

**DR. SHANKAR SANKARAN, DR. MARTIN ORR, DR. MADHU RANJAN KUMAR  
AND DR. SIMON WALKER**

## **How do organizations learn in a project environment? A multiple case study analysis drawing lessons for the built environment context**

### **ABSTRACT**

This paper is comprised of four parts. First it briefly reviews the literature on organizational learning, learning organizations and knowledge management and their relationship and describes a multifaceted model of organizational learning proposed in the literature to facilitate organizational learning. Second, it explains how organizational learning takes place in a project environment using three case studies based on doctoral research conducted by managers in their own organizations. Each of these projects was implemented as a strategic project in the organizations undergoing rapid change. All three projects used 'insider action research' to implement change. Project teams were used in these projects during implementation that promoted learning, knowledge sharing and dissemination. The multifaceted organizational learning model is then used to analyse how organizational learning took place in these projects. Third it points out that there has been considerable interest in organizational learning and knowledge management in both project and construction management. While these practices have been widely adopted in a project management environment the construction industry is still in the early stages of adoption. Fourth, the paper reports on a discussion with built environment practitioners on the applicability of a multifaceted model to construction management. The paper concludes that while there is an increasing interest in both organizational learning and knowledge management in construction only a few facets of the multifaceted model are actually being used by the industry in Australia. The paper proposes that further research is needed to find a suitable model for promoting organizational learning and knowledge management in construction.

**KEYWORDS:** Organizational learning, Knowledge management, Built environment, Project management, Construction management

### **ORGANIZATIONAL LEARNING AND LEARNING ORGANIZATIONS**

The concept of organizational learning has been written about since the 1960s but gained momentum in organizational literature towards the end of 1980. Some prominent publications at this time were Pedler's (1989) notion of a 'learning company', Garrat's (1988) ideas on 'learning organizations' and Arie De Geus' paper titled 'Planning as learning' in the *Harvard Business Review* based on his work in 'scenario planning' in Shell.

But it was Peter Senge's (1990) seminal book titled *The Fifth Discipline: The Art and Practice of a Learning Organization* which created an interest in many organizations to implement strategies to promote organizational learning. Both academics and practitioners were attracted to the notion of a 'learning organization' as Senge's writings combined prominent ideas from Forrester, Argyris and Schein in a 'pragmatic' as well as 'mystical' way. Senge proposed 'five component technologies' (personal mastery, mental models, shared vision, team learning and systems thinking) to help organizations realize their highest aspirations.

Although the idea of learning organizations appealed to managers and organizational consultants started offering their wares to help organizations become learning organizations the journey was slow. Organizations began to ask whether this was another one of those management fads. But the idea of organizational learning has lived on and seems to have found new life with the recent emphasis on knowledge management.

Why was the progress towards becoming learning organizations slow? Garvin (2000) attempts to explain this lack of progress by stating that while the concept looked good in theory it lacked clear

guidelines for practice. He adds that while several scholars in the field linked learning to knowledge acquisition, deeper understanding and improved performance they differed in other details about the concept. Garvin feels that managers were more interested to know how they can implement learning organizations rather than get involved in theoretical debates.

Perhaps realizing the difficulties faced by managers Senge *et al.* (1999) published a field book to serve as a resource for managers in their journey to sustain the momentum of becoming learning organizations. The field book contained many useful tools.

In a book titled *Learning Organizations* (Chawla and Renesch, 1995), with several chapters on how to create and sustain learning organizations, Dilworth (1995: 24-245) points out that there are five principal barriers to organizational learning:

1. Treating learning as an individual phenomenon rather than something that evolves in groups
2. Fixation with formal training and ignoring informal learning
3. Differentiating between learning and business processes
4. Having 'non-listening' work environments – ignoring that ideas need to be interchanged to promote organizational learning
5. Barriers to learn due to hierarchy, autocratic leadership styles, atmosphere of distrust, fear, blocked communications, fragmented work effort resulting in stultification of organizational learning.

Easterby-Smith *et al.* (1999), in their book on organizational learning point out that the literature provides different perspectives on organizational learning. They classify these broadly as 'technical' and 'social' views. While the technical view emphasises effective processing, interpretation and response to information generated internally or from external sources, the social perspective emphasises the way in which people make sense of their experiences at work. They add that the scholars who contribute to the social perspective of organizational learning also point out the political and cultural aspects of organizational learning.

