

# **Knowledge Management For The Quantity Surveying Profession**

**Richard DAVIS, United Kingdom, Paul WATSON, United Kingdom, Chi Lai  
MAN, Hong Kong SAR, China**

**Key words:** Competitive advantage, Knowledge assets, Knowledge management, Professional status, Quantity surveyors

## **SUMMARY**

Clients have an increased expectation of the service offered by quantity surveyors and this coupled with greater competition both internally (from the profession) and externally has resulted in a challenge to their professional status. To meet these challenges quantity surveyors need to enhance their professionalism and status in order that practitioners can maintain a competitive advantage.

Knowledge is a key feature of the surveyor's portfolio and therefore effective knowledge management skills can help to improve their expertise. Practitioners learn from experience and this is a continuing process. In any organisation junior members draw on the experience of seniors as part of their learning experience and to some degree that learning flow can be reversed. What is required is some means by which that learning experience, together with intuitive 'knowledge', can be 'captured' and disseminated to colleagues within the same organisation.

Knowledge management (KM) is a systematic management approach to identify and capture the 'knowledge assets' of a firm so that they can be fully exploited and protected as a source of competitive advantage (Scarborough & Swan 1999).

As the quantity surveying profession is subject to challenges and competition the proposed paper will explore the feasibility of introducing KM as a means to enhance professionalism and investigate its applicability to quantity surveying practices.

# Knowledge Management For The Quantity Surveying Profession

Richard DAVIS, United Kingdom, Paul WATSON, United Kingdom, Chi Lai MAN, Hong Kong SAR, China

## 1. LEARNING ORGANISATIONS

### 1.1 Definition of a Learning Organisation

There is no clear consensus as to what constitutes a learning organisation and a multitude of definitions abound. These range from aspirational type definitions of organisations, “...where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, [truly in line with a post-modernist philosophy] and where people are continually learning how to learn together” (Senge 1990), to normative definitions such as that espoused by Garvin, “A learning organisation is an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights”(Garvin 1993).

Nyhan et al (2004) suggested that, “the prescriptive and simplistic formula based view of the learning organisation does nothing more than discredit the concept”. In their opinion, becoming a learning organisation involves more than simply applying a formula; each individual organisation needs to, “...devise its own unique theory based on its own distinctive practice” (Nyhan 2004).

### 1.2 Organisational Structure

Johnson and Scholes (2002) assert that organisations have traditionally been viewed as hierarchical, bureaucratic structures geared towards stability rather than change characteristics, “...not suited to the dynamic conditions for change of the 21<sup>st</sup> century.”

Goh (2001) describes learning organisations as “...non-bureaucratic, with decentralised decision making structures, empowered employees and open lines of communication”. He proposes that by adopting policies and work procedures of a less rigid nature, a more fluid organisational structure is created. This corroborates the view of this author Griffith & Watson’s (2004) in that a heterarchical approach, which involves maintaining high levels of fluidity, is a fundamental requirement for companies operating in areas of ever-increasing complexity.

Örtenblad’s (2004) “learning structure” model, builds on this idea by describing a decentralised, flatter organisational structure that is team based, with learning depicted as an input, and flexibility as an output.

### 1.3 Providing the Correct Corporate Environment

Garvin (1993) suggests that a learning organisation is one that fosters, “...*an environment that is conducive to learning*”. He purports that in order for employees to learn, they need “...*time for reflection and analysis, to think about strategic plans, dissect customer needs, assess current work systems, and invent new products.*” (Garvin 1993). This highlights an important prerequisite for implementing any new initiative, the provision of adequate resources, particularly those of time and funding.

However, time and money alone will not create the required climate for learning. Ho (1999) proposes that the learning organisation provides an environment where, “...*people are excited in trying out new ideas and recognise that failure is an important part of success*”.

Love (2004), underpins this view describing an atmosphere where, “...*experimenting with new approaches is encouraged and errors are not perceived as failures*” These traits, when viewed in the context of an organisational environment typified by ever increasing complexity and uncertainty (Malhotra 1996), clearly point towards a morphogenic culture utilising processes that, “...*allow for change and development...*’ [and where] *the exciting nature of change is always highlighted*” (Griffith & Watson 2004).

