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KNOWLEDGE

Capture and Transfer in Professional Service Firms:

A study of Architectural Practice in Singapore

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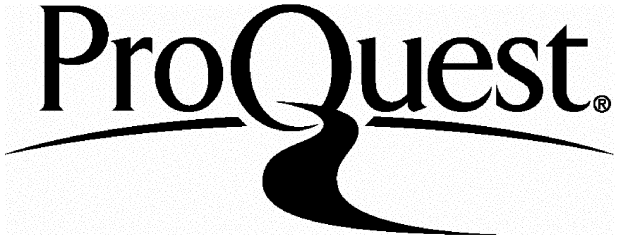

ABSTRACT

Architectural Practices exist in a professional-service, project-based environment where every product or service is supplied against a bespoke design. Architectural Practices, therefore, require an approach to its management which addresses the unique, novel and transient nature of its work; that invariably would be guided by the norms and controls of its professional institution.

In this paper, we describe our understanding of knowledge management policies in Architectural firms from a Human Resource Management perspective. We hypothesize that communicative practices are the dominant means of knowledge capture and transfer in these Professional Service Organizations. The individual member's participation, social structures and interactions, therefore, play a major role in the operational success of any strategy for knowledge capture and transfer. The paper describes a range of social mechanisms managers should pay attention to, and suggests that spatial design plays an important role in enabling and encouraging the level of communication required for knowledge sharing.

Keywords: Knowledge-Based View of the Firm, Professional-Service Organization, Social Identity, Organizational Behaviour, Knowledge Capture and Transfer.

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INTRODUCTION

Theories of the firm reflect concepts and models through which enterprises attempt to explain their structure and behaviour and predict their decisions and eventual success and/or failure.

The knowledge-based view of the firm is one such perception in which the primary task of management is to establish positions of sustainable competitive advantage through a focus on knowledge as the most strategically important of the firm's resources[1]. The critical element in maintaining a knowledge-based view of the firm therefore lies in its capability and capacity to learn and retain knowledge. However, we suggest that if managers try to impose and attempt management of a model of knowledge foreign to the workforce, they may not succeed. It is only with an understanding of what the workforce believes about knowledge that it is possible to look at how organizations deal with the practicalities of creating, managing and using knowledge.

This study takes an exploratory approach on knowledge management in Architectural practice in an attempt to review how these firms safeguard their resource (knowledge) and sole means of production. It focuses on the structure and processes within what we call project-based, professional service firms; and studies whether and how Architectural practices are able to learn and transfer knowledge acquired from one project to another. We hypothesise that social mechanisms play a key role in these knowledge management strategies and argue that, as project-based organizations, Architectural firms structure themselves as loose and flexible so as to allow a combination of skills and capabilities in new and innovative ways[2]. As Architectural practices are also professional service firms, we also hint at the role professional institutes play in influencing and encouraging knowledge sharing within the firm and industry in general.

Our aim is to understand the challenges associated with knowledge capture and transfer in Architectural practice; offering an approach to explaining how they might grow, improve performance and develop a reputation for excellence. We suggest that our findings could also have implications for Human Resource Management in most other Professional Service Organizations as the unique combination of a professional stance amidst the necessity to create strategies for profit and growth present similar challenges in knowledge capture and transfer policies.

These issues also have important consequences for general economic growth. In 1998, the Singapore Government unveiled plans to enter the stage where knowledge and innovation are seen as the main determinants of corporate competitiveness and national growth and development. The Singapore Economic Development Board noted that, with accelerating technological advances and globalisation, knowledge would become a strategic asset[3]. To survive and grow in this business environment, organizations are increasingly challenged to develop their dynamic capabilities[4]. Success, even survival, may be dependent on the extent to which organizations are able to learn, adapt and change. We suggest that the ability to meet the new demands and improve performance in this knowledge-based environment is closely related to the development of an organization's dynamic capabilities.

