part of a major EPSRC-funded study investigating the relationship between knowledge management and business performance. The specific objectives of the main study are:

(1) To establish current KM practices in construction organizations;
(2) To establish the extent to which key business performance measurement models are used by construction organizations;
(3) To investigate the relationship between KM practices and business performance in a number of flagship organizations; and
(4) To develop and evaluate a KM framework and supporting IT architecture that will enable construction organizations to better manage their knowledge assets/intellectual capital.

This paper focuses on the last objective: developing a framework to facilitate the implementation of KM. A three-pronged approach was used to develop and evaluate the framework. Firstly, a questionnaire survey informed by the academic and industrial literature, and semi-structured interviews with the project's eight industrial partners were undertaken. The exploratory survey was based on 170 leading construction organizations and focused on key issues in the formulation of strategies and implementation of KM and business improvement. Secondly, case studies were conducted with eight construction organizations for an in-depth exploration of the key themes identified. A number of questions were aimed at investigating the links between KM and business improvement, with particular focus on the use of Balanced Scorecard (Kaplan and Norton, 1996) and the Excellence Model (EFQM, 1999) as strategic frameworks for performance improvement. Finally, industry workshops were conducted to refine the initial concept and to evaluate the robustness of the KM framework that evolved.

Knowledge management in the business context

Organizations require both tangible assets (such as buildings, plant, equipment etc.) and intangible assets. Whilst tangible assets remain essential for production, intangible assets (such as knowledge) are considered to be a major source of competitive advantage as they represent a significant proportion of the market value of some organizations (Tiwana, 2000). There are several dimensions of knowledge: individual and group knowledge, internal and external knowledge, and tacit and explicit knowledge (Al-Ghassani *et al*, 2002). One of the most practical distinctions is that between tacit and explicit knowledge (Nonaka and Takeuchi, 1995). Tacit knowledge is know-how that is stored in people's heads. It is personal, acquired mainly through education, training and experience. Explicit knowledge is codifiable knowledge inherent in the so-called

non-human storehouses including organizational manuals on processes and procedures, databases, marketing channels and customer relationship management systems. Explicit knowledge is, therefore, easily shared with other people or parts of an organization. Examples of explicit knowledge in construction are design codes of practice, manuals on construction standards and specifications.

Knowledge can fall within the spectrum of tacit (implicit) knowledge and explicit (codified) knowledge. Different dimensions of knowledge are also required in an organization to deliver products and services. For example, innovative and complex projects (such as the Millennium Bridge) require not only a higher degree of tacit knowledge but group (project teams) and external knowledge through consultation with other experts or specialists to fulfil the design and construction requirements that cannot be met by established practices.

The role of KM is to facilitate, unlock, co-ordinate and leverage knowledge, whether tacit, individual or external, so that it becomes available as an organizational asset. KM is narrowly defined, in some instances, to reflect an IT or technology focus emphasizing 'the capture, access, and reuse of information and knowledge using information technology' (O'Leary, 2001; Gottschalk, 2000). The human resource perspective focused on the distribution, access to human experiences and relevant information between related individuals and workgroups (Excalibur Technologies, 1999; King, 1999; Egbu *et al.*, 2001). Whilst it is generally accepted that tacit knowledge is more difficult to manage, KM is increasingly recognized as an integrated concept relating to the 'active management of intellectual assets, either in the form of explicit knowledge held in artefacts or as tacit knowledge possessed by individuals or communities' (Snowden, 1998).

Knowledge management practices in construction

Knowledge management is an integral part of continuous performance improvement. Its role as a source of competitive advantage for construction organizations has been addressed by Kululanga *et al.* (1998), Egbu (1999) and Carrillo *et al.* (2000). Patel *et al.* (2000) argued that KM and organizational learning are recognized by the larger construction firms as potentially important but little has been attempted at a formal level. Whilst an increasing number of construction organizations now perceive KM as an integral aspect of business improvement, there are major difficulties associated with the adoption of KM, particularly in the formulation and implementation of a strategy.

