

■ Research Article

Knowledge Management in the AEC Sector: an Exploration of the Mergers and Acquisitions Context

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Knowledge Management (KM) is a relatively new terminology within the architecture, engineering and construction (AEC) industry, although certain aspects have always been practised within the industry. This paper conducts an exploratory study of how mergers and acquisitions affect knowledge management initiatives. The paper introduces the CLEVER conceptual framework that was developed at Loughborough University, UK. The conceptual framework is used to formulate the key aspects organizations should consider when implementing knowledge management initiatives. The paper presents case studies of AEC organizations that have recently undergone mergers and acquisitions. The case studies demonstrate what these companies are doing in terms of knowledge management, especially to collate and deploy the bodies of knowledge held in the hitherto separate organizations, to enhance their competitive advantage. The paper concludes by providing guidelines for companies to consider in developing knowledge management initiatives to cope with structural changes at an operational level. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

The emergence of the knowledge economy means that organizations' know-how is becoming more important than traditional sources of economic power (Scarborough and Swan, 1999). The vast majority of the literature on KM is overwhelmingly optimistic and the claims made about the value of KM irresistibly attractive (Storey and Barnett, 2000). Knowledge is now considered the most strategically important resource and learning the most strategically important capability for business organizations (Zack, 1999). Webb (1998) defined knowledge management as the identification, optimization and active management of intellectual assets to create value, increase productivity, and

gain and sustain competitive advantage. Knowledge management, if implemented effectively, appears to offer a partial solution to organizations for gaining sustainable competitive advantage. However, many question whether KM is yet another management fad. Wiig (1997) argued that previous fads were one-dimensional and led to brief performance improvement. He stated that KM's objectives and scope were quite different, providing a broad, multi-dimensional perspective and covering most aspects of an organization's activities.

AEC organizations are becoming increasingly aware of KM issues because of the impact claimed by other industry sectors. Organizational changes due to mergers and acquisitions add a further dimension to KM. Two organizations, which may have had totally different strategies at a number of levels, are amalgamated. They will both have different levels of knowledge stored in various media. The challenge will be to manage the knowledge that is held by these two organizations

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efficiently, so as to enhance their collective knowledge assets and thereby create the synergy anticipated by the merger or acquisition. This paper therefore explores how AEC organizations need to adapt their knowledge management strategies to cope with mergers and acquisitions. The contents of the paper are as follows: (1) the relevance of knowledge management to construction; (2) the context of mergers and acquisitions; (3) a knowledge management conceptual framework; (4) the research methodology adopted; (5) the case study results; (6) discussion; and (7) the research's conclusion.

KNOWLEDGE MANAGEMENT IN CONSTRUCTION

The AEC industry delivers large, expensive, custom-built facilities at the end of a construction process. The construction industry is a strong knowledge-based industry which relies heavily on the knowledge input by the different participants in a project team. Elements of knowledge management have always been practised within AEC organizations whether in the form of codes of practice, lessons learnt, or in the use of information technology (IT) applications (Anumba *et al.*, 2000; Kazi *et al.*, 1999). Kamara *et al.* (2001) proposed the simplified model of the construction process as shown in Figure 1.

Construction project delivery entails the formation of a 'virtual' and temporary, multi-disciplinary organization that consists of the client and representatives of the supply chain. The supply chain may consist of architects, structural engineers, mechanical and electrical engineers, contractors, sub-contractors, material and construction plant suppliers, etc., all employed by different

organizations. It is quite usual for these temporary teams to disband on project completion without discussing or disseminating the lessons learnt. Knowledge and information exchange is therefore needed both at a project level and also within the individual supply chain firms (Kamara *et al.*, 2001). This transfer of knowledge is further exacerbated when one component of the supply chain has undergone a merger or acquisition and potentially has knowledge that can add value to the project but does not know it exists.

KM is particularly relevant to the UK AEC industry with its current focus on collaborative working, knowledge exchange and the creation of new networks to increase competitiveness and profitability (Moodley *et al.*, 2001). The publication in the UK of the report *Rethinking Construction* (Egan, 1998) and the low levels of company profits have forced a number of AEC organizations to reconsider the way in which they manage their businesses and the role of learning and knowledge in achieving performance targets.

The AEC industry has been made increasingly aware of KM through published literature and industry workshops run by both construction and non-construction organizations. To date, most of the KM literature has focused on the nature of knowledge, types of knowledge and the theoretical bases for knowledge management (Storey and Barnett, 2000). Since 1999 there have been a number of research papers published on KM relevant to construction. Issues covered include: providing a framework for KM (Kamara *et al.*, 2001); knowledge transfer between organizations (Fernie *et al.*, 2001); the role of IT (Carrillo *et al.*, 2000; Patel *et al.*, 2000); the impact on innovation (Egbu *et al.*, 2001); the impact on business performance (Robinson *et al.*, 2001); and case studies within specific AEC companies (Moodley *et al.*, 2001).