The paper is organised in six parts. The following section defines the boundaries to the term 'knowledge' which we shall be using in this paper. This introduces the importance of the individual learner in the process of knowledge capture and transfer and sets the scene for the topic of organizational behaviour and social mechanisms to be included in our study. In Section Two, we review some knowledge management literature to ascertain a few common positions to knowledge capture and transfer strategies undertaken by organizations. We propose here that a firm's knowledge assets add to its dynamic capabilities – a requirement that enables the organization to gain a foothold in today's

knowledge-based economy. We acknowledge that the management of the structures and procedures in creating and utilizing such knowledge assets may serve to facilitate or stifle the development of organizational knowledge competences. Section Three introduces the particular aspects of the Architectural firm as a professional service organization and the challenges that these organizations face in relating knowledge management strategies. We present our case studies in Section Four and follow into a reflection on the research findings in Section Five. Section Six concludes the paper.

SECTION ONE: Defining Knowledge and the Actors involved

1.1 What is Knowledge?

From Plato[5] to Popper, theorists the world over have been debating the definition of knowledge. There have been many documented definitions of the different types of knowledge[6]. In our review, however, we shall be defining knowledge as an embodiment of two main elements:

(a) a codified proposition (explicit knowledge); that includes
(b) a cognitive ability (tacit knowledge) to interpret and elaborate information and experiences to adapt to current needs[7].

1.2 Tacit Knowledge

Polanyi (1996) contends that there are many things we do that we are not necessarily totally conscious about and would probably struggle to explain fully to others. This form of knowledge that we act on is derived from an experience that may not necessarily be from a codified or explicit knowledge source. This knowledge is known as 'tacit knowledge'.

This follows into an argument for the involvement of the person in the act of knowledge; and that the base of our knowledge foundation is built on a rational commitment to what we perceive as being known. In other words, what we perceive as explicit knowledge today may well be tacit knowledge for tomorrow's activities (Polanyi, 1958). Knowledge may therefore be defined as information processed in the mind of an individual: depicting that it is personal and subjective and includes personal judgement and interpretation of the facts.

1.3 Knowledge Capture

There are many perspectives taken on how and what an organization can and should implement in order to capture and retain knowledge within the organization. Most of the literature, however, suggests that the need to capture and transfer knowledge in firms concerns primarily the need to invent systems and procedures so as to codify knowledge. This is based on knowledge management literature with a predominant emphasis on the use of information technology, databases, intranets etc. to capture, codify and transfer knowledge within organizations.

The success of this creation of a knowledge base external to the individual members of the organisation not only makes the organisation less vulnerable to a loss of tacit knowledge, but also proves immensely beneficial to the long-term success of companies – success, being seen in the economic savings obtained when knowledge is codified and reproduced in successive operations at very low marginal cost[8]. Furthermore, codified knowledge may be seen as a commodity that may be bought and sold in markets. This allows firms to potentially save on time and costs in acquiring knowledge (for example computer software manuals) through outsourcing rather than develop it internally.

However, Cohen & Levinthal (1989) suggest that firms cannot survive by simply outsourcing all of its knowledge. Firms must invest in basic research so as to develop the ability to recognize, exploit and assimilate knowledge produced elsewhere. The degree of spillages and imitation depends on the nature of knowledge and the absorptive capacity of firms. In other words, even in the case of codified knowledge, the user or imitator needs certain know-how and technical

abilities to benefit from the knowledge. To appropriate the results of codified knowledge, one has to 'know the code'.

In spite of organizations' efforts to codify knowledge for transfer between projects and individuals, Ancori et al (2000) suggest that it is essentially the cognitive abilities of the individuals that bring meaning and use to any codified knowledge. Hence, organizations face not only the challenge of transforming tacit knowledge involved in codification; but also, a more urgent matter of the limitations implied by only using a literate form of knowledge representation.

It is our position in this paper that knowledge capture and transfer is not about obtaining an outcome (codified knowledge); but must be seen as a process (on managing both tacit and explicit knowledge through a variety of means) that includes experiential learning, articulation, formal teaching and other processes. We suggest that codification or capture of knowledge in an organization must also be seen in its non-tangible form as knowledge in its individual employees (tacit knowledge).

SECTION TWO: The Organization

2.1 The Individual Learner

In order to develop any position on a strategy for knowledge management, therefore, it is important to emphasise the part played by the subject involved in the learning process.