### 1.4 Knowledge Management

In the late 1980’s, Pedler et al (1988) recognised the importance of utilising information technology to, “...’*informate*’ as well as ‘*automate*... [in order to] *seek information for individual and collective learning*”. More recently, Lobermans asserted that a, “*corporate architecture*” needs to be in place to facilitate learning and to, “...*create knowledge sharing and dissemination mechanisms across the organisation*” and that the capture and systemisation of knowledge is a prerequisite to being a learning organisation (Lobermans 2002). The growing number of organisations utilising intranets and ‘lessons learned’ databases gives some indication of the perceived value of knowledge management systems.

However, recent research into cross-project learning led Newell to conclude that, “...*there is accumulating evidence that the medium of capture and transfer through ICT such as databases and corporate intranets is limited in terms of how far such technology can actually facilitate knowledge sharing*” (Newell 2004). Newell’s study also found that where transfer of learning had occurred, it had depended far more on social networks and a process of dialogue, than on ICT.

These findings concur with the view of Nonaka (1991) in that the key to organisations gleaning greater knowledge is through facilitating:

- The sharing of tacit knowledge through socialisation;
- the collation of discreet pieces of explicit knowledge to create new knowledge;
- the conversion of tacit knowledge into explicit knowledge i.e. externalising what

- individuals know;
- the conversion of explicit knowledge to tacit knowledge, i.e. internalising explicit knowledge.

## 1.5 Mental Models

Senge's (1990) discipline of managing mental models recognises that *"...new insights fail to get put into practice because they conflict with deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting"*.

Argyris and Schön (1974) opined that people are often unaware that the mental models that inform their actions are often not founded in the beliefs that they explicitly espouse, leading to a contradiction between their espoused theory and their theory in use. In order for people to manage their behaviour more effectively, they suggest the use of double loop and even triple loop learning in order to develop congruence between theory in use and espoused theory.

The double loop learning advocated by Argyris and Schön is fundamentally what Senge was referring to when he suggested that mental models should be brought to the surface and reflected on by *"balancing advocacy and inquiry"*, a process he describes as being *"...open to disconfirming data as well as confirming data - because we are genuinely interested in finding flaws in our views"* (Senge 1990).

This contemplative approach is necessary in order for organisations to escape what Shukla calls *"the success trap"* (1997). He describes how successful companies try to replicate their achievements by formalising their effective practices and procedures, standardising their products and services and investing in tried and tested technologies.

This single loop approach to learning results in the organisation becoming less sensitive to competitive demands; they lose touch with their environment and as Shukla explains, *"...their past learning becomes a hindrance in the way of the necessity of new learning; they must 'unlearn' to learn"* (Shukla 1997).

Hamel and Prahalad (1994) use the term *'frame'* in place of mental model, proposing that *"Although each individual in a company may see the world somewhat differently, managerial frames within an organisation are typically more alike than different"*, and, *"Almost by definition, in any large organisation there is a dominant managerial frame that defines the corporate canon"*.

The suggestion that there can be an institutional model echoes the view espoused by De Geus who sees the mental models of each learner as *"...a building block of the institutional mental model"* (De Geus 1988) (Cummings 2005)

## 1.6 Single, Double and Triple Loop Learning

Argyris and Schön (1974) first developed the idea that there are two basic types of organisational learning, 'single loop' or 'double loop'. Single loop learning is where organisations respond to changes in their internal and external environments by detecting and correcting errors in order to, "...maintain the central features of the organisational norms" (Barlow and Jashapara 1998). Argyris 1996 (cited Dahlgard 2004) when considering learning within an organisational context suggests that an error is any mismatch between the intention and what actually happens (the results). However, he further argues that discovering errors is not really learning. Learning only occurs when the discovery or insight is followed by action. From this view point, learning inevitably involves action.

It could be argued that incremental, imitative learning methods such as benchmarking and best practice are examples of single loop learning. Within what Argyris described as 'single loop' learning decisions are based solely on observations while in double loop learning decisions are based on both observation and thinking.

Learning hasn't really taken place until it's reflected in changed behaviours, skills and attitudes. (Stata 1989)

Double loop learning involves a more demanding approach to learning, where an organisation's norms, policies, assumptions and past actions are critically examined in order to inform new strategies for learning (Argyris and Schön 1974). Inevitably, such introspective organisational analysis may bring about conflict; Love (2004) maintains that, "*Frequently organisational conflict is a correlate of double loop learning in as much as the status quo is challenged.*"

In summary it can be stated that in "Single Loop Learning" people's decisions are based solely upon observations, While in " Double Loop Learning" decisions are based on both observation and thinking.

