

LINKING KNOWLEDGE MANAGEMENT STRATEGY TO BUSINESS PERFORMANCE IN CONSTRUCTION ORGANIZATIONS

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A growing number of construction organizations are using Key Performance Indicators (KPIs) and some also perceive knowledge management as an integral part of their strategy. However, the link between knowledge management (KM) and organizational performance has not been adequately addressed, as the evaluation of the impact of knowledge management on business performance has remained a difficult issue. A conceptual Knowledge Management framework (IMPaKT) is presented that encapsulates knowledge from people, process and product perspectives to facilitate an understanding of the interrelationship between the various types of organizational knowledge. An evaluation component is also incorporated into the framework to enable an assessment of the likely impact of KM initiatives on organizational performance. It is concluded that the conceptual framework when fully developed can make a valuable contribution to the development and implementation of KM strategies that will provide benefits to construction organizations.

Keywords: knowledge management, KPI's, performance measurement, business goal

INTRODUCTION

There has been a significant growth in knowledge management (KM) literature reflecting its strategic importance to modern organizations in the knowledge economy. The Key Performance Indicators (KPIs) recently developed for the construction industry is also a reflection of the growing importance attached to performance issues. Recent initiatives such as the Construction Best Practice Programme and Construction Productivity Network are in response to the increasing need to share knowledge of best practice in the construction sector and to improve performance. But these initiatives may not have the desired impact unless knowledge management is taken seriously. A growing number of large construction organizations now perceive KM as an integral part of their competitive strategy for providing long-term benefits.

But KM initiatives have to be integrated into a business performance measurement system to be able to assess its benefits. Carrillo, Anumba and Kamara (2000) suggested that KM could be integrated into KPIs, and other performance measurement approaches. However, a key issue in the implementation of KM strategies is the

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evaluation of the likely benefits, which has not been adequately addressed. KM approaches adopted have often been ad hoc without a coherent framework for performance evaluation. Also, the link between KM and business performance is not well understood. This paper explores the issues to be considered in the development of a KM strategy, and proposes a conceptual framework to assess the benefits of KM initiatives as part of an on-going research project¹. It starts with an outline of the research methodology and the literature review identifying the role of KM in the business context. The alignment of KM initiatives to business drivers and performance measures within the proposed KM framework, the role of KM tools as well as the evaluation of their impact on business performance, are then discussed.

RESEARCH METHODOLOGY

This study is part of an ongoing research project using a variety of research methods including literature review, questionnaire survey and semi-structured interviews for the development of a KM framework for construction organizations. The literature review identified the types of organizational knowledge - people, process, and product knowledge - which are relevant in the context of construction organizations. Key aspects of the knowledge management process as well as the elements of a performance measurement system are also reviewed.

A questionnaire survey was undertaken to identify important aspects of KM strategies and business performance measurement models in construction organizations. The questionnaire, which was sent out to senior managers and directors of large construction organizations, identified key elements and factors that could hinder or facilitate the successful implementation of KM strategies and performance measurement models. Through extensive collaboration with industrial partners, priority issues in KM and business performance measurement, as well as existing and potential interactions between KM strategies and business performance measurement, were also discussed. The literature review, the elements and issues identified through the questionnaire survey and semi-structured interviews will form the basis for developing a detailed KM framework. The applicability of the KM framework will be validated through case studies using data and information provided by industrial collaborators.

KNOWLEDGE MANAGEMENT IN THE BUSINESS CONTEXT

The growing body of literature on knowledge management reflects its strategic importance in the new knowledge-based economy. Knowledge management (KM) is an approach that evaluates an organization's processes, people, and products in order to capture and share key business knowledge to improve organizational performance (Robinson *et al.*, 2001).

It is underpinned by an organizational capabilities approach which emphasizes innovation, learning and competence as the basis for improving business performance (Leavy, 1996). According to King (1999) the core of knowledge management 'involves the acquisition, explication, and communication of mission-specific professional expertise in a manner that is focussed and relevant to an organizational

¹ The KnowBiz Project is aimed at understanding the relationship between knowledge management and business performance: www.lboro.ac.uk/KnowBiz

participant who receives the communication'. There are five distinct sub-processes in the knowledge management lifecycle; discovering and capturing; organizing and storing; distributing and sharing; modifying and applying, and retiring and archiving. There are also three important aspects to be considered in the implementation of a knowledge management strategy; determining the types of knowledge an organization needs, developing a strategy to manage that knowledge, and evaluating the effectiveness of the strategy.