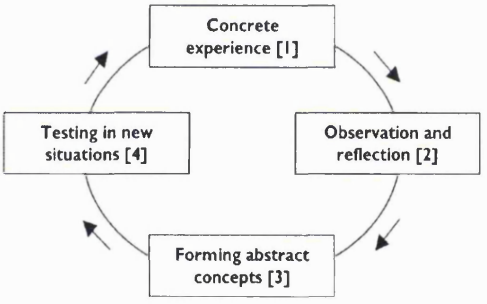
In our review of the management's policies and role in enabling knowledge capture and transfer, therefore, we must be reminded that such organizations are made up of a participation of various members who contribute to the collective mechanisms for such management. Knowledge cannot be managed like an object separated from its human context (Wenger et al, 2001).

Individuals are, therefore, challenged to transform themselves from assets to investors where individuals should invest in building their personal human capital which they could, in turn, invest in the business in which they choose to work (Gratton & Ghosal, 2003).

2.2 Reflective Practices

Within the individual, Kolb (1984) defines learning as 'the process whereby knowledge is created through transformation of experience' [9](Figure 1). This role of experience in the development of an organization's competence is further described in Turner et al's (2000) paper presenting findings that 85% of project personnel obtain knowledge through experiential learning.

Figure 1: Kolb's Experiential Learning Cycle



The model of the experiential learning cycle involves a questioning of prior experience and values in a structured reflection to create new theories for further growth and development. This process includes knowledge articulation as an important aspect of reflection[10] where a design effective for learning is here seen as requiring a setting where practitioners may reflect and question their own actions[11].

In Raelin's (2001) work, reflective practices include a variety of organizational learning tools, dialogue, story-telling and other practices. Aimed at improving project performance, these tools are designed to empower project members to reflect on aspects of their work in order to understand how their decisions impact the project course, outcomes and other project members. It is suggested that unless we are aware of the

consequences of our behaviour, learning will not occur[12].

In arguing for reflection-in-action, Schön (1983) contends that the practitioner reframes a problem situation in an attempt to utilize prior experience of a familiar situation[13]. This process further develops their tacit knowledge base to enable resolution to ever more complex situations. However, it is our view that reflective practices as a fundamental aspect of 'learning' places too much emphasis on individual cognition without reference to the wider social context.

2.3 The Social Setting

Pan & Scarborough (1999), instead, suggest a socio-technical perspective to organizing knowledge. They suggest that knowledge be seen as intrinsic in social interactions and not just a product that is passed from individual to individual. The framework they suggest depicts that the interaction between the technological, informational and social components should underline any knowledge management strategy.

Strategists, therefore, should not concentrate on individual learning per se, but on the manner in which systems and structures facilitate individuals in learning and sharing their experiences within an organizational setting (Nonaka & Takeuchi, 1995).

Social Relationships

Hansen (1999) explores the relationship of strong[14] or weak ties between people in the organization on the effectiveness of knowledge sharing. His findings indicate that neither weak nor strong relationships between operating units dominate in efficient sharing of knowledge. Different social relationships have their respective strengths and weaknesses in facilitating different types of knowledge transfer and sharing. Underlying his research, however, is the premise that communication is a key to knowledge transfer[15], irrespective of the kinds of ties linking such communication. Similarly, Uzzi (1996) studies the process by which social relationships shape economic action: a link he describes as the 'embeddedness argument'. His research findings suggest that a firm's network acts as a social boundary that defines the intensity of participation in learning, risk-sharing, investment and other organizational activities that may afford the organization a competitive advantage. In other words, the member's level of embeddedness and performance capabilities depend on the type of social relations (networks) he/she has built within the firm.

2.4 Organizational Behaviour

Organizational Citizenship

Central to the argument for embeddedness is the concept of 'organizational citizenship', which refers to the behaviour of an employee with regards to tasks that do not form part of the individual employee's formal job description. This includes assisting co-workers with their work, or with learning tasks and other 'volunteer' work that may benefit the organization. As these behaviours are not required by the job, there are no formal sanctions for failing to engage in them (Organ, 1988). When individuals feel that they are treated well by the organization, they naturally reciprocate and exceed the minimum requirements of their job description by engaging in organizational activities like helping others in the organization.