The difficulty for many organizations stems not only from the concept of KM or the complexity of operationalizing it, but the fact that the implementation of KM initiatives has often been ad hoc. As part of the research, a questionnaire survey and case studies were undertaken to identify the key considerations to underpin the development of the IMPaKT framework, and to facilitate a coherent approach to KM strategy formulation and implementation. The key findings are presented below.

Survey results

The survey was undertaken to ascertain the drivers for knowledge management; to investigate strategy and resources for implementation; and to investigate business performance measurement practices. A total of 53 completed questionnaires were received out of 170 giving a response rate of 31.2%. A summary of the key findings is given below.

Motivation and awareness

The main motivations for knowledge management are:

(1) To share the tacit knowledge of key employees;
(2) Disseminate best practices; and
(3) To reduce rework.

Over three-quarters (77%) of organizations are aware of the benefits of knowledge management.

KM strategy and implementation

- About 42% have a strategy and 32% are planning a strategy in the short-term. Half of the large organizations compared to a fifth of small (employing less than 500 people) organizations have a strategy;
- 45.3% have appointed a knowledge manager or a team to implement their KM strategy;
- About three-quarters (74%) identified the intranet as their main KM tool. Other tools include database systems (62%), document management systems (38%) and electronic discussion forums (15%);
- One third of the organizations use communities of practice (CoPs) or related technical networks (43% of large organizations compared to 7% of small organizations); and
- Almost two-thirds (63%) considered their implementation approach to be 'ad hoc' characterized by a high degree of fragmentation and lack of co-ordination.

Performance measurement system

Following the Egan (1998) report on 'Rethinking Construction' in the UK, significant interest has been generated in measurement using key performance indicators (KPIs). Awareness of the use of the Balanced Scorecard (Kaplan and Norton, 1996) and the Excellence Model (EFQM, 1999) has also increased.

Over three-quarters (77.2%) have a business performance measurement system in the form of a Balanced Scorecard, Excellence Model, KPIs or variants of it:

- About 15% are using more than one measurement system;
- A third (34%) of the organizations use KPIs; and
- Under a quarter (23 %) use the Excellence Model on its own compared to 13% for the Balanced Scorecard.

Case study findings

The case studies provided an in-depth analysis of issues critical to knowledge management implementation. Eight organizations were investigated consisting of four national and four international firms. Between two to five people and a total of 28 interviews were conducted with a chief knowledge officer, knowledge managers, IT/systems managers, financial directors, technical/group directors and business/continuous improvement managers. The interviews focussed on key themes of KM such as organizational goals, strategy formulation, implementation approach, barriers and the links between KM and business improvement. A summary of the key findings is presented below:

Motivation and awareness

The primary goal for knowledge management varies from improving technical processes to providing a better service to clients. However, the overall objective was to improve business performance and profitability. Although organizations are aware of its importance, there are differences in perception. Some see KM as synonymous with managing information where the role of knowledge manager is wrongly perceived as being identical to a technical librarian managing information on the Intranet.

KM strategy

Three out of the eight organizations have a KM strategy and the rest are either fine-tuning or planning a strategy in the short term. Central to their KM strategy are the talents of people, as tacit knowledge is considered more valuable for engendering innovation. Most knowledge is in people's heads and processes. KM is therefore not only a technical problem involving IT but a socio-cultural one involving people. However, the absence of a working definition reflects the ad hoc approach to KM.

KM resources

Three organizations have established full-time positions for KM – one chief knowledge officer and two knowledge managers – supported by budget, IT infrastructure, and support staff on a full-time or part-time basis. Others have their KM strategy evolving under the direction of a financial director, information systems or technical managers. Whilst it is true that the function is more important than the title, support on an ad hoc basis can be a source of distraction, as it increases the vulnerability to pressures from other conflicting activities.

KM tools

The Intranet is the backbone of the KM infrastructure but several organizations have started to develop Extranets to facilitate collaboration with others on specific projects. However, there is recognition that both IT and non-IT based KM tools remains largely unexplored. Significant effort should be directed towards exploiting non-IT techniques such as communities of practice to facilitate person-to-person and person-to-organization interactions.