In "Triple Loop Learning" a reflection phase is incorporated to support or improve the thinking phase and hence to improve the decision making process.

"*Thus both double and triple loop learning can be considered as generative learning, while single loop learning can be considered an adaptive learning*" (Dahlgard 2004).

Engeström (2001) proposes that conflict or "*conflictual questioning*" as he describes it, does not constitute a barrier to learning, rather, it leads to "*...deepening analyses*" as well as, "*...sharper and more articulated questioning*".

## 1.7 Summary

The concept of the learning organisation has evolved as a response to a rapidly changing, dynamic business environment, which is constantly in flux. The idea then, of a fluid, flatter, less hierarchical organisational structure that offers less resistance to the seepage of knowledge through the organisation, appears to have credence.

An organisational structure only provides the skeleton of the learning organisation; a capillary system is needed to transfer knowledge around the organisation. It does seem that most knowledge management strategies focus solely on the electronic collation of information, failing to take account of how different types of knowledge are internalised and externalised via social networks.

There also appears to be a degree of consensus that a 'learning climate' needs to be created, where individuals feel free to experiment with new ways of doing things. This requires a blame free culture where mistakes, instead of being hidden, are acknowledged and learned from. Changing organisational culture requires a well planned change management strategy to be developed and this needs to be initiated and supported by senior management in order to have any chance of success. It does seem that the utilisation of 'mental models' by companies inhibits the implementation of new concepts and most models are based on replicating previously effective practices. The models, though individually held, collectively form and reinforce the organisational model, which is focused on maintaining the status quo.

The idea of surfacing mental models (Senge 1990) seems closely aligned with the concept of double loop learning (Argyris and Schön 1978). The introspective organisational analysis associated with both concepts is a quantum leap away from the morphostatic culture (Griffith and Watson 2004) prevalent in many organisations, and may prove to be one of the most difficult learning organisation characteristics to attain. There is clearly a need to make a change management strategy an integral part of any generic implementational model.

Other key characteristics that typify a learning organisation are:

- Having in place a strategy for creating, acquiring and disseminating knowledge;
- collective aspiration (a shared vision);
- an emphasis on continuous learning;
- a holistic, 'systems thinking' approach to learning that recognises the interrelatedness of the organisation, the individual and its external environments;
- a tolerance of experimentation.

Several problematic issues may prevent a company from successfully implementing learning organisation concepts. For example, organisational structures geared towards stability rather than change as identified by Johnson and Scholes (2002) are noted as an unsuitable framework upon which to found aspirations to become a learning organisation.

A lack of senior management support, resulting in failure to provide adequate resources, particularly in respect of allowing employees 'time to think' will also lead to failure.

The above has been highlighted in order to emphasise the importance of Triple Loop Learning being incorporated into any model designed to improve the effectiveness of management functions.

## **2. KNOWLEDGE MANAGEMENT AND THE QUANTITY SURVEYING (QS) PROFESSION**

### **2.1 Challenges to the Quantity Surveying Profession**

A quantity surveyor is a professional who attempts to ensure the resources of the construction industry are utilised to the best advantage by providing the financial management and consultancy service to the client during the construction process (RICS, 1991). Seeley (1997) pinpoints the services provided by quantity surveyors as:

- Preliminary cost advice
- Cost planning and cost checking
- Advice on contracting methods
- Construction procurement systems
- Valuation of construction work
- Preparing tender documents and negotiating contract prices
- Preparing contract documents and participating in contract administration
- Preparing cash flow forecasts and exercising cost control over the project
- Value management
- Interim valuations and payments
- Financial statements
- Variations, final account preparation and agreement
- Project management
- Settlement of contractual claims
- Giving expert evidence in arbitrations and disputes

Quantity surveyors provide the above services on a wide range of projects including building construction, civil and structural engineering, mechanical building and engineering services, petro-chemical, mineral extraction, planning and urban. Due to economic environment changes, the role of quantity surveyors is not as simple as stated by Seeley (1997). The following are amongst the challenges facing the QS profession and in the face of these forward-thinking policies will have to be adopted in order to maintain their competitive advantages and to survive and create a new scenario in this and future decades (Cartlidge, 2002):

- Higher Clients' Requirements through the increasing complexity of modern construction projects.
- Impact of Computerization
- Competition from other Professionals

### **2.2 Reasons for using KM to enhance QS professionalism**

To survive and grow in the future, the QS profession "must respond quickly and creatively to the challenges of accelerating social, technological, economical and environmental change.