Psychological Contracts

A key influence on the individual's organizational behaviour are the psychological contracts that define the individual's perceptions of what the organization expects of them in terms of behaviour and attitudes that may not necessarily take a tangible form (Rousseau, 1995). This is, however, influenced by the individual's work status as work status underscores perceptions of obligations such as pay, benefits, access to training and opportunities for advancement.

The impact of the relationships between the individual and the organization are especially important for professionals in the service sector (Architectural practice being one such sector) as

these jobs typically involve large amounts of customer contact. The relationship between the professional and his/her organization may therefore have a direct effect on customer satisfaction (Mowday et al, 1982).

Organizational Culture

Organizational culture[16] and behaviour is also seen as one of the main determinants to the likelihood of learning becoming a natural process in the organization (Schein, 1997). This is because the ability to comprehend the assumptions and beliefs embedded in an organization provides one of the key tools in engaging in the learning process[17].

Organizational Design

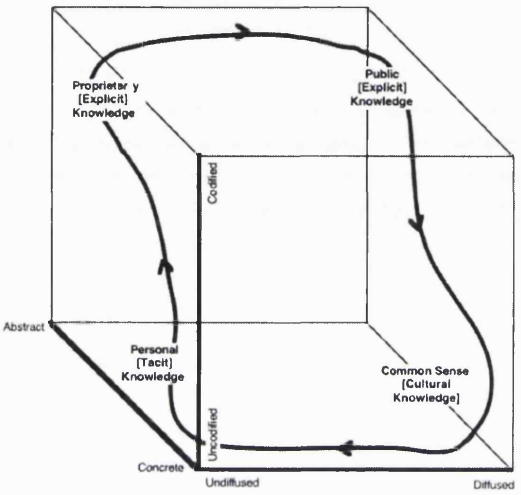
As organizational design influences inter-group relations and the extent[18] to which informal networks are able to grow, the challenge of the formal systems drafted by the organization is to allow the informal structures that facilitate organizational learning, knowing and sharing to occur (Ayas & Zeniuk, 2001)[19]. As Mintzberg (1991) explains, there needs to be an understanding of the need for deliberate and emergent strategies in organizational design.

SECTION THREE: Knowledge Processes

3.1 Knowledge Transfer

Boisot (1995) suggests, in his 'social learning cycle', that every individual comes to a task with an existing knowledge base (tacit knowledge) of that task. When new knowledge is acquired, the individual (re-)combines this knowledge to generate new tacit knowledge that will alter the way that they approach a task. This creates new knowledge that will invariably be different to the original individual's tacit knowledge (Figure 2). Pitt & Clarke (1999) describes a second cycle based on Nonaka and Baumard's exploration of Boisot's (1995) social learning cycle (above-mentioned) and includes an exemplification of skills and knowledge via a person-to-person transfer.

Figure 2: Boisot's Social Learning Cycle



Both cycles are applicable to most firms and are, in most cases, complementary depending on the type of knowledge development required by the particular environment of structures, processes and cultures.

As an example, consider a market that is characterized by relatively familiar problems. The organization may choose a path of highly structured and codified knowledge systems and procedures in mitigation. As there is low level of uncertainty and risks, procedures are relatively set. The standardization of systems leads to an emphasis on incremental learning. The organization will reap huge benefits in a shorter period of time if they can invest promptly in Boisot's (1995) first mentioned cycle of learning.

On the other hand, where the task at hand is ever-changing, uncertain or requires individuals to create non-obvious conceptual links, the second cycle may be more suitable, as processes are not forced into an early, premature phase of codification. Individuals are therefore allowed to explore options and hypothesis without the pressures of set procedures and systems and would probably require more face-to-face knowledge exchanges with other individual's tacit knowledge repositories.

What the two models neglect to address, however, is the heterogeneity of knowledge and the implications of such processes of knowledge creation on the wider social context.

