

# LEARNING FROM KNOWLEDGE MANAGEMENT AND TRANS-ORGANIZATIONAL INNOVATIONS IN DIVERSE PROJECT MANAGEMENT ENVIRONMENTS

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We move towards the next millennium with a growing body of clients who are knowledgeable about the type of products, services and technologies required for their businesses. This increasing body of clients with higher levels of expectations and needs creates challenges for providers of clients' services and products. Organizations have to compete to 'win work' and satisfy the needs and expectations of clients. Evidence from governments (nationally and internationally), research and practice also suggests that organizations will be faced with increasing competition. There is also the view that organizations that survive and have competed favourably in the late 1990s have largely done so by being innovative, by having a good customer focus, and by being able to manage the 'knowledge' and intellectual capital of their workforce. This trend is likely to continue well into the new millennium. The paper reviews the literature on knowledge management and innovation from a 'project management' context. It puts forward a framework describing the relevant research issues and methodologies under consideration in an on-going preliminary research study which attempts to investigate how organizations involved in 'project management' activities learn from innovations and knowledge management. The paper argues, from a research point of view, that benefits could be derived from employing a combination of research strategies, including cognitive mapping methodology, in eliciting relevant information on innovation and knowledge management from practitioners from different industrial settings who are involved in 'project management' activities. In terms of improving value-added to construction clients and for improving construction competitiveness, the paper concludes that the construction industry can benefit from a concerted effort directed at knowledge management. There is very little evidence of empirical studies directed towards this area, especially from a human resource perspective. There is therefore ample scope for research and education in the construction industry in the knowledge management domain.

Keywords: innovation, knowledge management, learning organization.

## INTRODUCTION

The concepts of 'innovation' and 'knowledge management' from a project management perspective have grown in popularity in recent years alongside a general appraisal of the importance of intellectual capital within organizations that offer project management services. Construction clients are increasingly becoming aware of construction processes and products. Their needs and expectations are also greater. Innovation, in terms of process and products, services, technology and markets is seen as a way of meeting clients' demands. Innovation is the successful exploitation of ideas, where the ideas are new to the 'unit of adoption'. For organizations that provide project management services to clients, innovation is also seen as a means of keeping ahead of the market and for gaining competitive advantage (Egbu *et al.* 1998a, 1998b,

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1998c). Project management in this paper means the planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve project specific objectives (BS 6079).

Organizations that offer project management services (hereafter referred to as project management organizations) increasingly need to think about how they organize their division of knowledge and expertise. They also need to develop and manage employees as specialists, with specific combinations of knowledge and expertise built from training and experience, and to best harness this knowledge and expertise to fulfil corporate objectives and add value to the services offered to clients.

The role and importance of knowledge as the key source of potential advantage for organization and for the society at large is not something new. It was Peter Drucker who coined the term 'knowledge worker' some 40 years ago. Almost four decades later, Drucker (1995) points out that "knowledge is the only meaningful economic resource". It follows that for organizations, the processes by which knowledge is created or acquired, communicated, applied and utilized must be effectively managed. Quintas *et al.* (1997) have argued that "the idea that knowledge may be managed is clearly fundamental to the related notions of learning organization, the knowledge-based business, the management of intangible assets and of intellectual capital". It is important for organizations to recognize or discover the assets that they have or are not using to their full potential. These include employees, information, patents, copyright, brands, R&D, licensing opportunities, and innovative use of assets such as databases. These provide opportunities for organizations to innovate, improve project methodologies, to cut costs, to save design time and reduce time to market.

For project management organizations to transfer knowledge across organizational boundaries, it is important that they address the 'boundary paradox' (Quintas *et al.* 1997). These organizations will have to be open to information and knowledge flows from both networks and markets on both formal and informal bases. At the same time, they must protect and preserve their intellectual capital and knowledge base because it is upon this latter point that survival depends.

In this paper, we consider knowledge management as a process and, therefore, distinguishing it from the focus on resources which Quintas *et al.* (1997) see as fundamental to many interpretations of intellectual capital. We adapt the definition put forward by Quintas *et al.* (1997) and in this paper, we contextualize knowledge management as the process of continually managing knowledge of all kinds relating to the management of a 'project' in order to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities. This definition of knowledge management provides a meaningful framework for distinguishing between different kinds of knowledge in project management activities. It also provides the possibility for the development of action-oriented goals for managers and organizations that offer project management services to clients.