Barriers

Organizational culture is one of the most crucial factors and 'perhaps the most difficult constraint that knowledge managers must deal with' (Davenport *et al.*, 1997). Another key barrier is demonstrating and communicating the benefits of KM. Other barriers include resistance to knowledge sharing, initiative overload, poor IT infrastructure, lack of top management support, and conflicting priorities between KM and other business functions. There is a need to address these barriers but only one organization implemented a change management programme to inculcate a positive attitude to knowledge sharing.

Links between KM and business improvement

KM is recognized as important but it is not explicitly linked to business strategy, and therefore difficult for the benefits to be demonstrated. Several organizations have identified KM initiatives but methods are not put in place to assess, monitor and communicate the benefits, to maintain it as a high profile activity and increase the level of awareness.

KM is perceived as having the potential to provide benefits through sharing tacit knowledge of key employees, disseminating best practice and reducing rework. Analysis of the case studies shows that organizations are likely to be successful in implementing KM if appropriate considerations are given to strategy formulation (e.g. motivation, leadership, resources, infrastructure), and implementation issues (e.g. barriers such as culture and incentives). However, a significant factor identified is the lack of co-ordination between KM and business improvement. This point is illustrated by a senior business improvement manager who argued that 'there's got to be a knowledge element to our business improvement strategy, otherwise it could very easily become out of focus, out of control and pretty haphazard'.

The low profit margins often associated with construction organizations means that KM strategies are more likely to be implemented where the contribution to business performance can be demonstrated. Carrillo *et al.* (2000) suggested that KM could be integrated into KPIs, and other performance measurement approaches, as a key issue in KM is the evaluation of the likely benefits. The survey shows that over three-quarters (77.2%) of construction organizations have a measurement system in place, and over 90% of organizations using the Balanced Scorecard and Excellence Model have or plan to have a KM strategy. A performance-based approach to KM is essential to facilitate the evaluation and monitoring of the impact of KM initiatives on business performance (Anumba *et al.*, 2002).

The IMPaKT framework

The literature review, questionnaire survey and case study findings provided the basis for the conceptual development of the framework and its subsequent implementation. The framework for **I**mproving **M**anagement **P**erform**a**nce through **K**nowledge **T**ransformation (IMPaKT) is shown in Figure 1.

The three-staged approach to transformation is described in subsequent sections. For each stage, there are conceptual questions, steps or thought processes required to (1) *explore* business problems or objectives and their knowledge implications, (2) *plan* the KM responses and (3) *assess* their impact on business performance. The framework consists of problem structuring templates and various supporting guides to facilitate a structured and informed exploration of issues and formulation of solutions at each stage. Condensed versions of the templates with examples of supporting guides are illustrated in the subsequent sections.

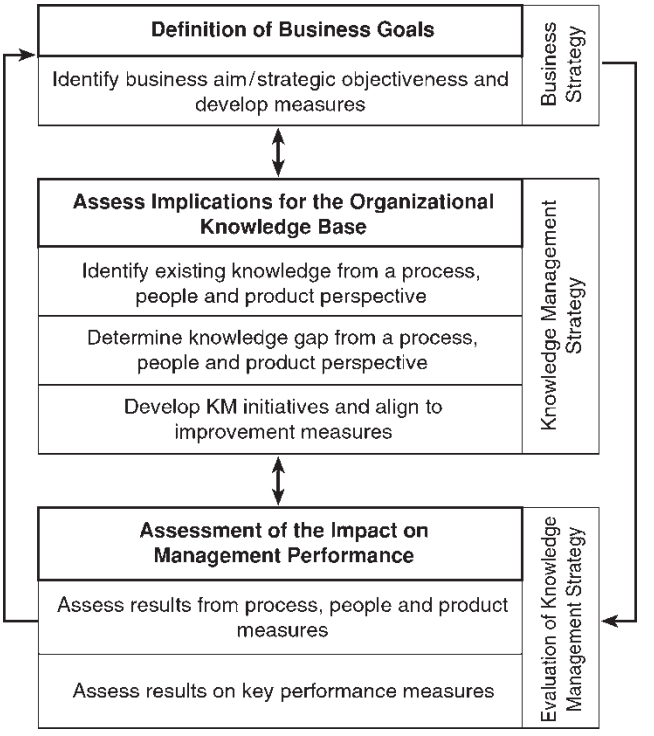

Figure 1 IMPaKT framework

Stage 1: developing a business strategy

Stage 1 provides a structure for formulating a business improvement plan. The steps involved are shown in Table 1 supported by detailed guides such as a sample of performance measures, metric definitions and expected benefits. The glossary of key terms supports the entire framework particularly in formulating the business plan in Stage 1.