3.2 Knowledge Matrix

We therefore turn to Nonaka & Takeuchi (1995) who have proposed a knowledge matrix that involves the role of socialization in the process of knowledge creation where social relations present conditions conducive for creative action (Figure 3).

Figure 3: Nonaka & Takeuchi's Knowledge Matrix

	Tacit	Explicit
Tacit	I Socialization	II Externalization
Explicit	IV Internalization	III Combination

This model classifies knowledge as either explicit or tacit and either individual or collective and proposes that the corresponding knowledge processes that transform knowledge from one form to another include:

(a) Socialization (tacit to tacit): where an individual acquires tacit knowledge directly from others through shared experience and observation
(b) Externalization (tacit to explicit): through articulation of tacit knowledge into explicit concepts
(c) Combination (explicit to explicit): through a systematisation of concepts drawing on different bodies of explicit knowledge
(d) Internalization (explicit to tacit): through a process of 'learning by doing' and through a verbalization and documentation of experiences

This process of 'organizational knowledge creation' is seen as a spiral in which knowledge is amplified through the four modes of knowledge conversion. Underlying this theory of knowledge creation is the concept of communication, without which knowledge cannot be created, managed or transferred.

3.3 Knowledge Management Spectrum

In order to assist organizations in understanding their position in their approach to knowledge management, Binney (2001) has created a Knowledge Management Spectrum, in which he identifies six categories most organizations fall into. He notes that organizations access a range of techniques to address their different organizational issues and needs.

However, the common element linking the different strategies is the imperative need for organizations to manage both explicit and tacit knowledge at all times.

This follows the work of Hansen et al (1999) where it is suggested that firms follow two management strategies:

(a) either a personalisation strategy – where knowledge is closely related to the individual who embodies the knowledge and is transferred only through person-to-person contact; or
(b) a codification strategy – where knowledge is transformed into literate form which may be accessed by anyone.

Their study finds that all firms use a combination of both the codification and personalization[20] approaches; although each focused on one strategy and used the other in a supporting role.

Following these research findings (Figure 4), we propose that a dominant personalization strategy is more relevant in Architectural organizations. This may be reinforced by social mechanisms rather than authority or bureaucratic rules. Architectural firms, therefore, need fluidity and ambiguity where supervisors need to learn to counsel non-directively.

Figure 4: How Consulting Firms Manage their Knowledge

	Codification	Personalization
Competitive Strategy	Provide high-quality, reliable, and fast information systems implemented by reusing codified knowledge	Provide creative, analytically rigorous advice on high-level strategic problems by channelling individual expertise
Economic model	**Reuse economics:**	**Expert economics:**
	Invest once in a knowledge asset; reuse it many times	Charge high fees for highly customized solutions to unique problems
	Use large teams with a high ratio of associates to partners	Use small teams with a low ratio of associates to partners
	Focus on generating large overall revenues	Focus on maintaining high profit margins
Knowledge management strategy	**People-to documents:**	**Person-to-person**
	Develop an electronic document system that codifies, stores, disseminates and allows reuse of knowledge	Develop networks for linking people so that tacit knowledge can be shared
Information technology	Invest heavily in IT; the goal is to connect people with reusable codified knowledge	Invest moderately in IT; the goal is to facilitate conversations and the exchange of tacit knowledge
Human resources	Hire new college graduates who are well suited to the reuse of knowledge and the implementation of solutions	Hire MBAs who like problem solving and can tolerate ambiguity
	Train people in groups and through computer-based distance learning	Train people through one-on-one mentoring
	Reward people for using and contributing to document databases	Reward people for directly sharing knowledge with others

Source: Hansen, Nohria & Tierney (1999) 'What's your strategy for Managing Knowledge?' *Harvard Business Review* 77(2): 106-118

3.4 Deployment and Use of Knowledge

It is through the reuse and diffusion of codified knowledge that the organization reaps the economic benefits to creating and sustaining a learning organization. The success of the organization in creating knowledge management strategies, therefore, is not as dependent on the integration of its knowledge codification mechanisms; rather, it is the ability to ensure that knowledge is successfully transferred throughout the organization and that such knowledge is utilized to create improved services and products for the organization and clients.