An essential element in the future success is the skill and knowledge base at the core of professional practice (RICS, 1991). It is believed that KM is a relatively quicker

and more effective way to enhance QS professionalism, compared with improving the education of the new generation of quantity surveyors or reformatting of the profession. (These are not mutually exclusive).

The QS profession is characterised by a wealth of experiential knowledge, which is tacit and cannot be written down easily. It is crucial that QS firms realise their true potential assets, which can be determined by the KM system as it enables the company to 'know what it knows'. Quantity surveyors are professionals who provide help to clients for the legal and financial problems with their expertise. The more projects quantity surveyors complete the more experience they gain. *'What is needed is a way of remembering the solutions for use in future projects'* (BSI<sup>2</sup>, 2003). However, most QS firms face a problem in that they are losing knowledge due to the retirement or resignation of key personnel. Delong (2005) asserts that *'losing knowledge may have impacts that are very tangible and financially quantifiable, or impacts can be intangible and hard to measure'*. With the help of a KM system, knowledge is shared and stored and thus the risk of losing the knowledge can be minimised.

According to Liebowitz (2000), (Beckman, 1997) and Wiig (1999), the benefits of adopting KM include:

- Improved service quality
- Rapid and effective in enterprise-wide problem solving
- Improved decision-making
- Increased revenue
- Business growth
- Increased innovation
- Practice and process improvement
- Higher levels of expertise and knowledge
- Increased customer satisfaction
- Enhanced employee capability and organisation learning
- Increased employee's morale, creativity and ingenuity
- Employee stimulation and motivation
- Increased flexibility and adaptability
- Raise company professional image

BSI<sup>2</sup> (2003) argues that KM does not only increase the profitability of the organisation but also reduces mistakes and waste of resources. Companies are realising that their competitive edge is mostly the brainpower or intellectual capital of their employees and management. Despite that KM is not yet tied to enterprise strategy and performance in practice (Davenport 1999). Establishing a KM system involves time, cost and changes in the original operating system which can be the reluctance of the investment.

### **2.3 The potential difficulties of introducing knowledge management**

The concept of KM is ideal, but it does not guarantee success. Liebowitz (2000) suggests some potential difficulties for deploying KM as:

- lack of successful KM model in QS profession

- Unwillingness to change the current operating system
- Unwillingness of employees to share their knowledge
- Difficult to value the intellectual capital and show the tangible benefits
- Misunderstanding KM with information management

## 2.4 Knowledge management techniques used in a QS firm

To encourage the use of KM the QS firms should be given a clearer concept of KM and more guidelines for its implementation. The exact KM approach relies heavily on the type and size of the organisation. BSI<sup>2</sup> (2003) pinpoints the seven critical aspects of developing a KM system in an organisation:

- Describe what is required from the KM programme
- Draw up a strategy
- Understand the organisation's current knowledge
- Enable a knowledge sharing culture
- Manage the knowledge content
- Use enabling technology
- Measure and review the results

Below are some KM techniques which can help manage the knowledge content in QS firms. It is basically divided into a codification and personalisation approach.

### 2.4.1 Codification approach

#### Capturing Knowledge

An expert system can help capture the experience and knowledge of experts within the QS firms before they leave (Liebowitz, 2000). It is a computer program which could diagnose problems and produce reasons from its conclusions (Willis, 1994). Ashworth and Hogg (2002) and DeLong (2004) concur that an expert system can capture the knowledge, e.g. where disagreement amongst experts is settled by negotiation, and such results are refined so as to create artificial intelligence for solving the future problems.

#### Storing Knowledge

To store the explicit knowledge, as firms can develop a database system for storing data such as project details, costs, rates, etc., with an effective search engine for immediate access. This database system makes the wealth of experience immediately available to everyone in the company. The Building Cost Information Service (BCIS) is a good example of a database system. The difficulty inherent in having such a wide variety of data is its access. Rapid updating and retrieval are necessary if this is to be properly effective (Smith, 1989).