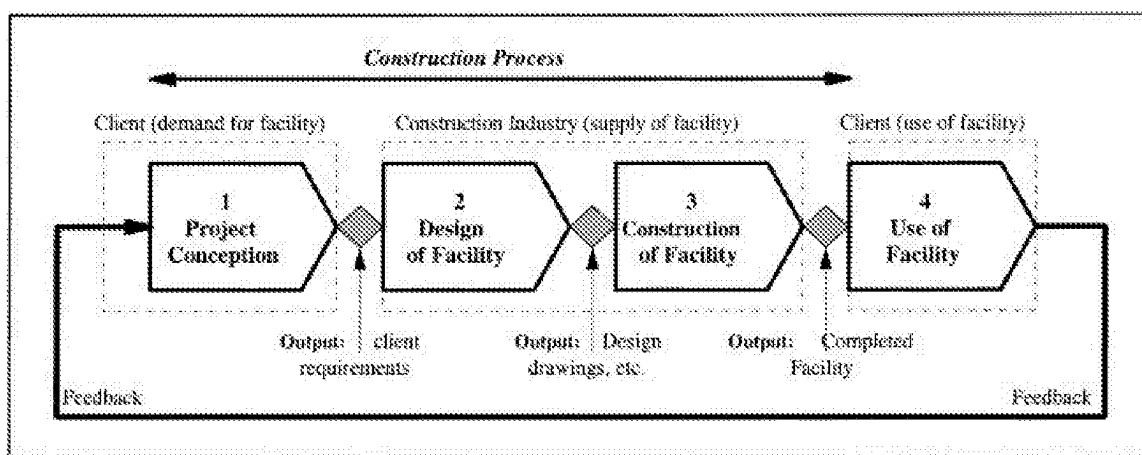


Figure 1 The simplified Construction Process (Kamara *et al.*, 2001)

An increasing number of AEC companies are also involved in KM research projects as industrial partners. Many of these companies have appointed Knowledge Managers who are tasked with developing and implementing KM strategies and thus want to learn from the experiences of other AEC organizations. The main drivers for implementing such KM initiatives are (Robinson *et al.*, 2001):

- The dissemination of best practice to a key set of employees;
- The retention of the tacit knowledge of key employees;
- To promote continuous improvement;
- The need to respond to customers more quickly; and
- The need to reduce rework.

A number of researchers (McConalogue, unpublished dissertation, 1999; Preece *et al.*, 2000; Robinson *et al.*, 2001) have highlighted that KM is still in its infancy in the AEC market and there is need to understand how different industry sectors are devising and implementing KM in order to learn from their experiences.

CONTEXT OF MERGERS AND ACQUISITIONS

Organizations find it difficult to manage efficiently their own knowledge resources through each phase of the knowledge life cycle. KM also becomes more complicated when companies suddenly change their size through organizational changes such as downsizing or growth through mergers and acquisitions. This means that either the organization's intellectual capital is lost or another organization's knowledge assets have to be managed within the context of changing organizational structures, politics and culture.

Stewart *et al.* (1963) defined a merger as 'an acquisition that takes place with the agreement of the board of the acquired company'. Occasionally, the terminology 'merger' is used when the two companies have a similar size in terms of number of employees and annual turnover while 'acquisition' is used when one partner is much larger than the other. Bengtsson (1992) adopted a realistic approach and stated that most companies use the terms loosely and interchangeably, and are most likely to settle on a term which is likely to be best received by the business world, confuse competitors, and protect their products. In this paper the terminology 'mergers and acquisitions' will be used jointly to indicate a change in company ownership independent of the size of the companies involved.

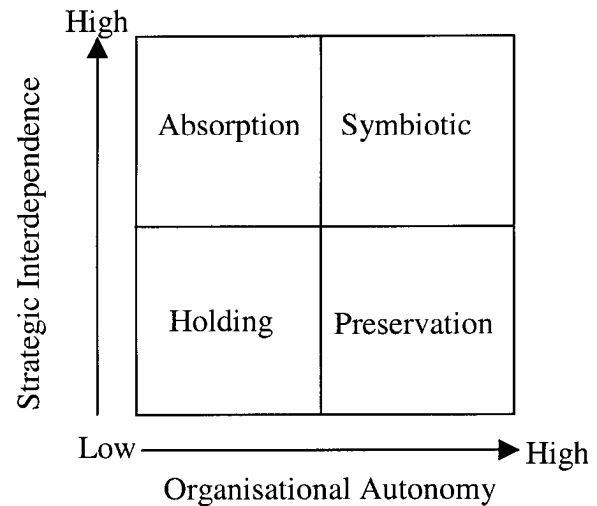


Figure 2 Types of acquisitions (Haspeslagh and Jemison, 1991)

Haspeslagh and Jemison (1991) distinguished between four types of acquisitions based on the level of strategic interdependence and organizational autonomy as shown in Figure 2. The type of acquisition will dictate what knowledge is to be shared and how this should be done. For example, a Preservation type acquisition may need to share knowledge, mainly at corporate level and will differ markedly from the knowledge sharing required by an Absorption type of acquisition where there may be full integration of the acquired company.