The first step is to recognize the knowledge implications of the business problem or objective(s). KM problems are related to, or caused by a dysfunction in the sub-processes such as obtaining/capturing, locating/accessing, sharing or the application of knowledge. This stage involves putting the business problem in its strategic context in order to understand the external and internal forces affecting the business environment. Business drivers (external forces) are the key issues influencing an organization to achieve or cope with radical changes in the business environment. These issues, for example, could be technological (e.g. the need for innovation), market or structural factors (e.g. expansion/downsizing). The critical success factors (internal forces) are the key factors on which the achievement of an organization's goals depends. These factors include customers, employees, shareholders, nature of services or products, etc. The final steps involved identifying processes likely to be affected and the performance gaps through the selection of measures

Table 1 Business improvement plan

	Stage 1 steps	Supporting guide
1.1	Choose a business problem with a knowledge dimension	Glossary of key terms
1.2	Place the business problem in a strategic context by relating it to your external business drivers, strategic objectives and critical success factors	Glossary of key terms
1.3	Select measures to monitor progress towards achieving your strategic objectives, and identify the business processes they relate to	Performance measures
1.4	Identify current and target scores for various measures and establish the performance gaps	Metric definition

aligned to strategic objectives to facilitate business improvement monitoring.

For example, if the strategic objective is to expand, the bidding process, supply chain and strategic partnerships, and customer relationship management processes could be affected. Measures such as bid/win ratio, customer satisfaction, new or repeat business volume, and success rate on joint bids could also be given greater priorities.

This stage help users to identify appropriate performance measures, to appreciate the need for metric definitions and the possible benefits likely to arise from an improvement in particular measures. The performance gaps reflect the urgency associated with particular business objectives, which in turn informs the development of appropriate KM responses to meet performance targets.

The outcome of Stage 1 is a business improvement plan with measurable indicators and performance benchmarks to assess progress.

Stage 2: developing a KM response

Stage 2 clarifies the knowledge problem(s) identified in stage 1 to develop specific KM plans to address the business problem or objectives (Table 2). Several detailed guides support this stage. The first step (2.1) within this stage involves defining the nature of the knowledge management problems. The problem diagnostic questionnaire guides the users through a set of carefully structured questions to facilitate the identification of the KM sub-processes associated with the business problems (see Figure 2 for sample questions).

The second step (2.2) involves formulating KM initiatives, which are systematic goal-directed efforts for addressing the stated business problems. The nature of KM initiatives and the tools for implementation are also influenced by the performance gaps identified in stage 1. Nonaka and Takeuchi (1995) identified four modes of knowledge transformation: socialization, externalization, combination and internalization (SECI model). The KM tool selector (step 2.3) builds upon the SECI model by incorporating two additional dimensions of knowledge to provide a robust mechanism for identifying the most appropriate techniques and technologies to implement KM initiatives. The tool, based on the interaction of three knowledge dimensions; conversion types (tacit-explicit), ownership form (individual-group) and transfer domain (internal-external), contains a large database of both IT (technologies and software applications) and non-IT (techniques) tools to support KM initiatives.

Steps 2.1 to 2.3 are strongly linked. The diagnostic questionnaire (step 2.1) that identifies the KM subprocesses (e.g. locating and sharing knowledge) relating to the business problem (s), provides the context for developing KM initiatives in step 2.2. The KM tool selector (step 2.3) therefore identifies the most appropriate mechanism for implementation based on the KM subprocesse(s) identified in step 2.1 and the additional characteristics of the KM initiative(s) developed in step 2.2 in terms of the three knowledge dimensions.

