IMPaKT: A Framework for Linking Knowledge Management to Business Performance

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Abstract: A number of organisations have recognised the importance of managing their organisation knowledge in a more structured manner. However, the question arises as to how to evaluate the benefits of a Knowledge Management (KM) strategy and its associated initiatives on the performance of the organisation. This paper presents a framework for the assessment of the likely impact of KM and discusses findings from an evaluation workshop held to critique the framework.

Keywords: Knowledge management, business performance, evaluation

1. Introduction

Business organisations are becoming increasingly aware of the need for innovative approaches to responding more effectively to clients' demands and changes in the market place. Knowledge Management (KM) is central to this and is increasingly recognised as an integral part of an organisation's strategy to improve business performance. A key issue in the implementation of KM strategies is the evaluation of the likely impact. The difficulty for many organisations stems from the fact that the implementation of KM initiatives has often been ad hoc, without a coherent framework for performance evaluation. A Knowledge Management (KM) initiative can be developed to improve the performance of a simple task and its impact easily evaluated. However, as we move away from simple tasks to organisation-wide systemic problems, KM initiatives become more complex and intertwined. This makes it difficult to evaluate the impact of these initiatives on business performance. There is therefore a need for a performance-based approach to KM that explicitly shows the interactions between KM initiatives and a set of measures for evaluating their effectiveness and efficiency. The Knowledge Management for Improved Business Performance (KnowBiz) project is a three-year research project, sponsored by the EPSRC and industrial collaborators, aimed at investigating the relationship between KM and business performance. As part of the project, an initial concept of an KM framework was developed (Robinson et al, 2001). This concept has now evolved into an operational framework refined through a follow-up technical workshop with the project's industrial collaborators.

This paper presents the development of a framework for **I**mproving **M**anagement **P**erform**a**nce through **K**nowledge **T**ransformation (IMPaKT) and discusses findings from the application of the framework based on an evaluation workshop held with industrial partners. Two distinct types of performance measures are identified to evaluate KM initiatives - an effectiveness measure, which relates to the degree of realisation of the strategic objectives and an efficiency measure reflecting the nature of the process used to implement KM initiatives.

2. Linking KM strategy to business performance

Knowledge within the business context can fall within the spectrum of tacit (implicit) knowledge and explicit (codified) knowledge. Tacit knowledge is stored in people's heads and is difficult to share. Explicit knowledge is captured or stored in an organisation's manuals, procedures, databases, and is therefore, more easily shared with other people or parts of an organisation. Organisational knowledge is a mixture of explicit and tacit knowledge and the role of KM is to unlock and leverage the different types of knowledge so that it becomes available as an organisational asset. However, a key issue in KM is the evaluation of the likely benefits. KM strategies are more likely to be successfully implemented if a performance-based approach is adopted that explicitly shows the interactions between KM initiatives and a set of performance measures for evaluating their effectiveness and efficiency.

Carrillo *et al* (2000) suggested that KM could be integrated into key performance indicators

(KPIs), and other performance measurement approaches. There is evidence that some organisations are now implementing various types of business performance measurement models such as the Balanced Scorecard (Kaplan and Norton, 1996) and the Excellence Model (EFQM, 1999). A recent survey of construction organisations shows that about 40% already have a KM strategy and another 41% plan to have a strategy within a year (Carrillo *et al,* 2003). About 80% also perceived KM as having the potential to provide benefits to their organisations, and some have already appointed a senior person or group of people to implement their KM strategy.

However, a major problem in KM is evaluating its likely impact on business performance. Performance is therefore a key issue and performance measurement models provide a basis for developing a structured approach to KM. Business performance measurement models are being used increasingly to encourage organisations to focus on measuring a wider range of business performance issues relating to processes, people and product. A recent survey conducted by the KnowBiz research team shows that over 35% of construction organisations are using either the Balanced Scorecard (BSC) or the Excellence Model (EM) and about a quarter (26.4%) are using other measurement systems, mainly the Egan KPIs or bespoke models. Over 90% of organisations using the BSC or the EM also have or plan to have a KM strategy in the short term (within a year). However, a significant factor identified in the case studies is the lack of co-ordination between business improvement and KM (Robinson *et al*, 2003). Linking KM to business performance could make a strong business case in convincing senior management about the need to adopt a KM strategy, particularly when the ability to demonstrate benefits of KM is becoming more important in the competition for funding.