In the mid-1990s, a number of mergers and acquisitions occurred within the US and European AEC markets. Mergers and acquisitions is the preferred vehicle for AEC expansion to cope with the globalization of the AEC market and the new ways of procuring construction projects (Schriener and Angelo, 1995; Carrillo, 1998). The globalization of construction aims to provide opportunity in new markets whilst reducing the dependency on individual, national construction economies. Also, the new forms of procurement in the UK, such as the Private Finance Initiative (also known as Public Private Partnerships) and Prime Contracting, have dictated the trend towards larger AEC organizations because of their ability to form large, influential consortiums that are better able to attract funding. Mergers and acquisitions therefore offer the mechanism for rapid growth (Fellows *et al.*, 1983; Friedman, 1984; Ball, 1988).

With respect to the rapid increase in company size through mergers and acquisitions, it becomes increasingly difficult to determine 'what the organization knows' and 'who knows what'. Horizontal mergers or acquisitions, those that



involve organizations with the same type of business portfolio, introduce particular problems. Inadequate knowledge exchange does not create the synergy anticipated and may lead to duplication of effort and even repetition of errors within the organization. Thus, there is a need to disseminate and provoke debate on the success and relevance of the approaches adopted by organizations in order to add to the limited body of knowledge currently available in this area.

The AEC sector is well known for repeating costly mistakes because they have not leveraged knowledge held in other parts of the organization. KM within the context of mergers and acquisitions allows companies, particularly those who have undergone horizontal mergers and acquisitions, to build their knowledge capacity and disseminate it effectively and efficiently to those who need it, thus reducing costly errors.

KNOWLEDGE MANAGEMENT CONCEPTUAL FRAMEWORK

Some AEC organizations are implementing KM initiatives, but these tend to be on an *ad hoc* basis without a clear KM strategy (Robinson *et al.*, 2001). A framework proposed for studying KM in organizations is the CLEVER conceptual framework (Kamara *et al.*, 2001). It was developed as part of a twenty-month UK government-funded research project on 'Cross sectoral LEarning in the Virtual entERprise (CLEVER)'. The intention of this project was to explore the characteristics of knowledge management in different industry sectors in order to derive a cross-sectoral framework that helps companies to select knowledge management processes best suited to their circumstances. This was in recognition of the fact that, in multi-project environments, the management of project knowledge (i.e. its collection, propagation, reuse and maintenance) is generally accepted as being open

to considerable improvement, both within companies and between companies in the supply chain (Siemieniuch and Sinclair, unpublished internal report, 1999). Even where good practice can be identified it is usually only disseminated within that industrial sector, with almost no learning across sectoral boundaries. Knowledge is generated within one project and then buried in unread reports and arcane filing systems, or lost because people move on. Failure to transfer this knowledge leads to wasted activity and impaired project performance. The emphasis of the CLEVER project was thus on the organizational and cultural dimensions of knowledge management within a project context (Anumba *et al.*, 2001). The objectives of the CLEVER project were:

- (1) To generate an 'As-is' representation of knowledge management practices in project environments both within and across enterprises in the manufacturing and construction sectors;
- (2) To derive generic structures for these practices by cross-sectoral comparisons;
- (3) To develop a viable framework for knowledge management in a multi-project environment, within a supply chain context, together with requirements for support; and
- (4) To evaluate the framework using real-life projects and scenarios supplied by the participating companies.

It is the third objective, the development of the framework for knowledge management, that is of relevance to this paper. The conceptual framework was thus intended to assist an individual company in determining important factors to consider when devising knowledge management initiatives in a multi-project environment. The CLEVER conceptual framework will be used to describe the attributes of knowledge and to propose solutions for effectively managing knowledge within organizations. The conceptual framework is divided into four inter-related elements as shown in Figure 3.

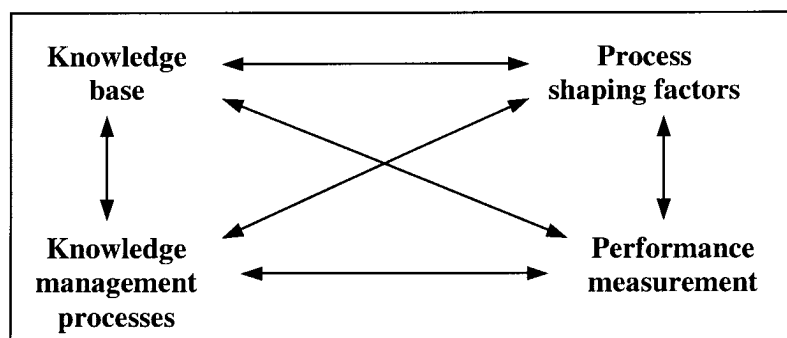


Figure 3 The CLEVER conceptual framework for KM

Table 1. The CLEVER Conceptual Framework Elements

Element	Description
Knowledge Base	The attributes of the knowledge being considered such as its class, source, importance and where it is located
Process-shaping Factors	The internal and external factors that may impact on the KM process
Knowledge Management Process	The goals of KM, the processes involved in KM and the tools required
Performance Measurement	The metrics and measurement methods used to assess the effectiveness of knowledge management

Table 2. The Knowledge Base description

Attributes	Sub-attributes
Type	Identifies the class of knowledge, its importance and relationship to business goals
Characteristics	Identification of knowledge characteristics, namely: Explicit/Tacit; Slow / Rapid change, etc., where the knowledge is located and how it is acquired
Source and Users	Identifies the source and the end users of the knowledge in terms of People, Software and Paper

Table 1 describes each element of the conceptual framework. The CLEVER conceptual framework is particularly useful for studying knowledge management within the mergers and acquisitions context because it provides a holistic approach to KM. It helps to identify the organization’s ‘As-is’ KM state, and recommends tools and techniques for achieving its ‘To-be’ state whilst considering internal and external factors that may impact on the organization. The elements of the conceptual framework are described below with particular reference to mergers and acquisitions in AEC organizations.