Finally, preparing for transformation is crucial. Organizational readiness to implement KM needs to be assessed in terms of the *resources* required, the *reform* needed and a *result* monitoring mechanism. The

Table 2 KM and transformation plan

	Stage 2 steps	Supporting guide
2.1	Clarify the knowledge dimension of your business problem by identifying the KM process(es) involved	Problem diagnostic questionnaire
2.2	Develop specific KM initiatives to address the business problem/objectives	Problem diagnostic questionnaire
2.3	Select tools to support the KM process(es) identified and the implementation of the KM initiatives	KM tool selector
2.4	Prepare an Action Plan and identify change management and resources required	Readiness audit checklist
2.5	Identify relationships between KM initiatives and performance measures and show how they relate to the strategic objectives	Cause-and-effect map

Sub-Process	*Diagnostic Questions*
Locating knowledge	Do employees face problems in identifying where knowledge exists? (e.g. which people have the knowledge, intranet, software systems or database)
	Is there a need to catalogue and index knowledge sources?
	Do employees need new software and/or hardware to search for knowledge
	Do employees know how to use different search methods to find knowledge
Capturing knowledge	Is there a need to codify knowledge that exists within the organisation? (e.g. tacit knowledge about people, processes and products etc)
	Is there a difficulty in codifying or representing tacit knowledge that exists within the organisation?
	Is there a difficulty in obtaining and representing external knowledge?
	Do you have problems in identifying tools for capturing knowledge?
Sharing knowledge	Is there a difficulty in sharing tacit knowledge between people across the organisation?
	Is there a need to transfer explicit knowledge between people, software applications and paper documents?
	Is there a problem in the learning process across the organisation?
Modifying knowledge	Is the knowledge-base within your organisation getting too large to maintain?
	Do you have a formal procedure for maintaining the knowledge-base?
	Is there a problem with identifying individuals or groups who should validate any modifications to the content of the knowledge-bases?
	Do employees face risk of using outdated knowledge stored in the knowledge-base?
Creating new knowledge	Is there a requirement to elaborate or combine existing explicit knowledge to generate new knowledge?
	Is there a need to re-use existing information to produce new knowledge?
	Do you need to encourage employees to generate new knowledge
	Do you need to obtain knowledge creating tools other than those already in place

Figure 2 KM problem diagnostic questionnaire

Readiness Assessment Checklist consists of a set of statements reflecting key criteria using a scale from low to high level of preparedness. The 'overall readiness' or output is a 'traffic light' system colour-coded, depending on aggregate scores, with statements reflecting the actions required (action plan) prior to implementing KM. Regardless of the efforts directed towards implementing KM, it may not be successful unless fundamental reform is addressed, and a monitoring mechanism put in place. For example, installing a skills yellow page could bring benefit but only if employees are willing to share knowledge and to provide updates of their experience, and there is a system for monitoring, otherwise the skills yellow pages will rapidly become useless and outdated.

The outcome of Stage 2 is a KM strategic and transformation plan with a set of initiatives, implementation tools and an action plan to support business improvement.

Stage 3: developing a KM evaluation strategy

Stage 3 provides a structure for evaluating the impact of KM initiatives on business performance using the outcomes from stages 1 and 2. This stage is supported by the cause-and-effect map, evaluation roadmap, cost and benefit checklists, and a priority matrix (Table 3).

Table 3 KM evaluation strategy

	Stage 3 steps	Supporting guide
3.1	Use the cause-and-effect map in 2.4 to assess the likely contribution of the KM initiatives	Cause-and-effect map
3.2	Assess the probability of success of your KM initiative in improving your performance measures (effectiveness measure)	Readiness audit checklist
3.3	Choose an appropriate method to assess the impact of each KM initiative on your business performance	Evaluation road map
3.4	Identify the cost for each KM initiative and the possible benefits (efficiency measure)	Cost and benefit checklists
3.5	Prioritize your KM initiatives based on the two measures of performance	Priority matrix

This stage is challenging, as the justification of KM initiatives depends on the costs as well as expected benefits. Too often, the focus of KM is on the inputs i.e. technologies such as intranets, groupware, etc. There is a need for a shift to the outcomes in terms of performance rather than the specification of inputs. The cause-and-effect map (see Figure 3), is a dynamic tool for exploring and clarifying possible relationships between KM initiatives, performance measures and the strategic objectives they are related to. It is outcome-driven and forms the basis for determining the impact of KM on business performance in terms of its effectiveness and efficiency.