#### Sharing or transferring Knowledge

Information Technology such as email, Internet, Intranet, Lotus Notes, distribution of printed documents, CD ROMs, etc. are greatly enabled knowledge transfer. But all this technology should be designed to conform to proper human-computer interaction

guidelines with respect to cognitive overloads, visualisation and' user interface consideration (Smith, 1989). A user friendly and easy assessed IT system would help to inspire knowledge transfer.

#### 2.4.2 Personalisation approach

##### Capturing Knowledge

According to Liebowitz (2000), the experience, skills and knowledge can be captured by means of interviewing, protocol analysis, questionnaires and surveys and observation and simulation.

##### Storing Knowledge

To store the inexplicit knowledge, the firm can adopt the Knowledge Attic technique, which is similar to having a corporate memory or repository sitting there for possible use (Liebowitz, 2000). The captured knowledge is evaluated and possibly edited before being indexed and stored in the corporate memory. It is used as an archive which can be consulted when needed.

### 2.5 Sharing and transferring knowledge

Knowledge can be shared by:

- Peer tutoring
- Regular meetings and training
- Supervision/Mentoring system
- Reward system
- Lesson learned

Knowledge management is an on-going process. Gumbley (1998) argues that sometimes organisations focus too much on building the KM system rather than actually using it. This will result in failure to achieve the expected return. Hence the measurement of the effectiveness of the KM system should be developed so as to check if KM works in the same way as expected.

### 2.6 QS professional's expectations and perception of KM

Owing to the increased complexity of construction projects and requirements from clients, quantity surveyors need to equip themselves with a broad range of knowledge. In order to sustain a competitive advantage the QS professional does not only need to learn faster than the speed of changes but also learn faster than their competitors. This can be achieved by establishing a KM system to capture, develop, maintain and renew the intangible assets in QS firms.

An empirical survey was undertaken amongst fifty QS professional companies with the following observations.

The findings from the questionnaire surveys and interviews show that KM is

necessary for enhancing professionalism in order to maintain competitiveness.

The majority of quantity surveyors agree that KM would bring numerous benefits to the company and themselves, so their perception of KM is very positive. However the results show that an increase in innovation would be less likely to occur. This can be explained by the lack of emphasis on creating knowledge.

Furthermore quantity surveyors expected that KM would bring personal benefits more than benefits to the company. This is shown by the current knowledge sharing practices they frequently used. The findings illustrate that in the knowledge sharing process, knowledge and experience are mainly personal experiences and not company tactical experiences or company level problem solving techniques. Thus they think KM would contribute personally more than organisationally.

The majority of the respondents believe that the most critical factors to KM success are top management support, employee active participation, application of IT system and creating knowledge sharing space. Indeed, those factors are very important. Without top management support, KM could not be implemented successfully; without employee active participation, even if there is an excellent KM system provided, no result can be achieved and without knowledge sharing space, knowledge cannot be shared and accessed widely and smoothly.

However, regarding IT application as a critical factor to KM success contradicts with the previous literature which claimed that effective KM efforts can be based on limited technology. It is a common misunderstanding that KM is the same as information technology. Not surprisingly most respondents considered that the reward system is not important in KM. This is because they rarely use a reward system in their firm, which makes them unaware of the benefits of the reward system.

According to the findings the main barriers for a QS firm to develop a KM system are lack of time and understanding of KM and the difficulty to locate, capture, generalise and store knowledge. The resistance to change the current practice and employ new management approach from the top management also contribute to the opposition to develop KM in as firms.

It is not uncommon to think that one of the main barriers for a firm to implement KM is an unwillingness to share knowledge with others. However the survey finds the opposite. Most quantity surveyors are willing to share their knowledge with others.

To conclude, the common current practices that quantity surveyors use to acquire or share knowledge are not enough to enhance employees' knowledge levels. Nearly half of the quantity surveyors cannot acquire all the knowledge they need from work, so there must be an improvement in KM methods to enhance their knowledge levels. Due to the deficiency in current practice and the positive expectation and perception of KM system, it is believed that KM is applicable to QS firms and is a possible means to enhance quantity surveying professionalism either individually and organisationally.

However, even if KM is implemented, there are some hidden limitations to the positive effects on QS firms. Firstly, as quantity surveyors seek knowledge mainly within their firms and seldom from external sources, the range of knowledge they acquire is limited to their profession only. New knowledge or other specialist knowledge is less likely to be acquired.