The Knowledge Base

The Knowledge Base is concerned with identifying the knowledge the organization is interested in managing. AEC organizations require certain types of knowledge. Kamara *et al.* (2001) recognized that knowledge will require to be managed at different, inter-related levels, namely intra-project (across different stages of a project and between different stakeholders) and intra-organization (across different departments within the same firm). Within the

context of mergers and acquisitions, there is a clear need to concentrate initially on intra-organizational KM (i.e. within the new, larger organization).

The CLEVER conceptual framework proposes that the knowledge base must be thoroughly understood before it can be managed effectively. To do this, the framework proposes the use of the attributes shown in Table 2.

Process-shaping Factors

This factor investigates the root cause of the KM problem and must be taken into account in devising any KM initiative. In this context, mergers and acquisitions are expected to create synergy, thus the body of knowledge held within the two combined companies can be expected to be greater than the sum of the two individual parts. In fact, this seldom happens because of the period of job uncertainty created by the merger and acquisition. Employees who do not have a sense of job security or trust their colleagues and new owners are unlikely to co-operate with any KM initiatives. Other Process-shaping Factors that may impact upon the organization are summarized in Table 3.

Table 3. Process-shaping factors

Process-shaping factors	Sub-divisions
Organizational Structure	Centralized, hierarchical, function-based, project-based, etc.
Organization Culture	Hierarchical, devolved, degree of agility, etc.
Team Boundaries	Departmental, functional, project, organizational, cross-organizational



Knowledge Management Processes

The Knowledge Management Processes are concerned with the component sub-processes in the knowledge life-cycle and the tools that can be used for each sub-process.

Knowledge Life Cycle

Several authors now recognize KM is multi-faceted. Ruggles (1997) identified three categories of the KM life cycle as generate, codify and transfer. Tiwana (2000) identified four categories as the creation, location, capture, sharing and use of knowledge. Siemieniuch and Sinclair (2002) extended the classification of the knowledge life cycle into five stages as shown in Table 4.

Within the merger and acquisition context, some of the KM sub-processes may be deemed of higher priority than others, particularly during the early stages of organizational change. One example may be the need to focus on the 'who knows what' (i.e. the Propagate sub-process) rather than the creation of new knowledge (i.e. the Generate sub-process). However, it is important to note that whilst some stages may take priority, the other stages of the life cycle cannot afford to be ignored for the effective management of knowledge.

KM Tools

KM tools consists of both IT tools and non-IT tools. However, much emphasis to date has been on the latter. Patel *et al.* (2000) categorized KM tools into four areas: Knowledge Generation, Knowledge Representation, Knowledge Retrieval and Knowledge Sharing. They also identified over 100 examples of commercially available software that claim to support KM. Carrillo *et al.* (2000) argued that any KM system must support the full KM life cycle—from knowledge generation through to transfer and eventual retirement—and not just a subset thereof. Realistically, most organizations looking to implement a KM system would expect an IT-based system in order to increase efficiency and flexibility.

Performance Measurement

Tiwana (2000) found that whilst several companies had been successful in implementing KM, as yet, none had a strong measurement programme in place. Moodley *et al.* (2000) noted that many of the AEC knowledge management initiatives are still in their infancy and thus measurements will only emerge as these reach maturity. A number of authors have proposed methods for measuring intellectual capital such as the Return on Assets (ROA) method, Market Capitalization Method (MCM), Direct Intellectual Capital (DIC) method, Tobin's *q*, human capital measures, the knowledge bank method, etc. (Abdolmohammadi *et al.*, 2000; Stewart, 1997; Siemieniuch and Sinclair, unpublished internal report, 1999). However, Siemieniuch and Sinclair noted that none of these addressed organizational structures, roles, or configuration of knowledge and these measures did not provide a direct measure on whether the problem was poor systems, bad processes, wrong organizational structure, or disaffected staff.

This raises the question of how the value of an intangible asset, like knowledge and its management, can be measured. Currie (1995) found that 85.5% of managers believe that qualitative benefits are as important as financial ones but only 53% attempted to quantify them because of their vague nature. Clearly, formal financial accounting terms such as those proposed by Tuck (2000) are inadequate since knowledge assets are hidden, not on the balance sheets, and they seek to provide a range of intangible benefits (Kanter, 1999; Martinsons *et al.*, 1999).

Within the context of mergers and acquisitions, it is important that any KM system is able to perform satisfactorily with the expansion of the organization. Also, the benefits of such a transaction are long-term, rather than short-term and any attempt to measure benefits must ensure that a KM system has performance measures spanning both these time periods.