You would have noticed by now that the paper seems to use the terms 'organizational learning' and 'learning organizations' interchangeably. It may be good to look at some definitions.

According to Argyris and Schön (1996:16), whose views on organizational learning have been quoted frequently by both academics and practitioners:

"Organizational learning occurs when individuals within an organization experience a problematic situation and inquire into it on the organization's behalf....In order to become organizational the learning that results from organizational inquiry must become embedded in the images of the organization held in its member's minds and/or epistemological artefacts (the maps, memories and programs) embedded in the organizational environment'.

Peter Senge (1990: 3) describes a learning organization as one 'where people continually expand the capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together' and (p 14) 'an organization that is continually expanding its capacity to create its future'.

Senge (1990) draws on the concepts of Argyris and Schon (1996) in his book on learning organizations and uses both terms 'organizational learning' and 'learning organizations' while interviewing leaders for his book and does not seem to differentiate between the two.

Easterby Smith *et al.* (1999: 2), quoting Tsang (1997), state that while the theorists of learning organizations have drawn heavily on ideas from organizational learning the traffic has been one way. They observe that while the literature on organizational learning studies organizations in a detached way by observing and analysing the processes of individual and collective learning inside organizations the concept of learning organizations has an action orientation and studies specific diagnostic and evaluative tools that identify, promote and evaluate the quality of the learning processes inside organizations. Vera and Crossan (2006:126) go a step further and propose that organizational learning 'is a descriptive stream, with academics who pursue the question "how does an organization learn?". In contrast LO [learning organization] is a prescriptive stream, targeted at practitioners who are interested in the question "how should an organization learn?"

It looks as though organizational learning is theory focused while learning organization is practice focused. This paper is interested in how theory links to practice in helping organizations to learn.

### A MULTIFACETED MODEL OF ORGANIZATIONAL LEARNING

From a brief discussion on organizational learning and learning organizations it becomes clear that organizational learning is a complex phenomenon and needs to be looked at from multiple perspectives – contextual, leadership, structural, personal and cultural. Such a multifaceted model of organizational learning has been proposed by Lipshitz *et al.* (2007) based on existing theory and research. The elements of the multifaceted model proposed by Lipshitz *et al.* (2007:15) is shown in Figure 1