3. Research methodology

This framework is a deliverable for an ongoing UK government EPSRC-sponsored research project supported by a number of industrial collaborators. A variety of research methods were used including literature review, questionnaire survey, industry case studies and semi-structured interviews for the development of the framework. A literature review identified the key issues in knowledge management and performance measurement. A questionnaire survey and case studies with industrial collaborators were undertaken to identify practices, motivation, barriers and enablers in the application of KM and business performance measurement. The initial concept of the framework was developed based on the findings from the literature review, questionnaire survey and case studies. The framework was further developed, reviewed and refined through a follow-up technical workshop and the applicability of the KM framework was validated through pilot studies and an evaluation workshop with industrial collaborators.

4. The IMPaKT Framework

A knowledge management strategy should not only facilitate the transformation of the various types of knowledge within an organisation but should provide an evaluation mechanism to measure the effectiveness and efficiency of any strategy. A three-stage framework for Improving Management Performance through Knowledge Transformation (IMPaKT) has been developed to link KM to performance measurement (see Figure 1).

The framework recognises that to be able to assess the *impact* of knowledge management, KM initiatives have to be aligned to an organisation's strategic objectives. Key issues at each stage are further explored through Templates (illustrated in the subsequent sections) supported by detailed guidelines. For each stage, there are steps or thought processes required to structure business problems.

4.1 Stage 1 - Developing a Business Improvement Strategy

The aim of Stage 1 is to provide a structure for formulating a strategic business plan by identifying the external (business) drivers, defining strategic objectives or goals, identifying critical success factors, and developing measures for monitoring performance improvement. The outcome of Stage 1 is a business improvement plan with performance targets and measurable indicators to assess performance. Table 1 shows a condensed version of the template for developing a business improvement strategy.
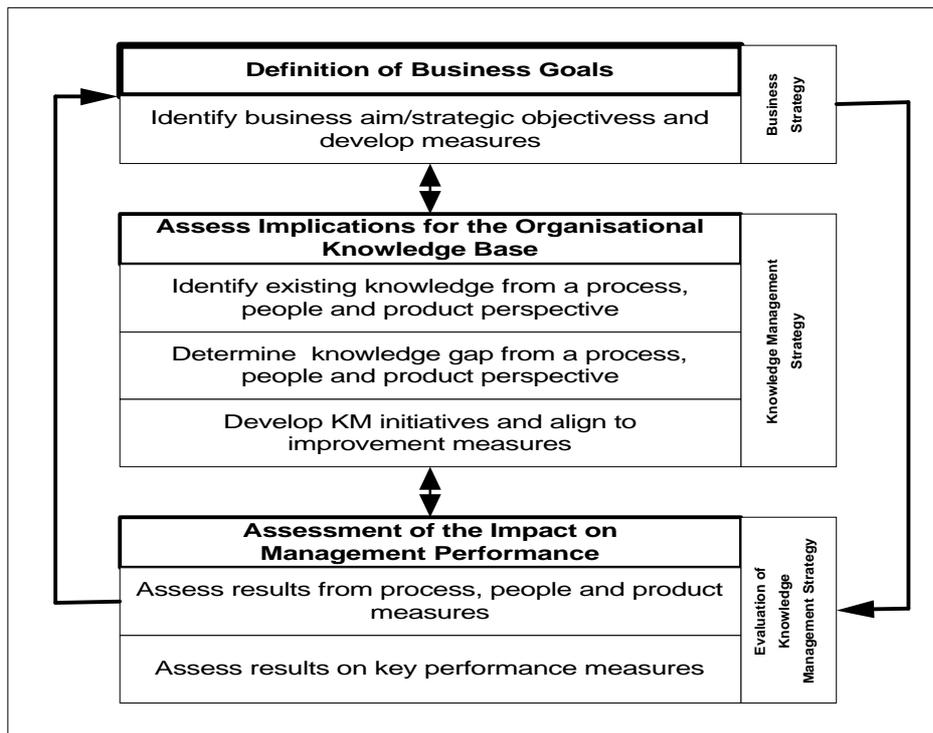
Figure 1: IMPaKT Framework

Table 1: Developing a business improvement strategy

STAGE ONE STEPS
1.1 Choose a business problem with a knowledge dimension. This is achieved by asking whether there is any knowledge the organisation ought to have to improve the situation or solve the problem
1.2 Place the business problem in a strategic context by relating it to your external business drivers, strategic objectives and critical success factors
1.3 Select an appropriate set of measures to monitor progress towards achieving your strategic objectives, and identify the business processes they relate to
1.4 Identify previous, current, target and benchmark scores for various performance measures and establish the performance gaps

Steps 1.1 to 1.4 are supported by detailed guides such as a glossary to facilitate the understanding of key terms of the Framework, a sample of performance measures with their metric definitions and examples of possible benefits arising from improvement in key performance measures.