At present, the UK AEC sector is undergoing a major transformation. Performance Measurement has been given a major boost through a number

Table 4. Knowledge life cycle processes (Siemieniuch and Sinclair, 2002)

Sub-process	Description
Generate	Obtain new knowledge from source, e.g. research or training courses, etc.
Propagate	Disseminate the knowledge to other parties
Transfer	Convert knowledge from one medium to another and/or one type of knowledge into another, e.g. tacit knowledge to explicit knowledge
Locate and Access	Store the knowledge in a particular medium for access by others
Maintain and Modify	Ensure the knowledge is current and can be made obsolete when required

of government-promoted initiatives geared towards improving the performance and profitability of the sector. Thus the sector is currently amenable to initiatives to improve performance, such as KM initiatives and also to mechanisms for measuring performance.

RESEARCH METHODOLOGY

A qualitative methodology was considered the most appropriate method for the research. The use of case studies of organizations was adopted because it afforded an opportunity to explain, describe, illustrate, and explore specific aspects of the merger and acquisitions phenomena. Case studies contribute uniquely to our knowledge of the organization being investigated. Yin (1984) stated that case studies allow the retention of holistic and meaningful characteristics of real-life events (such as mergers and acquisitions), within the context of organizational and managerial processes. In addition, case studies are ideally suited to exploratory studies such as this in order to investigate the actions taken by companies and their consequences. Multiple-case studies, in this case three, were used to provide in-depth, unique knowledge of the merger or acquisition phenomenon within each of the organizations studied. Semi-structured interviews were used to collect data on each organization's approach to their knowledge management strategy. Each interview lasted approximately two hours and was conducted with senior staff within the case study companies. Where more than one member of staff was responsible for the company's knowledge management initiatives, they were consulted to obtain an unbiased view. Case study summaries were written as reports and the interviewees asked to comment on their accuracy. Additional documentation was collected from company literature in the form of reports and the company web site. The data was then analysed using content analysis. Whilst case studies do offer advantages, there are some disadvantages as a research methodology. These are the lack of rigour; the tendency for generalization; and validity (Yin, 1993; Hamel *et al.*, 1993). The steps taken to minimize these disadvantages are discussed in greater detail under the section on case study results and discussion.

CASE STUDIES

Three AEC organizations were used as case studies to investigate their approach to developing a knowledge management strategy. The organizations were

AMEC plc (a construction and engineering organization), WSP Group (an engineering consultant) and Galliford Try (a construction contracting organization). These companies were selected according to:

- Topical relevance—i.e. companies selected because they are known to have a particular interest in the subject area (Yin, 1984);
- Feasibility and access—i.e. individuals were willing to let their companies act as case studies (Yin, 1984); or
- Extreme cases—i.e. to demonstrate polar situations (Eisenhardt, 1989).

The data from each organization was obtained using semi-structured interviews with senior executives such as the Chief Knowledge Officer, the Assistant to the Group Managing Director and the Deputy Chief Executive.

The following sub-sections will be used to provide details of the case study. The four-part CLEVER conceptual framework will be used to discuss the main attributes of the case study organizations' approach to knowledge management, namely the Knowledge Base, the Process-shaping Factors, the Knowledge Management Processes and Performance Measurement.

AMEC plc

AMEC plc is a leading international capital projects, services and investment group with significant operations in Europe, Asia and Australia with an annual turnover of over £3.1 billion. In April 2000 AMEC acquired the North American firm AGRA in what could be considered an Absorption type of acquisition. AGRA was a professional services group specializing in engineering, environmental and technology solutions. AMEC is now the largest international design firm (ENR, 2000) with over 50,000 employees in more than 40 countries. The case study focuses on the AGRA acquisition. A full integration process has occurred since the merger to create one company with one vision. All the major corporate systems, such as the Project Management, Financial and Human Resource Systems, are to be integrated on an international basis through an innovative Web-based Enterprise Resource Planning (ERP) system. The acquisition of the American organization provides AMEC with leading-edge web-enabled capability and e-business.

Knowledge Base

Knowledge management within AMEC is a relatively new initiative that focuses on achieving a

culture of sharing, learning and best-practice dissemination throughout the group. At present KM activity is considered at a more advanced state in the UK. AGRA is not known to have undertaken any formal knowledge management activity prior to the merger. However, as an integral part of the group, it will now play a full role in AMEC's knowledge management initiative. AMEC is interested in AGRA's:

- Customer base;
- Its relationships with clients;
- Marketing expertise; and
- Web-based technologies.

Most of this knowledge is tacit and is currently being shared through small networks facilitated by their Chief Knowledge Officer. It is anticipated that in the future this knowledge will be shared mainly by networking, face-to-face meetings and a company intranet which hosts a personal profiling system and 12 communities of practice. In the UK, key individuals and specialist groups are considered to be the main source of knowledge. Some 'external' knowledge is held by joint venture partners and strategic alliances. The knowledge currently being investigated may be characterized as tacit (mainly who knows what) and rapidly changing (such as lessons learnt).