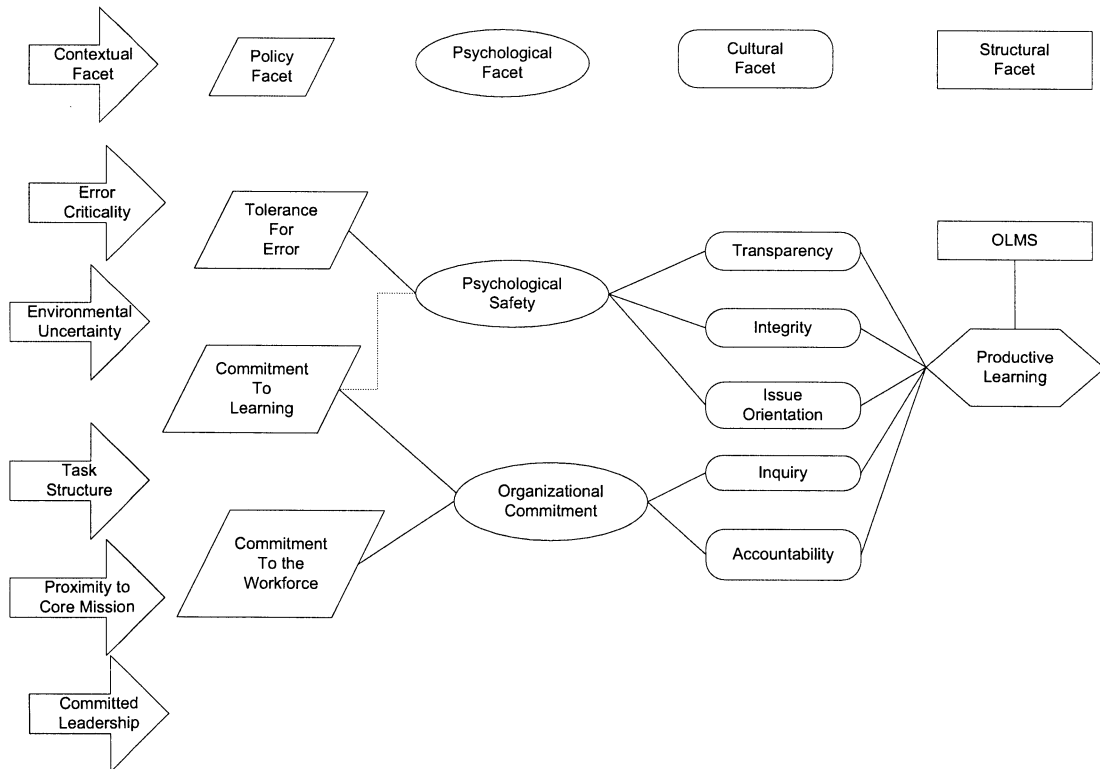


Figure 1 Facets of Organizational Learning (Source: Lipshitz et al 2007:15)

There are five organizational facets (contextual, policy, psychological, cultural and structural) that give rise to what that Lipshitz *et al.* (2007) term productive organizational learning.

Lipshitz *et al.* (2007) post two criteria to determine productive learning. The first is similar to the criteria proposed by Argyris and Schon (1996) that conclusively shows that learning results in intended organizational outcomes.

Argyris and Schön (1996:20) proposed three types of productive organizational learning:

1. Organizational inquiry or instrumental learning the leads to improvement in the performance of organizational tasks.
2. Inquiry in which an organization explores and restructures the values and criteria through which it defines what it means by improved performance.
3. Inquiry through which an organization enhances its capacity for learning types (1) and (2).

Lipshitz et al's (2007) second criterion is based on the relationship between learning and knowledge and tests whether learning results in organizational action based on valid knowledge. The validity of knowledge is based on its ability to withstand critical evaluation.

The elements of the various facets shown in the model in Figure 1 are discussed along with an analysis of the case studies in a later section of this paper. While the model is designed for promoting organizational learning it includes organizational practices promoted by knowledge management

practitioners showing the close relationship between 'organizational learning' and 'knowledge management'. This relationship is now examined in the next section of the paper.

### KNOWLEDGE MANAGEMENT AND ORGANIZATIONAL LEARNING

The practice of knowledge management in organizations has been influenced by the writings of Nonaka and his associates (Nonaka and Takeuchi, 1995). Their model of knowledge management known as the SECI model is based on the notion of knowledge creation through transformations between tacit and explicit knowledge (Easterby-Smith and Lyles, 2006). Nonaka's writings are influenced by the work of Polanyi (1966) who distinguished between explicit and tacit knowledge (explicit knowledge is knowledge that can be 'codified' and transmitted through formal, systematic language while tacit knowledge is personal, context-specific, i.e., in the heads of the individuals and hard to formalize and communicate through 'coding' mechanisms).

Figure 2 (Nonaka and Takeuchi, 1995: 62) shows the essential elements of the SECI model. According to Nonaka and Takeuchi (1995: 62-70), socialization is the process of face-to-face knowledge transfer, e.g. conversation that helps transfer technical skills. In externalization individuals articulate their tacit knowledge into explicit forms. For example, someone can interview the person having the knowledge to capture and convert it into an explicit form for reuse. Metaphors and models can also help this conversion. Combination occurs when discrete pieces of knowledge are converted into a new form through sorting, adding, combining or categorising explicit knowledge, e.g. a report or case study. Knowledge is internalized when it causes behavioural change, producing new behaviours such as a more efficient way of carrying out a process. It is closely related to the idea of 'learning by doing'.