The first step in Stage 1 is to choose a business problem and to analyse the knowledge dimension of the problem. KM problems are business problems that are associated with, related to, or caused by a dysfunction in the processes of obtaining/capturing, locating/accessing, sharing or the application of knowledge. The next step involves putting the business problem in its strategic context by identifying the organisation's external and internal forces. For example, the external business drivers (external forces) are the *key issues* influencing an organisation to achieve or cope with radical changes in the business environment. These issues could, for example, be technological (e.g. the need for innovation), market or structural factors (e.g. expansion/ downsizing), etc. The selection of measures for performance monitoring is also a crucial aspect of Stage 1. The improvement measures are driven by the firm's strategy and will therefore reflect the strategic objectives of the organisation.

4.2 Stage 2 - Developing a KM Strategy

The aim of Stage 2 is to clarify the whether the business problem has a knowledge dimension and to develop specific KM initiatives to address the business problem. The outcome of Stage 2 is a KM strategic plan with a set of initiatives and implementation tools to support business improvement. Table 2 shows a condensed version of the steps involved in identifying the knowledge implications of a business strategy and for developing knowledge management initiatives for business improvement.

Table 2: Identifying KM problems and initiatives

STAGE TWO STEPS
2.1 Clarify the knowledge dimension of your business problem by identifying the KM process(es) involved
2.2 Develop specific KM initiatives to address the business problem
2.3 Select possible tools to support the KM process(es) identified in the context of your business problem
2.4 Identify possible relationships between KM initiatives and performance measures and show how they relate to the strategic objectives (the Cause-and-Effect Map)
2.5 Prepare an Action Plan and identify change management and resources required

Steps 2.1 to 2.5 are also supported by detailed guides such as a questionnaire to identify the KM sub-processes involved, a matrix for the selection of the most appropriate KM tools and a checklist to identify possible barriers and facilitators prior to implementation.

Identifying the KM sub-processes associated with the business problem is the first step in clarifying a KM problem. Knowledge management consists of distinct but interrelated processes that are not linear but can be cyclical and iterative. Examples of KM processes are generate, propagate, transfer, locate and access, maintain and modify (Anumba *et al*, 2001). Others have used different classifications of the KM life cycle e.g. generate, codify and transfer (Ruggles, 1997); creation, location, capture, share and use of knowledge (Tiwana, 2000); discovery and capturing; organisation and storage; distribution and sharing; creation and leverage, retirement and archiving (Robinson *et al,*

2001). The next step is to identify the KM initiatives required. KM initiatives are systematic goal-directed efforts for addressing a KM problem in order to achieve business improvement. For example, a KM problem associated with client satisfaction could be improved by utilising more effectively information that already exists within the organisation about clients. It may also include other initiatives such as setting-up a post-tender forum with clients or project closure meetings to share information. A set of KM initiatives identified should align with the KM strategy. However, KM tools are required for the implementation of initiatives. A range of tools can be selected including both IT-based (hardware and software) and non-IT-based systems (Robinson *et al*, 2001). The hardware tools comprise the platform required to support an organisation's knowledge management strategy. The software tools vary from simple databases and groupware to intelligent decision support systems such as expert systems and business intelligence tools. The non-IT-based systems will focus on such tools as informal dialogue, mentoring, communities of practice, formal network meetings and research collaboration forum to harvest new ideas. It is also vital to assess an organisation's readiness before a KM strategy is implemented. An appropriate knowledge management context should be developed and its readiness assessed against the *reform* needed, *resources* required and *results* monitoring mechanism in place prior to the implementation of KM. KM is useful but there is a need to have the necessary reform in place, have adequate resources and to be able to demonstrate the benefits through a result-oriented approach.