Process-shaping Factors

The new AMEC intends to be a centralized, function-based organization with a devolved organizational culture that promotes cross-organizational teams. The main barriers to knowledge management within the organization are seen as follows:

- The protectionism of middle management where there is a climate of individual job and bonus protection, and reluctance to co-operate; in fact, intense competition between business units. This is due to the earlier focus on geographical and operational profit centres;
- The lack of a KM culture supported by a good knowledge management system that is easy to navigate and update;
- The low level of IT literacy at key levels within the organization; and
- The perceived lack of time to expend on knowledge management activities.

Knowledge Management Processes

To date, the focus has been on storing, sharing and using knowledge. A KM system will eventually be implemented that is expected to cover the entire life cycle of knowledge management. No specific KM tools are currently used but it is envisaged

that a proprietary system will be built, perhaps on a piecemeal basis.

AMEC recognizes that a KM system can be delivered without IT. However, such a system would be inefficient and IT is seen as an enabler to increase speed, flexibility and efficiency.

Performance Measurement

The area of performance measurement is still under consideration. To date, funding for the KM initiative has been obtained through storytelling the success of other organizations but more tangible measures need to be considered for further funding.

Lessons Learnt

The programmed absorption of AGRA means that there will be a great need for knowledge transfer between organizations. However, geographical distance appears to be a problem. People need face-to-face contact to build trust (Davenport and Prusak, 1998; Augier and Vendelo, 1999). This cannot be the responsibility of the Chief Knowledge Officer alone, as happens at the moment. To date, the main focus has been on KM within the UK businesses with little leveraging of AGRA's knowledge. The current organizational structure, based on internal competition, does not encourage sharing but this is may change. The use of non-IT tools for sharing tacit knowledge needs to be explored. There is currently an internal debate on whether the piecemeal KM system proposed is a viable solution. Also, a more tangible mechanism for measuring KM performance needs to be implemented.

WSP Group

WSP is now one of the UK's top consulting engineering practices with a turnover of £150 million and over 3000 employees. The group has eight UK operating companies and operations in the USA, South Africa and Asia. It has actively pursued acquisitions as a mechanism for growth, completing 12 horizontal acquisitions since 1988.

WSP's strategy is to increase their international business in order to reduce reliance on the UK and to benefit from the globalization of the market. This growth is being done through organic means but mainly through acquisitions. In 2000 the group acquired two US companies—Cantor Seinuk Group (structural engineers rated in the top three in the USA for high-rise buildings) and Flack + Kurtz (a building services engineering firm specializing in high-rise buildings and rated in the top five internationally for high-rise buildings). The US acquisitions could be considered

Preservation acquisitions with each company retaining their name and integration limited to Business Development and IT systems. The case study will focus on the two recent US acquisitions.

Knowledge Base

WSP is interested in their US acquisitions' technical knowledge of:

- High-rise building construction; and
- the associated building services.

The knowledge is mainly of a tacit nature and rapidly changing based on technological developments. In both cases, knowledge is held internally, with either individuals or groups and acquired mainly by interacting with others. Primarily, individuals or groups hold this specialist knowledge but some is held on paper and software.

Process-shaping Factors

WSP has a dual organizational structure. It uses centralized support for common areas such as HR, Finance, Marketing, IT, etc. and a decentralized structure for the various operating companies. A concern has been the rapid growth of the organization in recent years and the loss of key staff. The autonomy of the operating companies is also a factor in that each company tends to manage projects in isolation without input from the other operating companies. In the case of CSG and F+K, the organizations have a very high degree of autonomy linked to their purchase agreements and operate in a very narrow market that makes knowledge transfer to the wider WSP Group more difficult.

Knowledge Management Processes

WSP's intranet consisted of a skills database, a library service, collection of technical papers, etc. However, its use relied on personal initiative only (i.e. it was a 'pull' system), it was not very intelligent, and there was a lack of appropriate business processes to encourage its use. 1WSP is the name of a new knowledge management initiative involving the eight core UK operating companies. 1WSP will focus first on implementing business processes as the precursor to improving knowledge management within the organization. The improved processes are expected to change the current culture within the organization. The immediate focus will be on obtaining and sharing knowledge. Eventually, maintaining and modifying knowledge will gain importance. A number of problems were identified at different phases of KM. These included:

- A lack of business processes;
- A culture against sharing in a rapidly expanding organization;
- Too many sources and ways of acquiring knowledge; and
- A perceived lack of affordable technology, etc.

Performance Measurement

WSP does not currently use any performance measures but believes that performance measurement should be directly linked to their three existing measures:

- (1) Client satisfaction (service improvement);
- (2) Staff satisfaction (whether the KM system provides satisfactory help); and
- (3) Shareholder satisfaction.

There is agreement that the measures used could also include quality of knowledge (will depend on type of knowledge, i.e. business or technical), use of knowledge (monitored by the system), impact in terms of business performance and project performance and efficiency of KM processes.

Lessons Learnt

WSP considers itself as an integrated group. However, the two US acquisitions operate in such a narrow, specialized market that sharing technical knowledge with the rest of the WSP Group may not be realistic. Additionally, the level of autonomy poses a challenge for a corporate-wide KM system. It may be more sensible to address KM within operational units rather than at corporate level. It is laudable that WSP recognizes that they must first address their internal processes before implementing technology solutions for their knowledge management problem. It is also encouraging that they recognize the need to measure the effectiveness of KM initiatives.