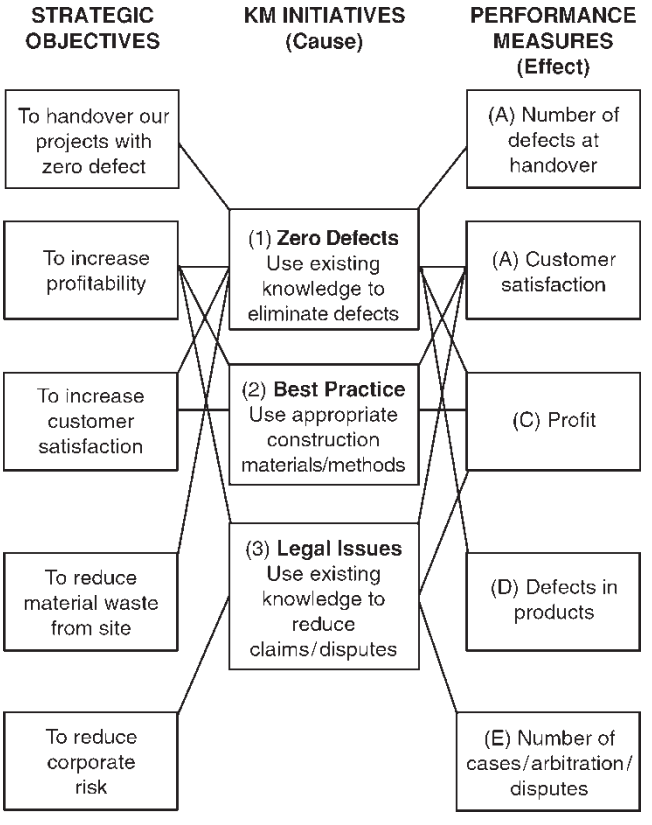

Figure 3 Cause-and-effect map

Measures of effectiveness relate to the degree or the probability that target performance measures are achieved, whilst measures of efficiency reflect the ratio of expected benefit or utility per unit of investment.

Measures of effectiveness

These measures help to identify the likely contributions of KM initiatives to performance measures and to evaluate the impact quantitatively or qualitatively. It encourages organizations to achieve effectiveness by focusing on driving performance and reinforcing the links between KM and performance measures. It helps shape and clarify the KM initiatives, and raise awareness of the level of risks. The probability of contribution to performance measures reflects the likelihood/risk that the KM initiatives are successfully implemented based on an organization's readiness to implement KM. The contributions are determined using indirect or direct weighting techniques such as ranking and rating.

Measures of efficiency

These measures help organizations to explore and uncover the real costs of KM, in relation to the benefits. Information technology costs is the most obvious or visible but form only one third of the time, effort, and money that is required to develop and use a KM system (Tiwana, 2000). The most significant components are the hidden costs associated with people (American Productivity & Quality Centre, 1997) such as setting up people sharing networks and processes. The cost checklist is based on the three pillars:

- *KM team component* represents the staff costs associated with the roles and skills required for knowledge transformation;
- *KM process component* reflects the organizational or (re)organizational costs associated with core and supporting business processes enabled, affected or re-engineered; and
- *KM infrastructure component* represents the costs associated with information and communication technologies (hardware and software), setting up or maintaining people sharing networks, systems

or techniques to provide knowledge creation and sharing capability and to facilitate knowledge transformation.

There are different types of outputs or benefits to be expected: operational and strategic which could be tangible or intangible. Operational benefits are direct, often visible or immediately arising from the implementation of KM initiatives whereas strategic benefits are indirect, often hidden and realizable in the medium to long term.