4.3 Stage 3 - Developing a KM Evaluation Strategy and an Implementation Plan

The aim of Stage 3 is, therefore, to provide a structured approach for evaluating the impact of KM initiatives on business performance. The outcome of Stages 1 and 2 of the IMPaKT Framework is a business improvement strategy underpinned by KM. The outcome of stage 3 is a KM strategy and an implementation plan with priorities and an appreciation of likely impact of various KM initiatives on business performance or key performance measures. This stage is the most challenging, as the justification of KM initiatives depends on the expected benefits (e.g. performance improvement). Two distinct types of performance measures are identified; measures of effectiveness and measures of

efficiency. Measures of Effectiveness are outcome-based measures relating to the degree to which target performance measures are achieved but does not take account of the cost of implementation. Measures of Efficiency are process -based measures relating to the nature of the KM system used in implementation and are a ratio of expected benefit or utility per unit of KM investment. It is, however, recognised that organisations at the embryonic stage of KM may not have a full-scale measurement framework but may need to start with basic qualitative performance measures to demonstrate the benefits (APQC, 2001). More concrete measures may have to be developed as an organisation progresses to a transformation stage where KM implementation is mature and well co-ordinated. Table 3 is a condensed version of the steps for KM Evaluation.

Steps 3.1 to 3.5 are supported by various guides developed such as a KM cost and benefit component checklists, and a KM guide to evaluation/assessment techniques.

4.3.1 Measures of Effectiveness

KM strategies need to be aligned to strategic objectives. These links will enable an assessment of the effectiveness of KM in terms of the degree to which strategic

objectives are realised. The Cause-and-Effect Map (Figure 2), showing possible relationships between KM initiatives, performance measures and the strategic objectives they relate to, forms the basis for determining the contribution of each KM initiative to the performance measures.

Table 3: Developing KM evaluation strategy and an implementation plan

| STAGE THREE STEPS |
| --- |
| 3.1 Use the Cause-and-Effect Map developed in 2.4 to assess the likely contribution of the KM initiatives to the performance measures |
| 3.2 Assess the probability of success of your KM initiative in improving your performance measures (the effectiveness measure) |
| 3.3 Identify the cost components for implementing each KM initiative and the possible benefits (the efficiency measure) |
| 3.4 Choose an appropriate method to assess (ex-ante) the impact of each KM initiative on your business performance |
| 3.5 Prioritise your KM initiatives based on the two measures of performance |
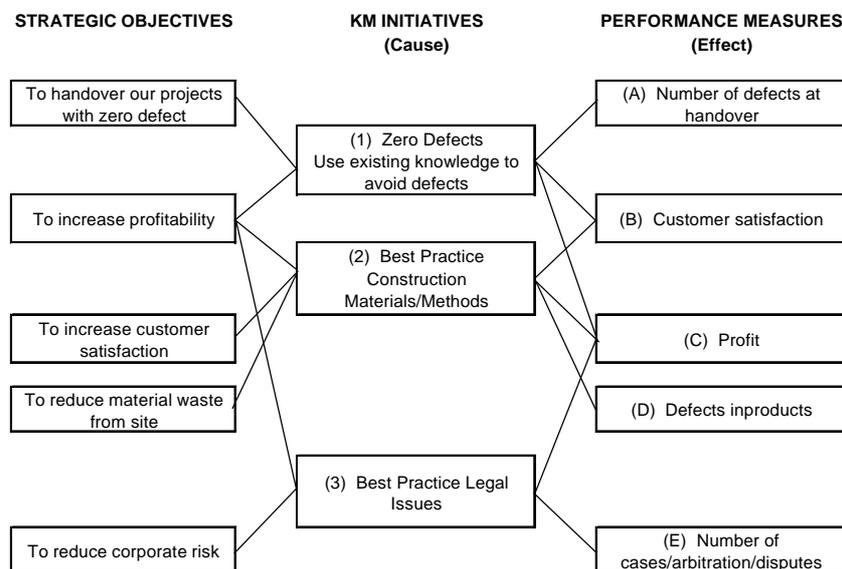
Figure 2: Cause-and-Effect Map

The first step in the assessment process is to identify the cause-effect relationships. The second step is to evaluate the impact quantitatively or qualitatively. A KM initiative may have varying impact on performance measures i.e. the impact of an initiative may be

greater in some than others. The impacts or contributions are determined using direct weighting techniques such as ranking and rating.

4.3.2 Measures of Efficiency

Determining the contribution of a KM initiative in improving performance score is not sufficient on its own to make strategic decisions, particularly where there are other competing initiatives and resource constraints. The efficiency of the process used to implement the KM initiatives should also be evaluated. This will also help uncover the real costs of KM initiatives. Information technology (IT) tools and technologies form one third of the time, effort, and money that is required to develop and use a KM system (Tiwana, 2000).