Galliford Try Group

Galliford and Try merged in September 2000 to form Galliford Try. Both organizations were medium-sized UK companies providing construction services and house building in specific geographical regions. The combined company has a turnover of £452 million and approximately 1750 employees. The merger could be considered as Symbiotic and is expected to produce growth, cost savings and synergy. Each business unit will maintain its existing autonomy because they operate in specific, complementary geographical regions. Some core functions are being integrated to provide an enhanced service. These functions are Marketing

and Sales, IT support, Purchasing, Human Resources, Accounting, Safety and membership of Best Practice clubs.

Knowledge Base

Galliford and Try were primarily interested in using the merger to increase geographical coverage (and therefore a wider client base) rather than acquiring each other's knowledge base or technical skills. However, Galliford was interested in Try's expertise in:

- Commercial buildings in London; and
- Housing on brownfield sites.

Correspondingly, Try was interested in Galliford's:

- Work on the Environment standards (ISO 14001); and
- Expertise in Partnering types of contracts.

Both companies were also concerned with the sharing of best practice and product knowledge. The knowledge required could best be characterized as explicit and slow changing. This knowledge is held by groups of people both internally and externally. A large proportion of knowledge is held externally because of the reliance on sub-contractors (typically 70-80% work) to complete housing projects.

Process-shaping Factors

The merger has not had a significant impact at an operational level and the emphasis has been on continuity. Galliford had a decentralized, function-based structure, whilst Try had a more centralized, function-based structure. The new company wishes to move towards a decentralized, project-based structure to provide a better service to its clients.

Knowledge Management Processes

Galliford Try's focus has been on obtaining new knowledge and embedding them in its business and technical processes. New knowledge is obtained through involvement in a number of national Best Practice initiatives. This new knowledge was then disseminated throughout the company by a number of means, mainly paper-based. The company is about to implement a management information system (MIS) that will be intranet-based for the purpose of disseminating explicit knowledge (e.g. accounting information, drawing registers, document management system, etc.). This will be supplemented with monthly digests and a biennial company newspaper. The main problem faced by the organization is the effective dissemination of knowledge. The onus was on

individuals to source knowledge of previous projects. The main problem causes were seen as:

- A lack of a proper system; and
- The culture of staff, i.e. staff are interested in obtaining new knowledge but do not see the internal knowledge base as the primary source.

Performance Measurement

Galliford Try does not measure the performance of any of its knowledge management processes at the moment. The view is that knowledge management should not be measured in isolation. Its performance should be linked to other company performance indicators, namely its Customers', Employees' and the Supply Chain's satisfaction and Egan's Key Performance Indicators (Egan, 1998). These indicators, when investigated in detail, will determine whether knowledge is being managed efficiently. The key issues to address will be the accessibility of knowledge and ensuring that staff are able to add value once the knowledge is obtained.

Lessons Learnt

At the moment, the knowledge held in the organizations is not being exploited because both companies continue to operate in an autonomous fashion. This may change as organizational changes take effect to reduce duplication. Merging the two companies may introduce cultural problems based on their opposing structures. Galliford Try recognizes (and is content to address) only part of the KM life cycle. Its new MIS will only deliver explicit knowledge but that is the main focus of their business. It is significant that Galliford Try's recognizes the need for measuring the effectiveness of their KM processes.

DISCUSSION

The case study organizations are at different levels of maturity in terms of KM. The different approaches adopted will be discussed in terms of the CLEVER conceptual framework and how KM should be approached in light of the observations made.

Knowledge Base

The Knowledge Base is that body of knowledge that the acquiring company wishes to gain from the acquired company for competitive advantage. Knowledge cannot be managed unless organizations have a true understanding of the knowledge

needs of individuals and teams within the combined organization. The interviewees all had some idea of the type and characteristics of the knowledge that needs to be managed. However, this was from a corporate viewpoint and specific sources and users of knowledge were not identified. This may be because the interviewees' seniority meant that they were more concerned with strategic issues. However, it does emphasize the importance of understanding the knowledge needs at an operational level. This sort of knowledge base can only be managed at individual business unit level rather than at a corporate level by identifying specific knowledge management problems within business units.

Process-shaping Factors

The Process-shaping Factors are those internal and external factors that impact on the manner in which knowledge is managed within the organization. The specific factors considered were the organizational structure, the organizational culture and the team boundaries. One company aimed for an integrated organization with all its acquisitions but the remaining two companies allowed a large degree of autonomy. The latter meant that knowledge was only managed at a high level for core systems such as HR, Finance, Marketing and IT. Technical knowledge, however, remains the domain of the individual operating units.

The three companies all agreed on a devolved organizational culture but all three companies identified cultural issues as a major barrier for knowledge management. There was an unwillingness to share knowledge for a number of reasons including:

- Knowledge is power;
- Lack of time was highlighted;
- Difficulty in validating knowledge; and
- Lack of a recognized, easy-to-navigate and maintain IT system to support knowledge management.