Although the on-going preliminary study on which this paper is based cuts across four industrial sectors (construction, aerospace, manufacturing and the utilities), the bias will be towards the construction industry.

## **RESEARCH OBJECTIVES**

The research objectives for the preliminary study are listed below. They have been developed through several brainstorming exercises conducted by the authors of this

paper, conditioned by the thorough review of literature on the general areas of knowledge management and on innovation. The large number of identified objectives allows for the possibility of a wider understanding of the subject area. In other words, the preliminary study emphasizes the breadth of coverage and not depth. The latter issue of depth and focus will be identified in the present study and addressed in a later and more robust research programme. A detailed study could lead to the development of knowledge management tools for managers which will enable them to give due cognisance to both intellectual capital and moral capital in carrying out their business activities. The listed objectives have also allowed for the development of research questions and hypotheses (not covered in this paper). The identified objectives are:

- To understand how knowledge is transferred across teams and from project to project
- To explore the perceived value attached to knowledge in differing project management contexts.
- To investigate the major barriers to knowledge (explicit and implicit) development, acquisition and application in a project management context
- To explore how project management organizations formulate strategic policies for developing, acquiring and applying knowledge.
- To explore the impact of organizational structure and culture on the nature of knowledge management programmes within organizations.
- To investigate the role of training, development, different professional backgrounds, motivation and types of employment contracts on knowledge management within organizations.
- To investigate the issues associated with the disclosure of knowledge so that all members of a team/organization can use that knowledge in the context of their organizational roles.
- To examine the technologies and tools which support knowledge management within organizations
- To examine the perceived merits, demerits and risks associated with knowledge management within organizations
- To explore how organizations monitor and evaluate the achievement of knowledge assets

## **METHODOLOGY**

This paper is based on a preliminary research programme currently being undertaken by the authors of this paper who are lecturers on both the undergraduate and postgraduate Construction Management and Generic Project Management courses in The School of the Built Environment at Leeds Metropolitan University, England. The intention is that this preliminary research would lead to the identification of specific and focused areas of research that would be subjected to a more robust and detailed empirical investigation in the future.

The preliminary study is at its early stage. The research objectives, research questions/hypotheses, methodology formulation and sample population/frame have been identified. A comprehensive database of project management organizations for

the study is currently being developed. Data collection will commence late summer 1999.

The study relies on a combination of methodologies (qualitative and quantitative). Writers such as Moser and Kalton (1971) and Jobber (1991) have argued that a combination of research procedures is often more useful than a single one, since the different methodologies yield different kinds of data, which taken together facilitates more comprehensive analysis of the phenomenon studied. The methodology for obtaining relevant information for the study will also involve site visits. Archive documentation on the companies and on relevant aspects of their knowledge management practices will be obtained for analysis. Project management organizations from four industrial sectors namely; Construction, Aerospace, Manufacturing and the Utilities are to be studied. The study groups will be made up of organizations that are at different levels of adopting and implementing knowledge management practices. The study takes a national outlook and considers large, medium and small project management organizations across the UK.

In order to understand the wider domain of knowledge management, such as core competencies and knowledge building, an ethnographic approach (“learning from the natives”) to interviewing will be conducted on a targeted number of people at different management levels from the four participating industrial sectors. The approach to be adopted for ethnographic interviewing will follow that championed by Spradley (1979). In our study, the emphasis is more focused towards the ‘people’ issue rather than on the technology issue. We take the view that collaboration is vital for knowledge management, and that collaboration is, in the main, a people issue. In a sense, our premise is also in line with Nonaka and Takeuchi’s (1995) view of knowledge as a “dynamic human process of justifying personal belief toward the truth”. Similarly, in our study, more attention will be directed towards tacit knowledge, although we accept the view that tacit knowledge should not be seen as knowledge which is independent of explicit knowledge.

In attempting to explore and capture the views of the individuals who are to participate in the study, we have also chosen to use cognitive mapping techniques. Cognitive mapping, according to Huff (1994) describes a set of techniques that are used to try and identify subjective beliefs and to portray these externally. The general approach is to extract statements from individuals about subjectively meaningful concepts and relations in particular problem areas and then to describe these concepts in some kind of visuo-spatial layout. The two main mapping techniques that will be deployed for this study are content analysis and factor analysis. The content analysis will help reveal key concepts and themes (Erderner and Dunn 1990). The factor analysis will help to identify dimensions for individuals that underlie the concepts they use in problem solving domains (Reger 1990). The benefits of employing cognitive mapping in management research and, especially, in research about innovation and knowledge management are well-documented (Swan 1997, Huff 1994)

Empirical analysis for the study will also be based on postal questionnaire which will be refined from the information gleaned from the interviews and sent out to participating organizations who are on the developed database.