'Information technology costs is the most obvious, but the bigger, and often, hidden costs are associated with people' (APQC, 1997) and the related time/cost associated with setting up human interactive systems and process reengineering or adjustments to core and supporting business processes. There are various inputs or cost components of a KM initiative as outlined below:

KM team component represents the cost associated with both the core (e.g. knowledge managers) and support team (e.g. IT personnel) required for implementing knowledge management initiatives.

KM infrastructure component represents the costs associated with providing the setting up IT and non-IT systems to provide knowledge creation and sharing capability.

There are different types of cost associated with KM such as staff costs, organisational or (re)organisational costs, hardware and software costs. As different KM hardware and software tools are used for the implementation of KM initiatives, consideration should be given not only to their appropriateness in terms of functionality (i.e. ease of use, integration, focus and maturity) but, also cost. Costs could be direct or indirect, one-off/lump sum (e.g. purchase and initial installation cost of hardware and software, consultant's fee etc.) or recurrent/periodic (e.g. hardware/ software maintenance costs, staff costs etc) or occasional costs (e.g. hardware upgrades, support staff costs etc).

There are also different types of benefits to be expected such as:
People e.g. direct labour saving, reduction in staff turnover;
Processes e.g. direct cost savings, increased productivity;
Products e.g. direct cost savings, increased sales; and
Other e.g. repeat customers, new customers.

4.3.3 Evaluation Methods

The aim of evaluation is to identify the input i.e. the nature of KM initiatives and their output i.e. the consequences (both positive and negative) in terms of changes in performance or contribution to business benefits or losses. Table 4 shows the various evaluation techniques included in the framework.

Table 4: Evaluation Techniques

Evaluation Technique	When to use it
Cost minimisation analysis: This involves a simple cost comparison of KM initiatives as it is assumed that the consequences (outputs) are identical or differences between the outputs are insignificant. It does not therefore take account of the monetary value of the consequences (outputs).	When output of KM initiatives are identical in whatever unit of measurement is used.
Cost effectiveness analysis: This involves the comparison of KM initiatives where the consequences (output) are measured using the same natural or physical units. The assumption is that the output is worth having and the only question is the cost of the input to determine the most cost-effective solution.	When output of KM initiatives are measured in the same natural or physical units e.g. number of accidents prevented, reduction in absenteeism or waste, training man-hours, etc.
Cost utility analysis: This involves a comparison of KM initiatives (inputs) which are measured in monetary units with the consequences (outputs) measured using utility or a preference scale. Utility refers to the value or worth of a specific level of improvement measured by the preferences of individuals, teams or organisation with respect to a particular outcome.	When a significant component of the output *cannot* be easily measured, quantified or expressed in monetary units. Useful in making internal comparison between divisions when there is, for example, a decision to introduce a pilot project within an organisation.
Cost benefit analysis: This approach provides a comparison of the value of input resources used up by the KM initiative compared to the value of the output resources the KM initiative might save or create. Consequences of KM initiatives are measured in monetary terms so as to make them commensurate with the costs.	When a significant component of the output *can* be easily measured, quantified or expressed in monetary units. Useful in determining return on investment (ROI), Internal Rate of Return (IRR), Net Present Value (NPV) or Payback Period of KM investments.

A number of these techniques can therefore be recommended in the framework depending on

(a) the existing techniques used by the

organisation and (b) the level of detail required in evaluating the KM initiative.

5. Framework evaluation

As part of the research programme, two one-day workshops were planned for the development of the IMPaKT framework. The first workshop was conducted at the end of the first year of the research project to assess and refine the initial concept and to provide ideas for the detailed development of the framework. A second workshop was held at the end of the second year. This was an evaluation workshop aimed at assessing the robustness of the framework that has evolved. Participants familiar with KM and business improvement issues were invited to the workshop following a consultation with the project's industrial collaborators. There were thirteen participants including a director of technical services, senior business improvement and knowledge managers, account manager, business systems and IT managers, both from the construction and manufacturing industries. Over three-quarters of the participants has a high level of awareness on KM (76.9%) and business improvement (84.6%) issues.