Thus the effect of KM in enhancing their professionalism would be limited to their field only. Secondly, knowledge creation is relatively less emphasized in the QS profession, so even KM is deployed, no new knowledge would be created and hence the profession would be less likely to expand. Thirdly, despite new knowledge or methods being developed through knowledge exchange by different personnel, its validity still needs experiential proof, thus there is a chance of theoretical inaccuracies.

## REFERENCES

Argyris, C., and SCHON, D.A., (1974). *Theory in Practice: Increasing Professional Effectiveness*. San Francisco: Jossey-Bass.

Ashworth, A., and Hogg, K., (2002). *Willis's practice and procedure for the quantity surveyor (Eleventh Edition)*. Oxford: Blackwell Science Ltd.

BSI<sup>2</sup>, (2003). *PD7503 - Introduction to Knowledge Management in Construction*. London: British Standard Institution. Available at [www.bsi-km.com](http://www.bsi-km.com) [Accessed 11<sup>th</sup> November 2005].

Barlow, J., and Jashpsra, A., (1998). Organisational Learning and Inter-firm 'Partnering' in the UK Construction Industry [online]. *The Learning Organisation*, 5(2), pp. 86-98. Available from: Emerald Fulltext Database [Accessed 9<sup>th</sup> November 2004].

Beckman, T., (1997). 'A Methodology for Knowledge Management'. In: *Proceedings of the IASTED International Conference on Artificial Intelligence and Soft Computing*, (ASC '97), M.H. Hamza (ed.), ACTA Press, Calgary, Canada, 1997, pp.29-32.

Burns, T., and Stalker, G.M., (1961). *Managing Innovation*. London: Pergamon.

Cartlidge, D., (2000). *New Aspects of Quantity Surveying Practice*. Oxford: Butterworth - Heinemann.

Cummings, A., (2005). *A Critical Examination of the Key Issues that Influence a Large Construction Company's Ability to Become a Learning Organisation*. BSc (Hons) Dissertation, Sheffield Hallam University.

Dahlgaard, S.M.P., (2004). Perspectives on Learning in a Literature Review. *European Quality*. 2(1), pp 033-047.

Davenport, T., and Prusak, L., (1998). *Working Knowledge: How Organisations Manage What They Know*. United States of America: President and Fellows of Harvard College.

De Geus, A.P., (1988). Planning as Learning. *Harvard Business Review*, 66(2), pp.70-74.

Delong, D., (2004). *Lost Knowledge: Confronting The Threat Of An Aging Workforce*. Oxford: Oxford University Press.

Engestrom, Y., (2001). Expansive Learning at Work: Towards and Activity Theoretical Reconceptualization. [online]. *Journal of Education and Work*, 14(1), pp.133-156. Available from: EBSCO Business Source Premier Database [Accessed 5<sup>th</sup> November 2004]

Garvin, D.A., (1993). Building a Learning Organisation. *Harvard Business Review*., 71(4), pp.78-91 [online]. Available from: EBSCO Business Source Premier Database [Accessed 4<sup>th</sup> November 2004].

Goh, S.C., (2001). The Learning Organization: An Empirical Test of a Normative Perspective. *International Journal of Organizational Theory and Behaviour*, 4(3&4), pp.329-355. [online]. Available from: EBSCO Business Source Premier Database [Accessed 16<sup>th</sup> November 2004].

Griffith, A., & Watson, P., (2004). *Construction Management: Principles and Practice*. Basingstoke: Palgrave Macmillan.

Gumbley, H., (1998). 'Knowledge Management'. *Work Study*, 47(5), pp.175-177.

Hamel, G., and Prahalad, C.K., (1994). *Competing for the Future*. Boston: Harvard Business School Press.

Ho, S.K.M., (1999). Total Learning Organisation. *The Learning Organization*, 6(3), pp.116-120 [online]. Available from: Emerald Fulltext Database [Accessed 4<sup>th</sup> November 2004].

Johnson, G and Scholes, K., (2002). *Exploring Corporate Strategy: Text and Cases*. 6<sup>th</sup> ed. Harlow: Pearson Education Ltd.

Liebowitz, J., (2000) *Building Organisational Intelligence: A Knowledge Management Primer*. Taylor & Francis Ltd.: CRC Press.