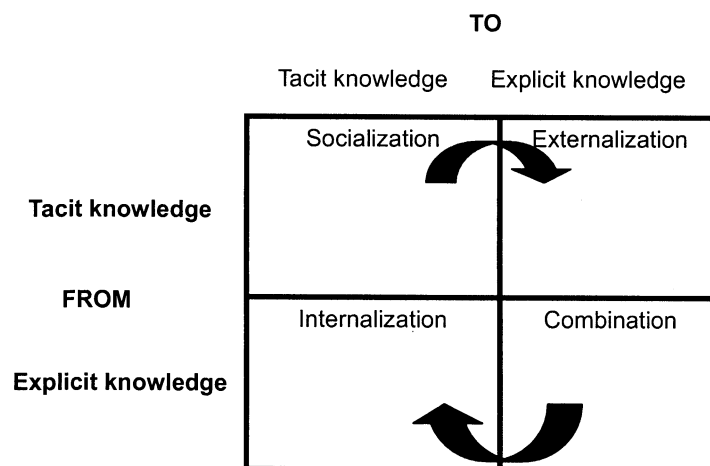


Figure 2. Models of Knowledge Conversion (SECI) (Source: Nonaka and Takeuchi 1995:62)

Vera and Crossan (2006) have attempted to integrate the concepts of organizational learning and knowledge management. They contend that while the terms 'organizational learning' and 'learning organizations' have been used from different perspectives in the literature, the distinction between organizational knowledge and knowledge management is not that clear. According to Vera and Crossan (2006: 124) "the term knowledge management is often used in titles of books and conference titles but it is seldom defined in academic papers where the concept of organizational knowledge is the one frequently used". They propose that (2006:127) 'OL [organizational learning] focuses on learning as a process of change while OK [organizational knowledge] stresses knowledge as a resource that provides competitive advantage and studies the processes associated with its management. LO [learning organization] and KM [knowledge management] share prescriptive views of how firms should effectively learn and manage knowledge'. Figure 3, adapted from Vera and Crossan (2006: 127) shows the boundaries of the organizational learning and organizational knowledge fields and their relationship to learning organizations and knowledge management.

Based on their review of the literature, Vera and Crossan (2006) argue that there is an overlap between the boundaries of organizational learning and organizational knowledge and recommend that organizations should take an integrated view of the two concepts to improve their performance.

Organizational Learning	Organizational Knowledge	
Micro-processes and relationships between learning at the individual/ group and organizational levels  Organizational learning system and infrastructure: Alignment between strategy structure, culture, procedure and systems	Learning as knowledge processes: creation, retention and transfer  Cognitive and behavioural aspects of learning, knowledge and knowing  Changes in knowledge and knowing  Situated learning and knowing in communities of practice	Knowledge-based view of the firm  Static knowledge and knowing
<b>Prescriptive: The Learning organization</b>		<b>Prescriptive: Knowledge Management</b> (Tools and IT solutions)

Figure 3: Boundaries of the organizational learning and organizational learning fields (Source: Vera and Crossan 2006:127)

The multifaceted model used in this paper integrates the concepts of organizational learning and organizational knowledge and therefore a clear distinction between these concepts will not be made in this paper while analysing the research projects.

### ANALYSIS OF THREE PROJECTS USING THE MULTIFACETED MODEL

Three projects were used to analyse the nature of organizational learning using the multifaceted model. The questions that were asked of the researchers who carried out these projects are shown in Appendix 1 of this paper. All the research projects are based on successfully completed Doctor of Business Administration theses supervised by the first author and carried out by the other authors.

The first project was the introduction of Total Quality Management (TQM) in a department of the Indian Railways while preparing the organization for ISO 9000 accreditation. The organization is in the public sector and can be considered a monopoly although facing increased competition from road transport and losing business. The second project was carried out in Europe in the service sector by a multinational company providing telecommunication services which was forced to adopt knowledge management practices to be competitive in a globalised environment. The third project was carried out in the health sector in New Zealand to introduce an electronic health knowledge management system in a large district hospital.

None of the three the projects started off with organizational learning as an expressed objective but it was expected that knowledge would be shared at individual, group and organizational levels. The projects in the services and health sectors were planned as knowledge management projects.

Organizational learning was observed to take place in the service organization. In the public sector organization, the researcher observed that the organization learnt through generating 'valid knowledge'. A two-tier 'corrective and preventive action process was introduced and the organization became more process oriented. This also helped the integration of quality and environmental processes used for ISO 9000 and ISO 14000. In the service organization the researcher observed that the use of 'after-action reviews' improved efficiency through learning. The solutions used in one country were used in another to provide solutions to problems reusing knowledge generated in one location to another. Engineers in the organization were able to use the 'explicit knowledge' stored in the knowledge repository. In the health sector the project led to the establishment of organizational structures that promoted organizational learning and knowledge management.