5.1 Evaluation Methodology

The evaluation workshop started with a presentation of the outline of the framework, a workshop brief and workshop manual consisting of tasks list with supporting diagrams and guidelines. Participants were organised into four teams of three to four people, with research team members acting as workshop facilitators. The workshop was divided into two sessions. Session 1 was based on the use of Template 1 to develop a business improvement strategy with a KM response, and covered Stages 1 and 2 of the framework. Session 2 was based on using Template 2 to develop a KM evaluation strategy and an implementation plan and covered Stage 3 of the framework.

Each group was asked to choose a business problem with a knowledge dimension and to structure the problem using a template provided by the IMPaKT framework. Each team went through the evaluation exercise using different examples of business problems. At the end of the workshop, a group discussion was held to identify issues regarding the use of the templates and an evaluation questionnaire was given to participants to complete. The evaluation questionnaire consisted of statements reflecting key aspects of the framework's capabilities. Participants were asked to rate each statement with respect to the degree to which they agreed or disagreed with it and to provide suggestions for improving the framework.

5.1.1 Findings and Feedback

The results based on the analysis of the evaluation questionnaires completed by the workshop participants are shown in Figures 3 to 6. The questionnaire used a rating scale from 1 (strongly disagree) to 5 (strongly agree).
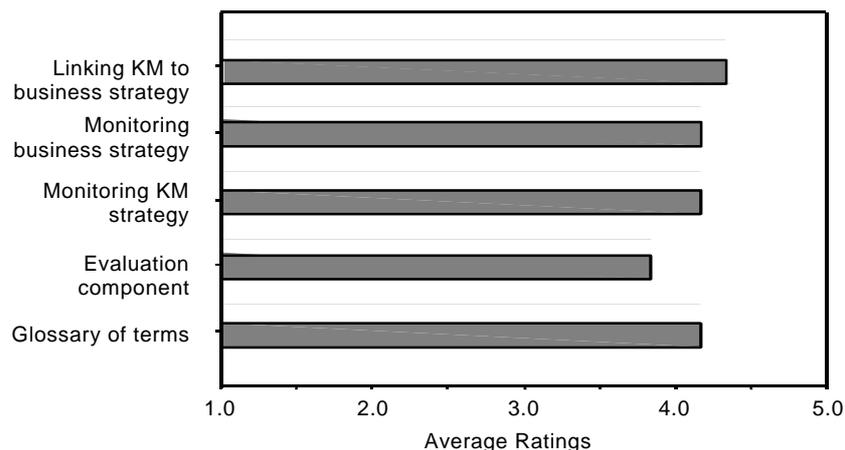
Figure 3: Average ratings of key components of overall framework

The overall approach of the IMPaKT framework was rated well in terms of the framework's capabilities to link business improvement and knowledge management, and for developing and monitoring business improvement and knowledge management strategies (see Figure 3). The glossary of terms accompanying the framework was

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considered helpful in the evaluation process. However, there were some concerns about the terminology. It was suggested that simplifying or refining some definitions could help as some of the terms used could mean different things to different people or organisations. The evaluation component was also found to be useful, although, it was rated slightly lower than the other aspects of the framework. It was noted that the development of the framework represents a significant attempt to conduct a structured approach to assessing the benefits of KM to be able to convince senior managers, Detailed findings of the components of the framework are presented in subsequent sections. Figure 4 is a summary of the average ratings for Stage 1 of the framework.
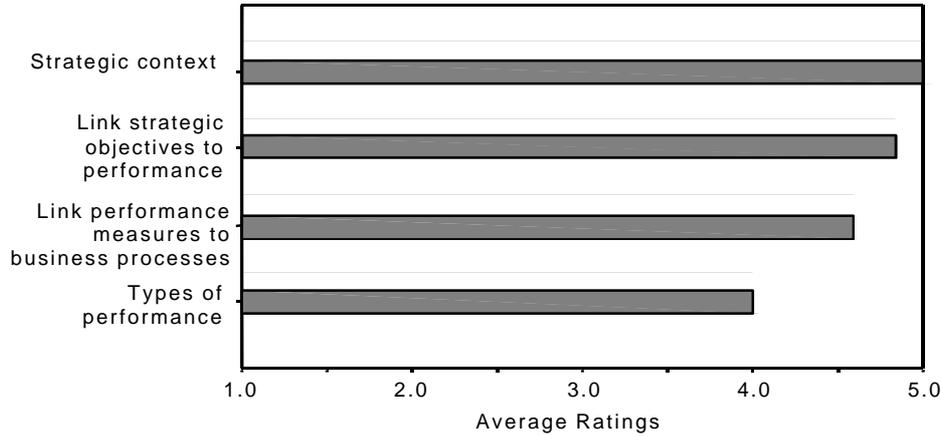
Figure 4: Average ratings of key components in Stage 1