This is, however, hindered by an underlying human impediment towards change. Even if individuals have been introduced to new ways of doing things, new materials, new solutions to age-old problems; people in general tend to favour doing things the way they have always been doing it. So while organizations are focused on ensuring that knowledge is captured and shared in the organization, this does not automatically equate the effective deployment of such knowledge as logic would dictate. The impetus lies in the manager's ability to orchestrate and direct knowledge diffusion and deployment inside the firm.

3.5 Linking Knowledge and End Results

Zack (1999) proposes a framework to enable an organization to make an explicit connection between its competitive situation and the strategies required to manage the knowledge necessary to maintain or (re-) establish its competitive advantage. While each organization may find their unique link between knowledge and strategy, any such competitive knowledge should be classified on a scale of innovation relative to the rest of the particular industry:

(a) Core Knowledge: the basic level of knowledge required by all members of that particular industry simply to function and survive
(b) Advanced Knowledge: knowledge that gives an organization a competitive edge by differentiating an organization from its competitors
(c) Innovation Knowledge: knowledge that enables an organization to become a market leader in changing the way a sector or industry works; or representing a significantly differentiating factor from other organizations

Zack describes quite rightly, that knowledge management strategies are quite meaningless unless the organization is able to benchmark itself against the rest of the industry and ascertain a particular strategy for survival or success. The difficulty in making this link, however, is that information about what knowledge the industry holds or what other organizations has within the industry is difficult to ascertain. Knowledge is difficult to define, and, even in adopting this framework, the organization is, at best, assuming and projecting its own level of innovation, strengths and weakness.

SECTION FOUR: Architectural Firms

4.1 What are Dynamic Capabilities

Dynamic capabilities may be defined as an organization's capability to constantly create combinations of resources which may not be easily imitated by competitors, thus lending a sustainable competitive advantage to the possessor of these capabilities (Teece et al, 1997). These capabilities include organizational culture, learning, routines, entrepreneurship and other competences that are distinctive or firm-specific and allow the organization the ability to sense market conditions and opportunities and address these with flexibility and complementary competences.

Zollo & Winter (2001) suggest that dynamic capabilities are deeply embedded in organizational routines that promote learning and may be built through a persistent structured learning mechanism that includes: *experience accumulation, knowledge articulation and knowledge codification*[21] (Figure 5). These learning mechanisms serve to enhance and subsequently contribute to an ongoing evolution of an organisation's operating routines and depict Knowledge Assets as a key element for the creation of dynamic capabilities. Knowledge, and the management of an organizations' learning mechanism are, therefore, important aspects to a firm's development of its dynamic capabilities.

4.2 Knowledge Assets

Teece (1998) cautions, however, that knowledge assets contribute to an organization's competitive advantage only if it is difficult for competitors to imitate such knowledge[22]. He proposes a measurement of the profitability of such knowledge assets through an 'appropriability regime'. A strong appropriability regime may be achieved through legal instruments like patents or closely guarded design secrets. Having a strong appropriability regime, however, does not necessarily guarantee survival or a sustained competitive advantage. In today's fast changing business environment, existing knowledge assets quickly become obsolete. Organizations are therefore faced with a constant struggle to reassess and reconfigure knowledge assets and other complementary competences to create the dynamic capabilities required to achieve sustainable competitive advantage.

Figure 5: Learning typologies, outcomes and economic benefits

	Learning processes		
	Experience accumulation	Knowledge articulation	Knowledge codification
Learning typologies	• Learning by doing • Learning by using	• Learning by reflecting • Learning by thinking • Learning by discussing • Learning by confronting	• Learning by writing and re-writing • Learning by implementing • Learning by replicating • Learning by adapting
Outcomes	• Local experts and experiential knowledge in individuals (eg. subject matter expert)	• Symbolic representations and communication • Improved understanding of action-performance relation (predictive knowledge)	• Codified manuals, procedures (eg. Project management processes)
Economic benefits	• Economics of specialisation	• Economics of co-ordination	• Economics of information (diffusion, replication and reuse of information)