All three researchers noticed differences between individual learning and organizational learning. Lipshitz *et al.* (2007) argue that while individuals learn from experience organizations need structures analogous to a central nervous system to be able to learn.

### Structural facet

The structural facet of the multi-faceted model looks at structures that help learning through the collection, analysis, dissemination and application of information and knowledge. The authors call these structures organizational learning mechanisms (OLMs) and propose two types of OLMs – integrated

and non-integrated. 'Integrated' OLMs are those where members of an organization who process the information also apply this to new knowledge. 'Non-integrated' OLMs are where the learning is carried out by different individuals. Examples of integrated OLMs are after-action reviews (AARs), communities of practice (COPs), debriefing, peer-assists, post-project assessments. Lipshitz *et al.* (2007) also classify OLMs as 'dual purpose' when the learning takes place during task performance and 'designated' when the task performance and learning are carried out at different times. Examples of non-integrated and designated OLMs are strategic planning, auditing and quality assurance processes. Examples of integrated and designated OLMs are performance reviews after a task is completed.

In the public sector case a two-tier corrective and preventive action process provided the necessary structure and matched the processes of the 'socialisation' and 'externalisation' proposed in Nonaka and Takeuchi's (1995) SECI model. In the service organization also the SECI model provided the supporting structure for organizational learning. Individuals benefited from tacit learning and the organization benefited from the ability to store the tacit knowledge as explicit knowledge and reusing it. In the health sector the action research process in groups supported the structural facet. Project reviews facilitated by an independent consultant also acted as an OLM.

The organization in the service sector used after-action reviews as organizational learning. The public sector organization used both integrated and non-integrated OLMs. Table 1 shows an analysis of the use of OLMs during the ISO 9000 accreditation process in the public sector.

Table 2 Placing different learning situations during ISO 9000 implementation within four types of OLMs

OLMs	Dual purpose (performance and learning together)	Designated (performance and learning at separate times and place)
<b>Integrated</b> (Information processing and application of learning as a result of it is done by the same person). Advantage – learning proceeds on-line	Learning while doing – difficult to achieve – normally happens in a crisis when there is no slack in the system. Example – Mode 2 of SSM	Performance review by members of a task team Example: Corrective and preventive action (CPA) meeting of ISO 9000 processes is an example of this type of organizational learning
<b>Non-integrated</b> (Information processing and learning is carried out by different individuals). Advantage – easy to install & operate	People who perform work together with those whose job is primarily information processing Example- On the job training. Management representatives and auditing unit-in-charges working together.	Example: Inspection, Internal quality audit, strategic planning

### Cultural facet

(Lipshitz *et al.*, 2007: 47-48) propose that organizations should embrace five norms under the cultural facet:

1. Inquiry – persisting the investigation and suspending inquiry until full understanding is achieved.
2. Issue orientation – focusing on the relevance of the information to the issues irrespective of the social standing or position of the recipient or the source.
3. Transparency – being able to expose one's thoughts and actions to the scrutiny of others.
4. Integrity – collecting and providing information regardless of its implications
5. Accountability – taking responsibility for learning and implementation of the lessons learned.

The cultural facet introduced several complexities in the service sector due to issues with organizational, national and professional cultures. The organization was primarily concerned about the bottom line in implementing knowledge management. The professional culture was more interested in problem solving than knowledge sharing. The national culture had difficulties with using common language (English) in dealing with customers who did not speak the language. There was also hesitation in capturing knowledge when it was felt that this may cause job redundancy. Status in the organization was also an issue. In the public sector organization a cultural transformation took place through the introduction of TQM that helped in capturing knowledge through the quality processes. The health sector generally provided a supportive culture for learning and knowledge sharing but the researcher found that converting the support into effective action was often problematic.

### Psychological facet

The psychological facet (Lipshitz *et al.*, 2007: 17-18) to support productive organizational learning is based on the degree of psychological safety i.e. engendering trust and enabling people to face the risks

of inquiry, transparency and accountability and a commitment to the organization to counteract the dysfunctional effects of politics and game playing on learning.