Organizational capital and knowledge

Organizations manage both tangible organizational capital (buildings, plant, equipment etc.) and intangible organizational capital. Whilst tangible organizational capital remains essential for the production of goods and services, intangible organizational capital is increasingly seen as a major source of competitive advantage as it represents a significant proportion of the market value of some organizations (Tiwana, 2000). Intangible organizational capital is therefore crucial in a knowledge-centric environment, and needs to be understood in order for it to be properly managed. It has three interrelated dimensions, human capital, structural capital and customer capital (Stewart, 1997). Knowledge that is in people's head, often referred to as human capital, is acquired mainly through education, training and experience. Structural capital is inherent in processes, the so-called non-human storehouses of knowledge including organizational manuals, procedures and databases. Customer capital refers to knowledge acquired through marketing channels and customer relationship (clients and society).

Knowledge management strategy

An integrated approach to KM that reflects the business context - processes, products and people - is necessary to transform organizational knowledge into productive knowledge (Robinson *et al.*, 2001). The type of process, product or people employed in an organization have implications for the type of knowledge to be managed, which in turn influences the KM strategy. This knowledge can be classified into two distinct types; tacit (implicit) knowledge and codified (explicit) knowledge. Tacit knowledge is stored in the minds of individuals and is difficult to communicate externally or share. Codified knowledge is captured or stored in an organization's manuals, procedures, customer databases, and is therefore, more easily communicated or shared with other people or parts of an organization. Organizational knowledge is a mixture of codified knowledge and tacit knowledge about people, processes and products. The knowledge base of an organization is therefore a function of the procedures designed to capture knowledge about processes, products, as well as, people because knowledge primarily resides in individuals. Information technology (IT) is an important enabler necessary to support the knowledge management process (see Figure 1).

The key to developing a successful KM strategy is, therefore, to understand the different types of organizational knowledge about processes, products and people, and to identify the key business knowledge. A range of strategic options can be considered, from computerization to personalization (see Figure 2). Computerization, at one extreme, revolves around IT- the software and hardware tools - for managing knowledge. Personalization, at the other extreme, revolves around human and organizational factors with IT helping to facilitate the communication of knowledge (Hansen, Nohria and Tierney, 1999).

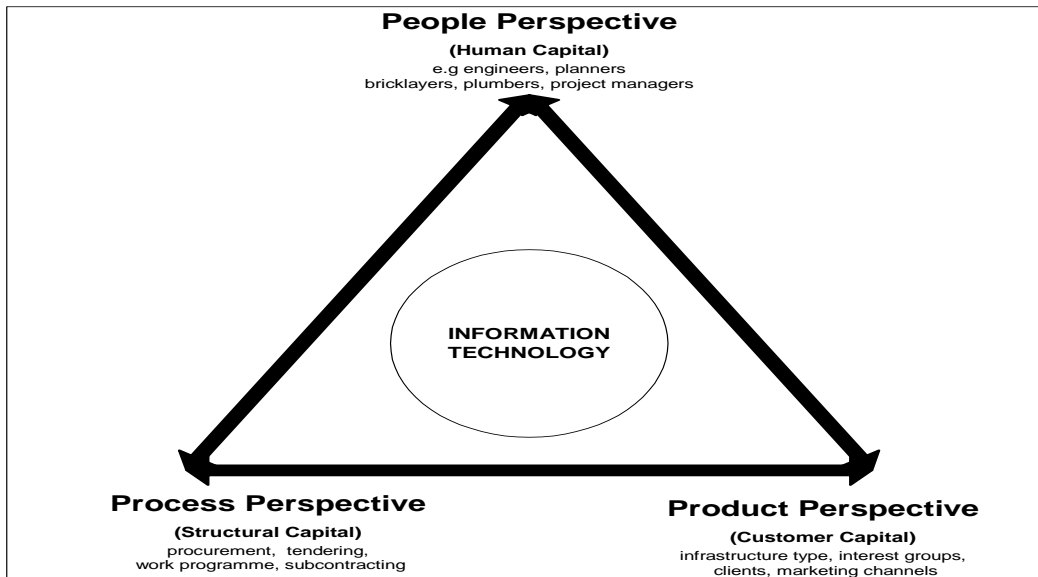


Figure 1: Organizational Knowledge Base
Source: Adapted from Robinson *et al.* (2001)