All of the participants strongly agreed that the framework allows an organisation to be able to put its KM/business problems into a strategic context. The need to align the strategic objectives of an organisation to performance measures, and to be able to relate performance measures to the business processes they impact on, was also found to be useful aspects of the framework, as the ratings for both are high. The performance monitoring aspect encapsulating the different types of performance scores (previous, current, target and benchmark scores) were also considered to be important, although the average rating of 4.00 is not as high as other aspects.

Figure 5 is a summary of the average ratings for key aspects of Stage 2 of the framework. The KM clarification process was found to be useful, so are the KM tools required in the implementation as part of a business improvement strategy.
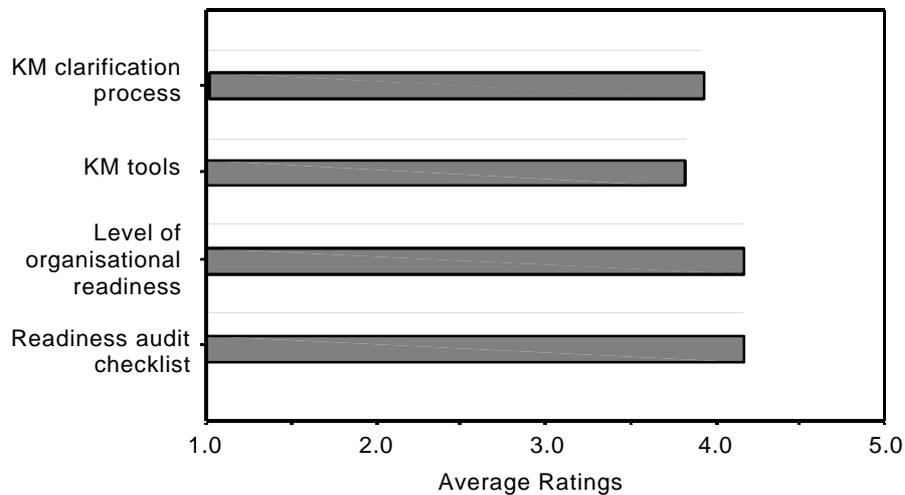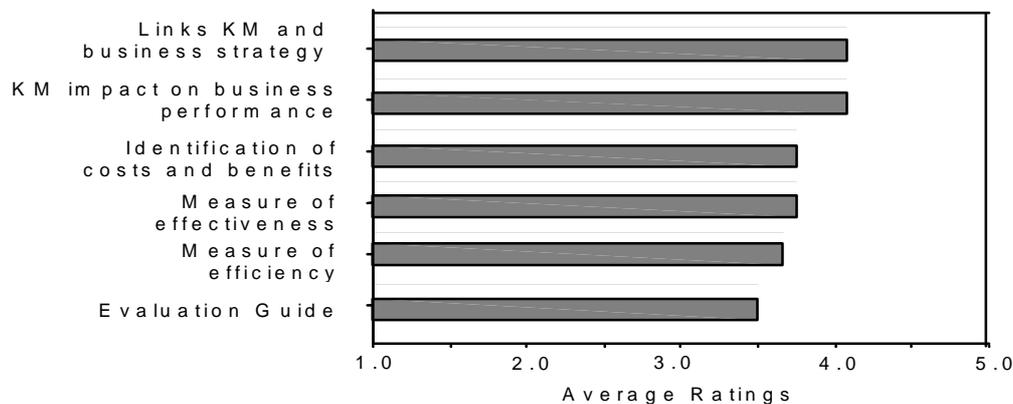
Figure 5: Average ratings of key components in Stage 2