The case studies revealed that little effort was being spent on addressing cultural issues as part of the KM initiative. Egbu (2000) outlined factors that either promoted or inhibited knowledge sharing in construction organizations and emphasized that KM cannot take place effectively without extensive behavioural, cultural and organizational change. Bourdreau and Couillard (1999) proposed the use of new organizational structures, designed around teamwork, self-managed teams, and overlapping responsibilities to facilitate knowledge sharing and development. This is particularly

important when, as in the case of AMEC, the full assimilation of another company is planned.

There was no agreement on the team boundaries to be adopted (these were organizational, cross-organizational and function-based) and how knowledge may be transferred between teams, based on these boundaries. Therefore there is a need to initiate mechanisms for disseminating lessons learnt between teams, whatever their boundaries.

Knowledge Management Processes

Knowledge Management Processes are concerned with the KM life cycle and the tools to facilitate these. The life cycle includes the creation, location, capture, sharing and use of knowledge (Tiwana, 2000). The focus to date has been very much on the sharing of explicit knowledge using company intranets. The three companies all plan to implement IT systems to deliver a KM solution. AMEC and WSP would like to implement KM Systems that cover a number of KM processes whereas Galliford Try plans to use a company intranet for sharing knowledge only.

Zack (1999) and Tiwana (2000) both agree that whilst IT systems are capable of managing explicit knowledge, it can do little to support the management of tacit knowledge as required by AMEC and WSP. Instead, such organizations are advised to concentrate on encouraging staff to interact repeatedly over time to disseminate tacit knowledge.

Performance Measurement

It is important to evaluate whether any KM initiative implemented is effective, good value for money and has an impact on business performance. None of the three case study companies are at a sufficiently advanced stage of KM development to implement performance measurement. Both WSP and Galliford Try hoped to link performance measurement to their company-wide measure for stakeholders' satisfaction. However, it was unclear how performance in these categories could be directly attributed to KM initiatives. Clearly an effective KM system should support the company's performance indicators but it is difficult to isolate the specific contributions of KM to these indicators.

Proposed KM Performance Indicators

A number of authors have proposed adapting Kaplan and Norton's (1992) Balanced Scorecard for KM performance measurement (Martinson *et al.*, 1999; Tiwana, 2000; de Gooijer, 2000). However,

the Balanced Scorecard is better known, particularly in the USA, for assisting in strategy formulation rather than as a measurement tool. In Europe, many organizations are implementing the European Foundation for Quality Management (EFQM) Excellence Model (EFQM, 2002) as a mechanism for assessing company performance on a broad range of criteria. For this reason, the use of the Excellence Model may be better suited because of its strengths in performance measurement, rather than the Balanced Scorecard, which requires adapting both for KM and as a measurement tool. Those organizations interested in measuring performance against stakeholder satisfaction will find this fits comfortably under the Excellence Model's 'Results Criteria', namely People Results, Customer Results and Key Performance Results. Thus, the high-level goals of a KM strategy can be broken down into more task-specific objectives and assessed for effectiveness by the stakeholders in conjunction with the overall financial results.

CONCLUSIONS

This paper investigated how AEC were adapting their KM initiatives to cope with mergers and acquisitions. It introduced the CLEVER conceptual framework as a mechanism for studying KM initiatives in organizations. The CLEVER conceptual framework investigates the company's Knowledge Base (the specific knowledge the company is interested in managing across organizations); the Process-shaping Factors (the organizational environment as it affects knowledge management); the Knowledge Management Processes (the various sub-processes involved in the management of knowledge and affiliated tools); and Performance Measurement (mechanisms for analysing the benefit of the KM programme). Three case studies were undertaken to investigate the different approaches adopted for Knowledge Management strategies with AEC organizations involved in mergers and acquisitions.

The paper found that the case study companies were embarking on a number of mechanisms for enhancing the management of knowledge within the organization. However, the following observations and recommendations are made:

(1) Organizations were not sufficiently aware of their knowledge bases because specific knowledge management problems had not yet been identified. This is best addressed at an operational unit level rather than at a corporate level;

- (2) Organizational culture and the ability to disseminate lessons learnt between teams will play a major role in the success of any KM initiatives. Organizations should therefore examine mechanisms for promoting a culture that encourages managing knowledge. This is with an emphasis on developing employee trust during the delicate period merger and acquisition activity;
- (3) There was a strong focus on sharing knowledge using electronic means. Little attention was paid to other aspects of the KM life cycle and to the use non-IT tools. Companies therefore need to realize that KM is about processes and not just the provision of an intranet; and
- (4) Whilst organizations are keen to measure the effectiveness of KM initiatives, little has been done in this area. The Excellence Model was recommended as a potential measurement tool. The KnowBiz (Knowledge Management for Improved Business Performance) project at Loughborough University (Robinson *et al.*, 2001) is currently addressing this.

Based on anecdotal evidence, mergers and acquisitions in the AEC sector is not that unique compared to other sectors. Its end products may be unique but the aspects of design and construction processes are generic. In the UK, there has been a major push to encourage the sector to realize that it encompasses aspects of both the manufacturing and service sectors and thus some processes are repeatable. Therefore, the findings of this research may be equally relevant to other industrial sectors.

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