- *Operational benefits* are associated with people (e.g. direct labour savings and reduction in staff turnover), processes (e.g. direct cost savings other than labour, increased productivity) and products (e.g. direct cost savings or increased sales/services).
- *Strategic benefits* are associated with future situations such as repeat customers/ businesses and the attraction of new customers/ businesses, increased market share or entry into new markets.

The cost and benefit checklists facilitate an understanding and an appreciation of the likely implication of KM. These checklists are designed to be flexible so they could be embedded into whatever costing system/ resource allocation model an organization is using. Evaluation of benefits could be in the form of tangible monetary units and/or intangible utility values reflecting preference or satisfaction.

Evaluation techniques

There are various techniques that can be used to evaluate the impact of KM initiatives: cost minimization analysis, cost effectiveness analysis, cost utility analysis and cost benefit analysis. The evaluation roadmap (Figure 4) is an interactive tool that guides the users in the selection of the most appropriate technique based on a set of structured questions and the characteristics of the inputs and expected outputs of the KM initiatives.

This stage allows users to create a priority matrix that incorporates both measures for effectiveness and efficiency to identify the best or worst performing KM initiatives, which could provide the basis for implementation or review.

The outcome of stage 3 is a KM evaluation strategy and an implementation plan with an appreciation of likely impact of various KM initiatives on business performance in terms of effectiveness and efficiency.

Evaluation

Two one-day workshops were conducted to evaluate the IMPaKT framework. The first workshop was held at the end of the first year of the project to refine the initial conceptual framework and to provide the basis for detailed development. The second workshop was held a year later to assess the robustness of the framework that evolved. Participants were invited to the workshop following consultation with the project's industrial collaborators. There were thirteen participants representing six different organizations, and over three-quarters of them had a high level of awareness of KM (76.9%) and business improvement (84.6%) issues. The participants, mainly senior managers and directors responsible for business improvement, knowledge management, business systems and IT, were organized into groups with the research team acting as workshop facilitators. Each group chose a business problem and applied the IMPaKT framework to it.

A group discussion followed at the end of the workshop to identify the key issues. An evaluation questionnaire was also given to participants to complete. The questionnaire consists of statements reflecting the framework's capabilities. Participants were asked to rate key elements of the framework with respect to the degree to which it facilitated the structuring of problems and the formulation of KM solutions. The results based on the analyses of the completed questionnaires are presented below (Table 4) using a rating scale from