Another key issue is the level of organisational readiness to implement KM. This is relevant since, regardless of the enthusiasm and resources directed towards improving KM, these efforts may not be successful because there may be fundamental technical and social issues that need to be addressed. For example, installing a skills yellow page could bring benefit but if employees are not willing to provide updates of their experience then the skills yellow pages will rapidly become outdated. Participants agreed that organisational readiness is not only a very significant factor to consider prior to implementing a KM strategy, but the accompanying checklist provided was useful in identifying the barriers and facilitators to KM. Template 1 for stages 1 and 2 of the framework was considered quite clear and very useful in working through the issues or problems selected. One participant commented that it was 'useful thought process to go through, well focussed and easy to use'. Other participants noted that the template also provides a link with the external environment (external drivers) of an organisation and is a good template for a general business problem. However, it was suggested that in dealing with some of the issues arising, it is important for senior management to be involved especially for key strategic issues. Although the workshop was based on structuring hypothetical business problems, it was acknowledged that the framework could be more easily implemented in a company set up were real data is widely available. Figure 6 is a summary of the ratings for key aspects of Stage 3 of the framework.

Figure 6: Average ratings of key components in Stage 3

Average ratings of slightly over 4 shows that participants agreed that the framework does facilitate an understanding of the links between business improvement and KM, and also provides a basis to be able to assess the impact of KM. It was also found to be helpful in identifying the potential cost and benefits of KM initiatives. The measures of effectiveness and efficiency are thought to be good approaches for assessing the impact of KM on business performance. However, the ratings for the evaluation guide to help identify the most suitable techniques to assess the impact of KM initiatives was only slightly above average. Some participants simply focused on cost benefit analysis. This is, in part, due to their familiarity with, or popularity of cost benefit analysis (CBA) compared to other evaluation techniques.

6. Discussion

Template 2 was relatively more difficult to use compared to Template 1, although it was acknowledged that the intention is clear. Template 1 had undergone a number of iterations and pilot testing before being presented at the evaluation workshop. However Template 2 was relatively new thus the workshop proved a valuable exercise in providing areas for improvement. Some participants found it quite complex as evaluation is considered a difficult area. However, the Cause-and-Effect Map was found to be very useful as the starting point for the evaluation. It was also found to be useful to 'facilitate a structured way of thinking about a problem' and a 'good way to explain to management how everything is related - performance measures, initiatives and strategic objectives'. There were suggestions

that the Cause-and-Effect Map could also be used as a summary of the first session of the workshop based on Template 1. The checklist for identifying costs was found to be well laid out and helpful, although it was noted that the approach to costing might be different depending on the cost models used in individual organisations. The benefit side was more difficult to address, however, it was agreed that the checklist does help in providing some structure in the evaluation of benefits. Further refinement of the cost and benefit evaluation checklists will continue. But it was suggested that putting more details into it could probably make it more complicated and possibly renders it less credible. There was also some concern about the repetition on Template 2. However, due to the paper-based version being used in the workshop it was felt that certain aspects had to be repeated to assist participants but this problem will be overcome in an electronic/ automated version of the framework, which would also enhance delivery. Other suggestions include clarifying some of the headings to reflect the tasks list, and simplifying Template 2. Issues were also raised about how the framework could be introduced to senior management and the level of details of a KM implementation plan to be provided to senior executives.

All the recommendations made at the evaluation workshop have been addressed in the version of the template described in Tables 1, 2 and 3. The framework therefore provides a solid basis for developing KM strategies that are not only coherent but also consistent with the overall strategic objectives of an organisation. The next stage of the research involves refining the IMPaKT framework further, and developing an automated version and an IT architecture to facilitate the implementation of KM strategies, and integrating it into an existing KM tool called CLEVER. CLEVER helps organisations to identify specific KM problems and guides users through providing solutions to these problems (Anumba *et al.*, 2001).

7. Conclusions

The development of a three-stage Knowledge Management framework (IMPaKT) to enable the impact of KM on business performance has been presented and discussed. The robustness of the framework was assessed through a technical workshop with industrial collaborators and a post-workshop evaluation questionnaire. The findings based on the questionnaires analysed and the discussions provide sufficient evidence of the potential of

IMPaKT as a structured framework for developing a KM evaluation strategy as part of business improvement. The two measures of performance proposed to determine the effectiveness and efficiency of KM initiatives does not only ensure that appropriate initiatives are selected but enables the ranking of KM initiatives in terms of level of impact on business performance and on specific performance measures. The increasing number of organisations now implementing the Balanced Scorecard and the Excellence Model means that KM can be readily linked to performance measures. The initial focus of the work reported and the evaluation is based on analysis from both construction and manufacturing organisations. However, IMPaKT is a generic framework applicable to other sectors as well. Further development and fine-tuning of the framework will continue as part of the on-going KnowBiz Research Project.

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