## KNOWLEDGE MANAGEMENT AND TRANS-ORGANIZATIONAL INNOVATION

In almost all industrial sectors, an ability to understand, exploit and learn from the relationships between knowledge management and innovation process is gaining momentum. The observation and analysis of knowledge management practices for innovation offers important fresh insights into the crucial relationship between knowledge management and innovation. Knowledge management practices can also help an organization to take practical steps to improve its responsiveness by breaking away from the traditional constraints on innovation caused by a company's culture and history. The important roles played by organizational culture and climate in construction innovations have been documented (Egbu *et al.* 1998a, 1998b, 1998c). A thorough review undertaken for this preliminary study would suggest that knowledge management analyses, in the main, have concentrated on issues such as the classification of types of knowledge. This is typified by debates about whether the 'tacit' knowledge held by individuals can be effectively represented as 'explicit' knowledge which can be represented in ways that can be easily shared across time and space, for example through information and communication technologies (Polanyi 1958, Nonaka and Takeuchi 1995). There have also been debates about the role of the 'whole system' of knowledge management, such as core competencies and knowledge building for achieving competitive advantage (Leonard-Barton 1995). Other discussions have been levelled at the data – information - knowledge typologies (Coleman 1998). In this perspective, information is seen as organized facts and data, and "knowledge consists of truths and beliefs, perspectives and concepts, judgements and expectations, methodologies and know-how" (Wiig 1993). Knowledge adds value to data by providing selectivity and judgement. Charles Handy (1995) recently claimed that the future lies in a 'three-i' economy, with organizations adding value through the application of 'information', 'ideas' and 'intelligence'. These could well be vital components within the knowledge management processes, but the word application perhaps disguises the complexity of these processes.

Knowledge can also be considered as existing in an array of forms, such as symbolic, embodied, embrained, and encultured (Collins 1995). In a sense, this typology helps us to differentiate, for example, knowledge of information (such as catalogue and explanatory knowledge) and context dependent knowledge relating to skill and competence (e.g. process, social and experiential knowledge). Catalogue and explanatory knowledge are symbolic in nature and therefore are more readily transmittable than the contextually sensitive encultured knowledge (e.g. process, social and experiential knowledge). One explanation for this is because encultured knowledge is learned through socialization (Collins 1995), or through immersion in communities of social practice (Lave and Wenger). As a result encultured knowledge is intrinsically tied to its context. The knowledge is 'situated' and produced –in-use. For such knowledge to be formally transmitted, it will need to be decontextualized, and may lose its 'special character'.

Studies on innovation, especially in the last decade, would seem to have been largely interested in exploring the organization-specific routines involving how an organization deploys knowledge to produce innovation (Metcalf and de Liso 1997). In a way, this indicates a dependency on the evolutionary path determined by the bodies of accumulated knowledge and experience within a given organizational culture, management style and operational routines. From this perspective, a 'path dependency' is created as internal routines stabilize certain bodies of knowledge,

embedding them in shared understandings within the firm, providing standard approaches to the deployment of that knowledge.

Our review of literature would suggest that little or no empirical studies have been conducted in the areas of knowledge management which have taken a construction industry perspective. Yet, the construction process involves the movement of knowledge within people across teams, projects and organizations (Egbu, *et al.* 1998b; Winch 1998). Much of the studies on knowledge management have been conducted in other mature industries such as pharmaceuticals, manufacturing, financial sectors and the information technology sectors. Even in these well-established industries, it is only recently that attention has begun to be directed towards knowledge management from a human resource perspective.

The construction industry is characterized by short term and temporary coalitions of contractors and sub-contractors. This, in conjunction with the transient nature of construction workers and the risk projection practices between members of the project team, according to Egbu *et al.* (1998b), constrain the transfer of tacit and explicit knowledge across teams and across projects. In their study, however, Egbu *et al.* (1998b) highlighted how four innovative construction organizations have been able to transfer knowledge across project teams through maintaining long standing relationships with suppliers, through regular meetings, in-house seminars and workshops, de-briefing after end of projects, coaching and job rotation. More of these sorts of knowledge transfer mechanisms need to be studied, documented and 'best practice' documentation produced for the wider benefit of the industry.