The psychological facet was an issue in the service organization where tolerance for errors was not high. When it came to revealing mistakes job security took precedence. The frequent 'downsizing' did not help this either. In the public sector organization ISO certification did not pose major psychological issues but saving face is of great importance in an Indian cultural context. To protect this a mechanism like an 'internal' networker was necessary to develop learning through mistakes. In the health sector adequate safety was provided within the teams that implemented the project.

### **Leadership and policy facet**

The leadership and policy facet (Lipshitz *et al.*, 2007:18) denotes formal and informal steps taken by management to support organizational learning. Such steps include learning oriented leadership and policies that provide clear commitment to learning, exhibiting tolerance towards errors and a commitment to the workforce.

The knowledge management program was supported from the top in the service sector but talk did not match with actions when budgets and resources were required to support the project. The expectation of returns from the investment in knowledge management took precedence in making decisions. In the health sector it was observed that management was highly supportive of the project and encouraged the use of an action research framework.

### **Contextual facet**

The contextual facet (Lipshitz *et al.*, 2007: 18) of the model focuses on exogenous factors that are beyond the control of management and include the degree of environmental and task uncertainty, task structure, proximity of the learning to the organization's core tasks and the degree to which errors can be costly.

Uncertainty due to the rapid changes in the telecommunications market provided the impetus for introducing knowledge management in the service company. The public sector organization benefited from the concept of the 'caste system' in India. The notion of 'castes' in India be it caste according to religious division or professional divisions encouraged the formation of 'communities of practice' and 'learning communities' and 'clans' that worked together to form a learning context.

Inhibitors to organizational learning in the public sector was the 'power-distance' nature of the Indian culture where the 'boss is always right'. The natural instinct of Indians to stay together (promoted by the culture of overprotection from childhood) makes them work in teams easily putting aside their differences. In the service organization resources to implement knowledge management were very limited. The structure of the organization (silos or cross-functional) also affected knowledge sharing. The emphasis was also on business knowledge.

### **Applicability of the model**

The researcher from the service sector felt that the multifaceted model used for analysis needed to be improved for clarity. The relationship between facets and elements needs to be clearer and it was unclear whether there is a progression from one facet to the other in phases. The researcher from the public sector felt that the model was useful in conceptualising organizational learning and its most important contribution was the emphasis on organizational learning mechanisms. The researcher from the health sector felt that the model certainly helped to think through some of the issues. He agreed that while an organization is made up of individuals the organization requires a framework and culture to facilitate/capture learning in an ongoing manner.

## **ORGANIZATIONAL LEARNING IN THE BUILT ENVIRONMENT**

What is the relevance of organizational learning and knowledge management models to the built environment context? Initially, when knowledge management was introduced as a concept to improve organizational performance, the emphasis was on functional organizations. It was felt that since projects were one-time efforts using temporary organizations, organizational learning and knowledge management were not that important. But this stance changed as observed by the publication of several

papers about the importance of knowledge management in projects. The Project Management Institute has also established the James R Snyder Center for Management of Knowledge and Wisdom in 2001 ([http://www.pmi.org/info/PIR\\_KWCHistory.asp](http://www.pmi.org/info/PIR_KWCHistory.asp)). A search of the database at this centre resulted in close to 90 publications on knowledge management since 1996 and 58 publications about organizational learning since 1993 showing the growing literature in these areas relevant to project management.

Knowledge management is being recognised as a core business concern in the architecture, engineering and construction industries (Kamara *et al.*, 2002) and a core skill for project managers in the construction industry (Edum-Fotwe and McCaffer, 2000). Kamara *et al.* (2002: 56) suggest that the need for knowledge management in the construction industry has been triggered by the need for innovation, improving business performance and increasing client satisfaction. The effective use of lessons learned from projects is being used in the industry to overcome its weaknesses. However the term knowledge management is new although it is practiced under different names. Fifteen cases in architecture, engineering and construction sector through the CLEVER (Cross-sectoral learning in the virtual enterprise project) funded by the Engineering and Physical Sciences Research Council (EPSRC) in the UK were examined by Kamara *et al.* (2002). They observed that the industry was heavily reliant on accumulated individual knowledge and informal networks but there was a general lack of formal processes to capture and disseminate knowledge.