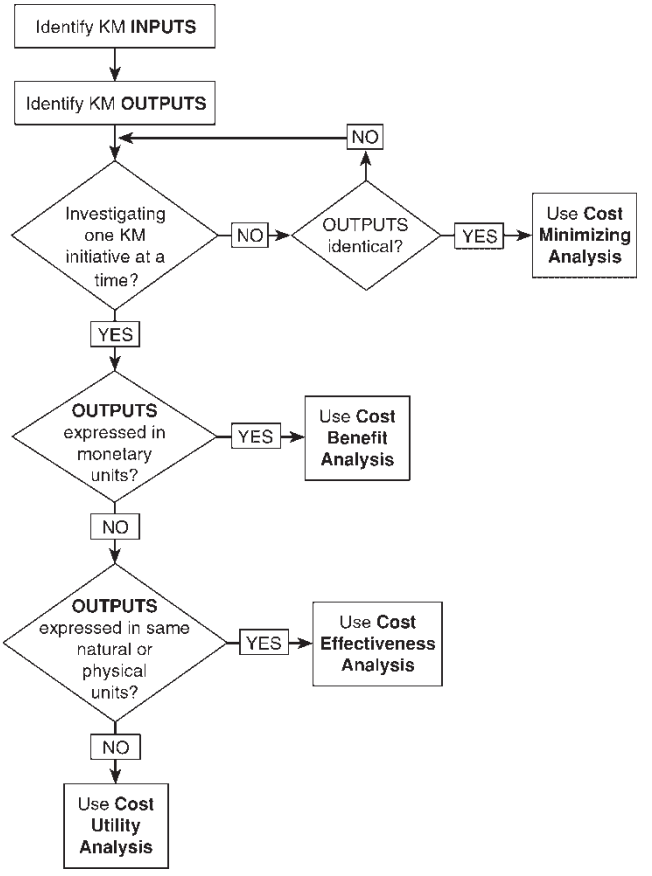

Figure 4 Evaluation road map

Table 4 Ratings of key elements of the IMPaKT framework

Steps		Rating score
Stage 1: business improvement		
1.1	Understanding the strategic context of business problems	5.00
1.2	Linking strategic objectives to performance measures	4.82
1.3	Linking performance measures to business processes	4.55
1.4	Developing and monitoring performance measures	3.91
Stage 2: knowledge management plan		
2.1/2.2	KM clarification and diagnostic process	3.91
2.3	Selection of KM implementation tools	3.73
2.4	Relevance of assessing organizational readiness	4.09
2.4	Action plan or readiness checklist	4.09
Stage 3: knowledge management evaluation		
2.5/3.1	Reinforcing the links between business improvement strategy and KM	4.09
3.2	Assessing KM impact on business performance	4.09
3.3	Evaluation Guide	3.36
3.4	Identification of KM costs and benefits	3.64

1 (strongly disagree) to 5 (strongly agree). The rating scores of key elements relate to the steps at various tages of the framework discussed in the previous section.

The consistently high ratings of most elements in stages 1 to 3 reflect the framework's capability in helping users to understand the strategic context and knowledge implications of business problems, develop KM solutions and evaluate their impact. Suggestions from the post-workshop discussions and the evaluation questionnaires provided the basis for further improvement. A few problems were identified as follows:

(1) Simplify some terminology to ensure they are easily understood;
(2) Improve guidance on the selection of KM tools and evaluation techniques; and
(3) Repetition between stages in the paper-based version.

Problem 1 was addressed by adopting user-friendly terms contained in a glossary. Problem 2 was addressed through the development of an automated KM tool selector, which provides information about the tools and facilitates selection based on three dimensions of knowledge outlined in the previous section. This is superior to the KM tools matrix in the original paper-based version, consisting of a list of tools with the KM processes they support. A roadmap has also been incorporated to help users to choose the most appropriate evaluation technique based on key attributes of KM initiatives. Problem 3 was overcome in the electronic version of IMPaKT designed to facilitate its use and enhance delivery. The overlap between stages in the paper-based version was to facilitate its use during the workshop. These suggestions have been incorporated in the version of the framework described in Tables 1, 2 and 3 and the supporting guides.

The IMPaKT Framework thus:

- Allows an organization to structure its business problems and to put it into a strategic context;
- Facilitates an exploration of the knowledge implications of business problems and enables formulating a KM response;
- Provides a structured approach for devising and evaluating KM strategies to ensure that they are coherent and consistent with the overall strategic objectives of an organization; and
- Provides a set of complementary measures for assessing the impact of KM initiatives on business performance.

Overall, the framework was found to be a useful thought process to go through, well focused and easy to use. IMPaKT is considered to be an innovative KM tool that incorporates issues not adequately addressed in other frameworks. The accompanying guidelines incorporated into the framework were considered helpful. For example, the Readiness Assessment Checklist was considered crucial in identifying the barriers and facilitators prior to implementing KM. Further evelopment of the IMPaKT framework involves: (1) refining the electronic version to further enhance its use and delivery; and (2) integrating it with an existing KM tool that helps organizations to identify specific KM problems and guides users through providing more detailed solutions to KM problems.

Conclusions

A knowledge management (KM) strategy is essential for continuous business improvement and in creating and maintaining competitive advantage. However, the development of a business case to demonstrate its

benefits and to provide reassurance to an organization and other stakeholders remains a major challenge. This paper has argued for a performance-based approach to KM and presented a three-stage framework (IMPaKT) that provides a basis for developing a business case for KM. Evaluation of the framework through two industrial workshops and a questionnaire shows that it is a robust KM tool. IMPaKT was found to be a well-structured approach for developing a business case for KM as it facilitates an understanding of the strategic context of business problems, their knowledge dimensions, and the full implications of a KM strategy and its business impact in terms of effectiveness and efficiency.

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