Innovation is dynamic. The dynamics of innovation which has become increasingly intensive (Foray and Lundvall 1996) result in high levels of risk and uncertainty, arising for example from difficulties associated with accessing, transferring and assimilating knowledge which is external to the organization. These externalities include the heterogeneity of the knowledge sources which are important to innovation; technological complementarities (including those between product and process innovations), cumulateness, path dependency and incrementalism; compatibility between innovations; user-producer relationships; inappropriability; and bounded rationality. The dynamics of innovation, especially trans-organizational innovation (or network innovation which involves bringing together knowledge from a range of disciplinary and geographically disparate sources), place significant strain on knowledge interchange (involving knowledge transfer and assimilation) and knowledge interwork (involving the synthesis of product-related knowledge from disparate sources into a coherent product without compromising usability).

Information and communication technologies (ICTs) are pervasive in today's business environments, and have in many ways, provided the technological basis for the shift from 'multi-domestic' to 'global' corporate operations. It could therefore be argued that they carry the potential to redefine the management and control of innovation on a global basis through the removal of barriers such as time and distance.

If we consider trans-organizational innovation associated with technology fusion (the development of new technologies based on hybrid combinations of existing technologies ) for example, this requires that new configurations of knowledge are created out of a range of knowledge inputs. This pattern of innovation relies heavily on learning and technology interchange. The learning process generates new knowledge which could be embedded in the design of new technologies, products or processes. This new knowledge is the end product of management processes

concerned with technology interchange, especially those enabling knowledge synthesis and assimilation.

Knowledge management from an organizational perspective involves the implementation of knowledge in such a way that it adds value to an organization. Ruggles (1997) informs us that knowledge management involves four, interdependent activities which, taken together, are vital to learning. Firstly, the identification of knowledge requires that the stock and structure of knowledge available to the organization are critically assessed. Secondly, the processes associated with knowledge codification ensure that knowledge is made communicable. This is achievable through decontextualizing knowledge so that it can be explicitly represented and leveraged in a range of settings. Thirdly, knowledge interchange includes both knowledge transfer and its active assimilation at its point of destination. Finally, knowledge production processes involve synthesizing, adapting and transforming knowledge in order to generate knowledge which is novel or creative.

## **RESEARCH AND MANAGEMENT CHALLENGES**

Conducting research in the knowledge management domain is not easy, especially when such a research cuts across different industrial sectors and different organizations. In this study, there is a host of issues and challenges to be faced. Some of these are discussed below. Firstly, from an organizational point of view, knowledge management does not mean managing all that is knowable (even if that could be brought together). This therefore means that knowledge management is about the creation and mobilization of certain knowledge geared towards a specific purpose (e.g. for continuous improvement, efficiency gains, and competitive advantage). One important research dilemma is in establishing useful organizational knowledge. Another dilemma is knowing whether an organization's success is dependent on the exploitation of that knowledge. A further important issue revolves around the fact that the usefulness of knowledge may be context-specific and its benefit difficult to transfer (let alone replicate). A lot of knowledge can also be useless or too costly for organizations. For example, many process and product innovations depend on knowledge repertoire that has long been known but not applied to current problems. Too much knowledge may therefore be a disadvantage. The acquisition, assembly and assimilation of knowledge for project management activities require the development of organizational capabilities, which are often expensive and uncertain in their benefits.

## **CONCLUSIONS**

This paper has set out a framework of an on-going preliminary research on knowledge management. It discusses the growing importance of knowledge management in organizations in different industrial settings. The increasing competition in most markets in different industrial settings has been put forward as a major factor fuelling the growth in knowledge management practices. The objectives of the study have also been highlighted. Primarily, it is to improve our understanding of knowledge management practices in construction, manufacturing, aerospace and the utilities. A study of the type discussed in this paper, which takes a 'people's perspective to knowledge management, is one that calls for a combination of qualitative and quantitative research methodologies.

The study is to adopt an ethnographic approach to interviewing, cognitive mapping techniques (content analysis and factor analysis) and postal questionnaires. A thorough review of literature in the general areas of knowledge management and in construction reveals that only a meagre amount of empirical research exists in construction which has given due cognisance to knowledge management. There is therefore ample scope for research and education in the construction industry in the knowledge management domain.

This paper has attempted to put forward some views on knowledge management from an on-going preliminary study in its formative stages. If it in any way would assist in raising and furthering the debate on knowledge management in a construction industry context, then the authors would have achieved an important objective.

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