Source: Prencipe & Tell (2001) 'Inter-project learning: processes and outcomes of knowledge codification in project-based firms' *Research Policy* 30: 1373-1394

4.3 Knowledge-Based Organizations in Project-Based Environments

The Knowledge-Based View of the firm, therefore, suggests that Human Resource Systems can contribute to a sustained competitive advantage through the facilitation of a development of their human resource[23]. The danger faced by these knowledge-based organizations, however, is that they do not own their own means of production. Rather, it is leased to the organizations by individual members (human repositories of knowledge) party to that organization. The ability to codify knowledge seems, therefore, to be of great importance to these organizations as it allows for the creation of a body of knowledge external to the individual members and assumes continuity of 'knowing' through the organizations' life.

Architecture firms are knowledge-based organizations that trade explicitly on one resource – knowledge. Their production of tangible drawings, documents, specifications etc. are but a process of knowledge transfer that contributes to a final built form – the building.

Complexity of Product

The difficulty Architecture firms face of replicating and transferring this knowledge is underscored

by the complexities of the relationships between the technical, technological and aesthetic knowledge in question; as well as the organizational practice which governs it. Knowledge on aesthetics or good design, for example, is quite impossible to transfer.

Project-based Environment

These difficulties are compounded by operations in a project-based environment[24]. For our purposes, we have defined project-based firms as firms where the main business functions are primarily arranged around temporary coalitions organized to create a single one-off product for specific customers and markets.

While firms usually map their routines around activities that are recurring and frequent; by contrast, projects usually present unique[25] features that do not lend themselves to be systematically repeated. The be-spoke nature of tasks imply that different solutions to similar customer requirements may be put forward which add to the hindrance of organizational learning or a standardization[26] of an organization's procedures[27]. Project-based organizations, therefore, require flexibility to adapt to changing projects and innovate new solutions to meet client demands on a continual basis. Project-based firms are therefore found lacking in the organizational mechanisms necessary for knowledge to be transferred between projects – a characteristic compounded by the temporary nature of the projects undertaken[28]. Learning is, therefore, not a natural outcome of projects and a project-based environment is not necessarily conducive to learning.

Multi-actor Environment

In addition, projects often occur in a multi-actor environment where decisions and learning do not occur nor are necessarily implemented within the firm itself. Rather, these are enacted on the projects in which the firm is engaged[29].

Architectural practices exist in an environment where project teams operate in temporary coalitions consisting of many other organizations. This allows all project members access to knowledge and learning beyond the scope of their immediate organization. Inter-organizational transfer of knowledge is an important resource for further development and growth. As membership in projects is temporary, individuals are offered the opportunity to belong to multiple communities[30]. This contributes to the amount of experience accumulation the individual is exposed to. Membership in these multiple communities contributes to the creation of informal webs of people who act as knowledge brokers (Wenger, 1998). The opportunities project-based organizations have in promoting learning; however, do not meet up with the reality of the take up. In reality, time pressures and costs in promoting such learning practices restrict organizations from investment in learning and knowledge management.

In the current business environment, clients and organizations run a race where speed, flexibility and responsiveness to client's requirements play an increasingly important role in sustaining competitive advantage (Keegan & Turner, 2001). Organizations are challenged to respond by beating their competitors in the time taken to prepare bids, produce designs, obtain government clearances and get the building constructed in time for hand-over. Under these time pressures, project teams seem to be running from one fire to another, sparing little time for reflection, discussion or sharing learning experiences that may embody future benefits.

4.4 Professional Service Organizations

Coupled with the predominance of project team structures, Architecture firms are also Professional Service Organizations; and differ from other firms in that their members are commonly guided by the norms of professional conduct. These firms are characterized as being knowledge-intensive and have a high degree of customization as well as an extreme reliance on the individual professionals who make up the firm. This reliance on the named individuals is, unfortunately, non-transferable: as the reputation

of an established Architect is built up over time and is particular to the individual.

The competitive capability of a Professional Service Organization, therefore, depends heavily on their ability to mobilize and reinvent professionalized bodies of expertise to meet the demands of particular projects and clients. In studying the knowledge management strategies of these organizations, we have to be mindful of the impact of professional norms and controls on the individuals within the organization.