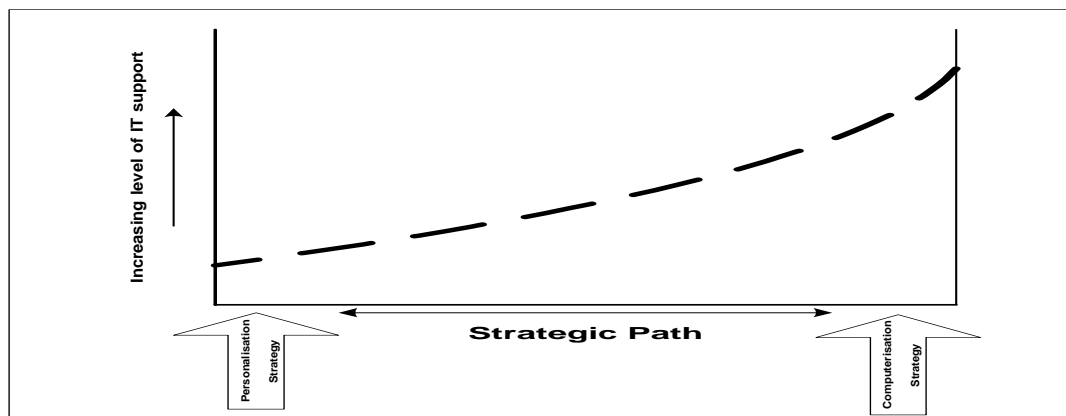


Figure 2: KM Strategic Options

The evaluation of the KM strategy would require an assessment of the impact of specific KM initiatives on performance measures. This would further require the development of a performance management system integrated into the KM framework. This is discussed in the subsequent sections.

PERFORMANCE MEASUREMENT SYSTEMS

Performance improvement has been the subject of recent construction industry reviews. The Construction Best Practice Programme and Construction Productivity Network have also identified knowledge sharing as an important mechanism for facilitating continuous performance improvement. The drive for continuous improvement is gaining momentum as organizations are not only expected to deliver projects within a given time and allocated budget but also to a high quality, required by increasingly demanding clients. But quality is not simply a problem to be solved, it is a competitive opportunity (Gavin, 1987), and is also an integral part of performance management. There are two elements to a performance measurement system. Firstly, the performance issues need to be identified i.e. performance indicators, and secondly, the performance issues should be measurable. Quality does not improve unless it is

measured (Reicheld and Sasser, 1990), and 'what gets measured gets attention, particularly when rewards are tied to the measures' (Eccles, 1991). Measurement has therefore been an integral part of performance improvement but it is often the financial aspects that are measured.

Multi-dimensional performance measures

The dominance of financial measures in performance measurement is largely driven by practices in traditional accounting systems with a disproportionate emphasis on short term indicators such as cash flow, profit, return on capital employed, turnover and quarterly earnings (Whiting, 1986). However, it is now increasingly recognized that traditional financial measures are no longer sufficient for understanding the dynamic business environment in which organizations have to operate (Butler, Letza and Neal, 1997). There is growing evidence that other non-financial indicators are becoming important to investors, shareholders, employees and other stakeholders.

Reliance on financial indicators as key performance measures can, at best, result in short term benefits. However, this is often at the expense of understanding the key connections to process, product and people measures that influence financial performance. Such short-sightedness can have adverse effects on the long-term competitive opportunities, as organizations with a limited performance-based approach tend to pay less attention to other crucial aspects of their business. This point is also illustrated by Sommerville and Robertson (2000) who argued that 'an organization adopting the principles of Total Quality Measurement (TQM) quickly appreciates that financial measures on their own are very limited in reflecting the wider aspects of achievements and progress in general'.

Performance measurement models

Measurement of people, product and process performance in business is essential in identifying areas for improvement, and more significantly for monitoring continuous improvement. However, most businesses lack rigorous performance measures for their processes (Hammer and Stanton, 1999). This has recently been recognized by Kueng (2000) who developed a conceptual tool for process measurement. The lack of rigorous performance measure is an argument that is also valid for product and people factors. The need for comprehensive performance measurement approaches has also recently led to the development of key performance indicators (KPIs) for construction. Hoxley (2000) developed a 26-item scale for assessing quality in construction professional service organizations. Sinthawanarong (2000) also developed a methodology using indicators reflecting cost, time, safety and quality factors as the most crucial variables determining construction project performance. These approaches reflect a growing concern in the construction industry that performance is a multi-dimensional measure. However, the Balanced Scorecard developed by Kaplan and Norton (1996) and the Excellence Model developed by the European Quality Foundation (EFQM, 1999) are more holistic and robust approaches reflecting the need for organizations to focus on the wider business environment. The Balanced Scorecard allow managers to assess performance from four important perspectives; a customer perspective, financial perspective, internal business perspective and innovation and learning perspective (Butler, Letza and Neal, 1997). The Excellence Model is also based on a wide range of measures such as leadership, product, processes, policy and strategy, people and society issues to assess performance.