Lobermans, J., (2002). Synergizing the Learning Organization and Knowledge Management. *Journal of Knowledge Management*, 6, pp.285-294 [online]. Available from: Emerald Fulltext Database [Accessed 5<sup>th</sup> November 2004].

Love, P.E.D., (2004). Nurturing a Learning Organization in Construction: a Focus on Strategic Shift, Organizational Transformation, Customer Orientation and Quality Centred Learning. *Construction Innovation*, 4(2), pp.113-126 [online]. Available from: EBSCO Business Source Premier Database [Accessed 16<sup>th</sup> November 2004].

Malhotra, Y., (1996). Organizational Learning and Learning Organizations: An overview. [online]. Available at: [Http://www.kmbook.com/orglrng.htm](http://www.kmbook.com/orglrng.htm) [5<sup>th</sup> November 2004].

Newell, S., (2004). Enhancing Cross-Project Learning. *Engineering Management Journal*, 16(1), pp. 12-20. [online]. Available from: EBSCO Business Source Premier Database [Accessed 16<sup>th</sup> November 2004]

Nonaka, I., (1991). The Knowledge - Creating Company. *Harvard Business Review*, 69(6), pp.96-104. [online]. Available from: EBSCO Business Source Review Database [Accessed 7<sup>th</sup> November 2004].

Nyhan, B., (2004). European Perspectives on the Learning Organisation. *Journal of European Industrial Training*, 28(1), pp.67-92 [online]. Available from: Emerald Fulltext Database [Accessed 16<sup>th</sup> November 2004].

Ortenblad, A., (2004). The Learning Organization: Towards an Integrated Model. *The Learning Organisation* 11, pp.129-144. [online]. Available from: Emerald Fulltext Database [Accessed 4<sup>th</sup> November 2004].

Pedler, M., Boydell, T., and Burgoyne, J., (1988). *Learning Company Project Report*. Sheffield: Manpower Services Commission.

RICS (1991). *Quantity Surveying 2000*. RICS.

Seeley, I.H., (1997). *Quantity Surveying Practice (Second Edition)*. London: Macmillan Press Ltd.

Senge, P. M., (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. London: Century Business.

Scarborough, H., and Swan, J., (1999). *Case Studies in Knowledge Management*. London: Institute of Personnel and Development.

Smith, J.A., (1989). *Computers and Quantity Surveyors*. (sl): Macmillan Publishing Company.

Shukla, M., (1997). *Competing Through Knowledge: Building a Learning Organization*. New Delhi: Response Books.

Stata, R., (1989). *Organisational Learning - The Key to Management Innovation*. *Sloan Management Review*. Spring.

Wiig, K., (1999). 'What Future Knowledge Management Users May Expect'. *Journal of Knowledge Management*, 3(2), pp. 155-165.

Willis, J.A., and Willis, J.C., (1994). *Practice and procedure for the quantity surveyor (Eleventh Edition)*. Oxford: Blackwell Science Ltd.

## **BIOGRAPHICAL NOTES**

**Richard Davis** is a Chartered Quantity Surveyor. He is a Senior Lecturer and Course Leader for the Quantity Surveying degree at Sheffield Hallam University.

**Paul Watson** is Professor of Building Engineering, Head of Construction and Head of Business Development at Sheffield Hallam University. He is a Fellow of the Association of Building Engineers, a Corporate Member of the Chartered Institute of Building and is a Registered Practitioner with the Higher Education Academy.

**Chi Lai Man** is a graduate of Sheffield Hallam University having graduated in 2006 with a first class honours degree in Quantity Surveying. She is currently working as a quantity surveyor in private practice in Hong Kong SAR, China.

## CONTACTS

Mr Richard Davis  
Sheffield Hallam University  
Howard Street  
Sheffield  
UNITED KINGDOM  
+44 114 2253098  
+44 114 2253179  
[r.w.davis@shu.ac.uk](mailto:r.w.davis@shu.ac.uk)

Professor Dr Paul Watson  
Sheffield Hallam University  
Howard Street  
Sheffield  
UNITED KINGDOM  
+44 114 2253968  
+44 114 2253179  
[p.a.watson@shu.ac.uk](mailto:p.a.watson@shu.ac.uk)

Ms Chi Lai Man  
[mandylai82@gmail.com](mailto:mandylai82@gmail.com)