They found that several OLMs such as lessons learned, project reviews and feedback mechanisms were being used. IT tools like Intranets and groupware were also being used. It was also observed that organized knowledge sharing was encouraged within some departments but not across the organizations. Quintas (2005), writing in a book on *Knowledge Management in Construction* points out that the drivers for knowledge management are accelerating change in markets, competition, technological advances, drive for innovation, cross-boundary partnerships and wealth being increasingly generated from knowledge and intangible assets. It looks as though while the construction industry is realising the need to manage knowledge better it is not establishing formal processes to manage organizational learning and knowledge management in systematic ways. In terms of the multifaceted model organizational learning is reliant on supporting the structural facet through OLMs.

Discussing the implication of knowledge management to the construction industry Egbu and Robinson (2005: 36-38) suggest that there are three aspects to be considered to map the knowledge required by construction firms:

1. Product-based factors to supply standardised, mature or innovative products depending on what is required from small and simple buildings to sophisticated structures such as the Millennium Bridge in London
2. Process-based factors supporting technical and management systems required to deliver the products. Processes range from highly knowledge-intensive approaches relying on tacit knowledge (sketching concepts) to automated processes requiring standard procedures based on 'codified' knowledge
3. People-based factors that relate to problem-solving skills and team work. Both highly-skilled individuals and competent teams are required to successfully carry out construction projects. Problem-solving skills and creativity become very important while working on ill-defined or complex projects.

## RELEVANCE TO THE AUSTRALIAN CONTEXT

A discussion with a senior academic and practitioner at the School of the Built Environment at the University of Technology, Sydney about the multifaceted model for organizational learning in a local context revealed that while the construction industry is aware of the benefits of knowledge management and organizational learning, a model such as the multifaceted model may be difficult to apply to the industry due to intense competition, nature of temporary work in the industry, lack of tolerance towards mistakes, fear of litigation and the hierarchical nature of construction work. However, there is scope for using explicit knowledge in the supply chain of the construction industry to balance supply and demand for products used in construction. For example, an architect's drawing could be used to estimate the demand for products instead of waiting for the construction bills of materials to be produced. This will help suppliers smoothen their production and the construction companies to have materials delivered on time reducing delays and minimising inventories. Such knowledge sharing is common in other industries such as the retail industry where supply and demand are matched through business-to-business (B2B) e-commerce solutions reducing wastage, delays in supply and reducing inventories. The literature also confirms the value of e-commerce technologies to enhance organizational learning in materials



management in the construction industry (Perdomo-Rivera 2004). An interesting research studying the impact of complexity, social interaction and procurement industry by studying a two-stage tendering process for building a local council swimming pool (Cicmil and Marshall 2005) revealed that the process helped in creating interdisciplinary knowledge in real time and resulted in project control being both delegated and socialised.

Through communication with another senior academic at the Royal Melbourne Institute of Technology (RMIT) researching in project and construction management it was found that several research projects are being carried out to study the use of knowledge management for both the project management and construction industries – exploring the use of community of practice software management tools (Jewell and Walker, 2005), diffusion of information and communication technology to support communities of practice (Peansupap and Walker, 2005), creating a knowledge leadership vision (Walker *et al.*, 2005), procurement innovation and organizational learning (Walker and Maqsood, 2002).

## DISCUSSION

The three research projects did not start with a specific model for organizational learning but used practices available in the literature to promote both learning and knowledge sharing. Hence the analysis is a post-project reflection of their learning experience. The researchers felt that the model served as a very useful tool to examine their own model of organizational learning and knowledge transfer. Even though some elements of the model were not clear it served a good purpose. The researchers agreed that organizations required appropriate support structures and policies to enable learning. It was not difficult to adopt elements of the structural facet of the model through appropriate OLMs. The contextual facet was also favourable as each organization in the research project was undergoing change and both organizational learning and knowledge management helped in the change process. The leadership and policy facets were supportive only when organizational learning and knowledge management contributed to the bottom line in the service sector which was running a commercial business. It was interesting to note that national culture and organizational culture played a part in two of the sectors. So culture could be context specific in terms of introducing initiatives. The most difficult was the psychological facet as organizations, whether they are the private sector or public sector are not forgiving of errors and mistakes. Some 'social' mechanisms are required to unearth lessons learned from failures and mistakes in a non-threatening way.