TOWARDS A KNOWLEDGE MANAGEMENT FRAMEWORK

An effective knowledge management strategy should not only be able to capture, organize and share the various types of knowledge relevant to the business context - processes, products and people, but must be linked to a performance measurement system, for an organization to be able to evaluate its benefits. A conceptual framework has been developed to meet this need. The 3-stage approach in the IMPaKT (Improving Management Performance through Knowledge Transformation) framework is presented in Figure 3.

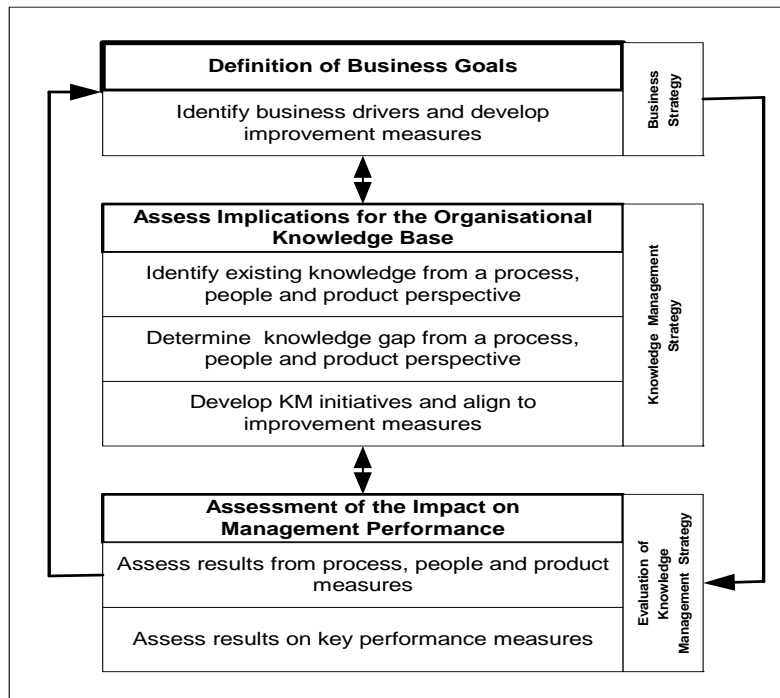


Figure 3: The IMPaKT Framework

The framework recognizes that to be able to assess the *impact* of knowledge management on organizational performance requires defining business goals and identifying business drivers, developing improvement measures linked to business drivers, as well as developing an evaluation method.

Definition of business goals

The first stage involves defining the business goals, identifying business drivers and developing measures for improvement. The improvement measures are driven by the firm's strategy. An organization's vision or mission statement is of limited value unless translated into a strategy. The strategy forms the basis for defining business goals, which could be financial, safety, people, project, innovation or shareholder driven. These 'drivers' are then used for developing specific improvement measures to assess progress and to continuously monitor performance. For example, measures for project could be size of new contracts, bid/success ratio, cost and time overrun. Similarly, measures for people could be staff retention, number of staff with professional qualifications, attendance on continuous personnel development programmes, and employee satisfaction.

Development of KM strategy

The second stage of the IMPaKT framework involves assessing the implications for the organizational knowledge base in terms of the current knowledge that exists ('as-is situation') and future knowledge required ('to-be situation') from the people, process and product perspectives. Knowledge management has several dimensions – strategic, tactical and operational.

The strategic dimension is concerned with what types of knowledge an organization needs, and how that knowledge can be obtained and organized to create and sustain a competitive advantage, and to achieve its business goals. The tactical and operational dimensions are more focused on transforming knowledge, and relate to the tools required for activities such as the creation, capturing, sharing and the application of knowledge (Wigg, 1997). Construction organizations, through projects and services offered to clients, deal with all types of intangible capital - and require current and future knowledge from the processes, products and people perspectives. The starting point of a KM strategy is therefore to develop knowledge maps to capture existing knowledge, and to identify knowledge gaps from a process, people and product perspective. The processes involved could be standardized or diversified (Hammer and Stanton, 1999), whilst products could be standard, traditional or innovative (Bennett, 1991, Fisher, 1997). People possessing various types of skill (managerial, professional or operative) are also involved. In order to improve performance in construction organizations, knowledge about best practice on a range of process, product or people issues have to be shared, and this knowledge may be either codified or tacit knowledge. Codified knowledge includes design codes of practice, manuals on construction standards and customer database whereas tacit knowledge includes the unrecorded experience of estimating and tendering, individual knowledge acquired over time through dealing with customers, constructing a new facility and work programming skills. There is a long tradition of apprenticeship and professional training schemes in the construction industry responsible for producing competent craftsmen and professionals often relying on tacit knowledge to solve problems.

An important factor at the tactical and operational level of KM is to determine how existing and additional knowledge can be located, shared and applied to create competitive advantage and improve organizational performance using KM tools.

The KM tools are enablers and include both IT-based and non-IT based systems. Examples of the tools are shown in Table 1. The hardware tools (KM infrastructure) comprise the platform required to support an organization's knowledge management strategy whereas the software tools build on the KM infrastructure. The criticalware tools focus on the non-IT-based systems often influenced by organizational culture. These tools interact to varying degree in a complementary way in the implementation of an organization's KM strategy.

Evaluation of KM strategy

The third stage of the IMPaKT framework deals with the evaluation of the impact of KM initiatives on people, process and product measures as well as on the overall organizational performance. An increasing number of construction organizations are implementing the Balanced Scorecard and the Excellence Model; these could provide a good basis for assessing the impact of KM strategies on organizational performance. As a result of this development, construction organizations are beginning to focus on a range of quality measures reflecting product issues (e.g. defect rates, client satisfaction, society aspects), process issues (e.g. safety, procurement), people issues

(e.g. employee satisfaction and involvement) to be able to measure performance in a multi-dimensional way. Some large construction organizations are also redefining their strategy, as product measures (e.g. customer capital) are becoming increasingly important. These organizations recognize that a customer-focused approach through feedback from satisfied as well as disaffected customers can direct attention to key issues and help develop vital customer capital to continuously improve performance (McCull-Kennedy and Schneider, 2000). Product measures are also related to process and people measures, as constant product innovation through better targeting of customers can drive changes in processes which in turn can stimulate process actors (people) to become more active in learning and sharing knowledge of best practice, and searching for new knowledge. This can also lead to the identification of a 'knowledge and innovation champion' - a crucial mechanism for the sharing and transferring of knowledge in construction organizations (Egbu, 2000).

Table 1: Examples of KM Tools Associated with the KM Life-cycle

KM stage	Hardware	Software	Criticalware
Discovering, Locating & Capturing	Computers	Push technology	Recruitment
	Telephone & operating systems Pagers	Document management Database Internet, extranet and intranet	Face-to-face interviews One-to-one conversation/ dialogue
Organizing & Storing	Computers	Database	Skills yellow pages
	Voice processing machines Answering machines Pagers Audiotape & videotape Filing and storage system	Document management system Internet, extranet and intranet	Telephone directory
Sharing & Transferring	Computers	Groupware & shareware	One-to-one conversation/ dialogue
	Phones Fax machines Video conferencing facilities Networks & Servers	E-mails Internet, extranet and intranet Electronic discussion forum	Communities of practice Job rotation system On-the-job observation, training & mentoring scheme/ employee transfers Conferences/ seminars
Modifying & Applying	Computers	Case based reasoning	Brainstorming
	Networks	Expert systems/ simulators Datamining	Networks of people/ meetings Research Collaboration forum
Archiving & Retiring	CDs	Database	Manual record
	Floppy/Hard Disks Servers		management system Filing and storage systems

Source: Robinson *et al.* (2001)

This stage is absolutely crucial, as the justification of KM initiatives depends on how much benefit is expected. Different KM tools are used for the implementation of KM initiatives but consideration should be given to their appropriateness in terms of functionality and cost. KM initiatives have to be evaluated in terms of the cost of implementation and expected benefits, for example, in terms of cost and time savings, personnel and operational savings and revenue enhancement. The evaluation can

involve a combination of various methods from directly quantifiable measures to non-quantifiable (qualitative) measures.

CONCLUSION

Developing and implementing a knowledge management (KM) strategy can create significant competitive advantage but assessing the benefits of such strategies remains a major obstacle in deciding when, where, what and how to implement a KM strategy. This paper has argued for an integrated Knowledge Management framework (IMPaKT) incorporating an evaluation component, so that the impact of KM on organizational performance can be assessed. The key issues in the development and implementation of a KM strategy and a performance measurement system for construction organizations are discussed. A conceptual framework is presented, which provides the basis for developing KM strategies that are not only consistent with the overall business goals and drivers, but also aligned to business performance measures. Further development of the conceptual framework presented here is being addressed as part of an on-going research project, through extensive collaboration with industrial partners and will be tested using data and information provided from case studies.

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