There are some similarities between the experience of the projects analysed and the status of organizational learning and knowledge management in the construction industry. It looks as though the structural facet can be implemented as part of routine processes in the construction organizations that could serve as OLMs. But the other facets are not as easy as the industry is only in the early stages of realising the potential of organizational learning and knowledge management. The industry has adopted technology that helps to store and share explicit knowledge. This may be because construction processes traditionally use a lot of documents and databases in their work which can be considered repositories of explicit knowledge. Tacit knowledge transfer is still not well established compared even to the project management discipline where OLMs that promote tacit knowledge sharing have been adopted by many organizations.

## CONCLUSIONS

The value of organizational learning and knowledge management seems to have been recognised in the built environment context. While the project management discipline has taken up organizational learning and knowledge management to improve performance it is still early stages in the construction industry in Australia. Models such as the multifaceted model described in this paper could be used as a starting point to investigate the application of organizational learning and knowledge management practices in the construction industry. There is scope for more research in investigating how successful construction companies are adopting organizational and knowledge management practices to construct a useful model for the construction industry. The paper has not studied the status of organizational knowledge and knowledge management practices in architecture. So there is scope for faculties and schools involved in interdisciplinary research in the built environment in Australia such as the Centre for Interdisciplinary Built Environment Research (CIBER) at the University of Newcastle, the Centre for Applied Built Environment Research (CABER) at the University of Technology Sydney and the School of Property, Construction and Project Management at the Royal Melbourne Institute of Technology to carry out research into organizational learning and knowledge management practices in an integrated way in

all aspects of the built environment context to develop useful and practical models in collaboration with industry.

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## APPENDIX 1

Questionnaire used by the researchers to reflect on 'A Multifaceted Model of Organizational Learning' in their projects. A paper by Lipshitz, Popper and Friedman (2002) showing the model was also sent with the questionnaire.

1. Did your doctoral research project have 'organizational learning' as one of its objectives? (Also think about knowledge sharing instead of the term organizational learning as many of the mechanisms stated in the paper apply equally to KM).
2. Did you feel that your organization learnt during your research project?  
i.e. learning generated 'valid knowledge' that the generated knowledge led to (some) action?
3. Did you notice differences between how individuals or the organization learnt from your project? (The authors argue that while people learn using the Kolb (1984) learning cycle whereas organizations need supporting structures to learn – similar to various KM models)
4. Structural facet: Did your project incorporate some organizational learning mechanisms to support the learning?  
Typical examples of integrated organizational learning mechanisms are – post-project reviews, after-action reviews, communities of practice etc. I think an action learning or action research group can be considered an OLM for our purpose.  
Typical examples of non-integrated organizational learning mechanisms are strategic planning, auditing, quality assurance processes etc.
5. Cultural facet: The article says that to promote organizational learning cultural facet is important. The article considers five norms that are likely to produce valid information and commitment to learning. These are – transparency, integrity, issue orientation, inquiry and accountability. I think it may be difficult for you to think about these characteristics. You may like to comment on the culture of the organization when you did your project and comment on how culture helped or hindered the project.
6. Psychological facet: There are two aspects of psychological facet – Psychological safety i.e. they are not afraid to be embarrassed or afraid to report mistakes or. The second aspect is organizational commitment i.e. how members of the organization identified with the goals and values of the organization during the projects. Did you feel that people who participated in the project felt 'safe' to participate?
7. Leadership/policy facet: Did the management take formal or informal steps to promote organizational learning to support your project i.e. did the organization's policies, rules, procedures, budgets support learning? The article points to three areas as being critical – commitment to learning, tolerance for error and commitment to the workforce. Was the leadership of the organization supportive of organizational learning and change?
8. Contextual facet: These are external factors that were under the indirect control of the management or factors that were beyond the management's control – factors such as an external crisis, environmental uncertainty, and market forces.
9. Do you feel any other factors contributed to or inhibited organizational learning?
10. Do you think the model is adequate or has to be modified to represent OL or KM?