SECTION FIVE: Case Studies

To protect the anonymity of the firms interviewed, we have depicted the firms as Firms A, B, C, D and E.

The firms are chosen from the medium to large size, of personnel staffing of more than 20 members of staff. The Research Method may be found in Appendix A.1.

5.1 Use of Knowledge

There are many types of knowledge inherent in any organization. Knowledge is used differently in different tasks and the nature of the knowledge used is also different. For example, drafting knowledge and the delivery of the product in a tender document is likely to be dominated by explicit knowledge embodied in processes and procedures. Self-generated modifications to that knowledge base so as to customize the product to the particular project, however, are likely to be controlled by processes that ensure limited consequence to the changes. This would probably be based on more tacit knowledge. On the other hand, even within the same organization, individuals involved in site management and construction supervision are much more likely to operate under a dominant tacit knowledge base and exchange (Von Krogh et al, 1998).

The conclusion to be drawn is that the use of knowledge in any organization or situation is likely to be a conglomerate of many complex elements. The management and measurement of such knowledge, therefore, cannot be based on any one simple system. Managers must recognize the different ways in which knowledge is created and used in their organizations if they are to manage it successfully and create value for the organization.

All the firms interviewed acknowledge three main types of knowledge relevant to the firm:

(a) Specialist knowledge – which varies according to the phase the project, is in.
(b) Technical knowledge – including codes, regulation, building materials etc.
(c) Organizational knowledge – knowledge specific to the workings of the particular organization and is therefore non-transferable.

It would be beneficial to explore the evolution of knowledge within a project, in a project-life survey to understand how different strategies may be enforced or developed to effectively capture and transfer the different types of knowledge at different stages of the project's life. The duration and scope of this paper, however, lends limitation to this. We have, therefore, generalized the knowledge management practices within the firms studied to look to a broad overview to common elements and difficulties that plague the professional service firm in their quest to effectively manage their knowledge resource. Further research, however, should include the different sources of knowledge these firms draw on during the course of the project.

5.2 The Cases

We have discussed some major features (from our analysis of the literature) as being the most likely to influence the processes of knowledge capture and transfer in Professional Service Organizations. The analysis below seeks to establish the extent to which these aspects influence practice.

We have set out our study as follows: first, we shall introduce the work practices of each case study. In particular, we shall look at the organizational set up and structure for individual tasks. Secondly, we will focus on the ways in which knowledge is captured and transferred within the firm. Third, we will explore the formation of social identity within the firm and look at the extent to which the organization influences or enables norms of behaviour in knowledge capture and transfer to occur.

The research aims to address the following issues:

(a) How do work practices shape the process of knowledge capture and transfer within the organization?
(b) What types of knowledge management strategies do Architectural Firms employ to ensure knowledge capture and transfer within the firm?
(c) What role does social identity perform in the process of knowledge management?

Firm A

Firm A is a medium-sized firm headed by two principals.

Work Practices

Projects are led independently by Project Architects who organize their own staffing through informal contacts (mainly based on who they are or have already worked with). The Principals are mainly responsible for obtaining projects through their networking and personal contacts. The running of the office, management, strategies and policies are therefore very much left to the intermediate and senior Architects. There is, however, no formal chain of command.

Knowledge Management Practices

The firm lacks any formal project-to-project learning mechanisms. Employees are not expected to do post-completion reviews or discuss their projects in any formal venue. There are no scheduled internal office meetings or subscribed budget for training or education of staff. However, informal meetings over lunch breaks and coffee breaks are common. Most staff are aware of other projects undertaken by the firm and the key problems encountered in those projects. Learning occurs in these informal sessions where discussions of personal reflection on lessons learnt are commonplace.

Despite the lack of formal systems, we found that a high degree of knowledge transfers occur mainly due to the close personal relationships formed between the staff. Most staff have been with the firm for more than eight years. New additions that are unable to assimilate the culture usually leave the firm within months.

The project managers interviewed expressed learning as an individual task, in which the imposition of rigid rules and regulations and procedures would only serve to diminish. They believe that the quest for knowledge should be an individual undertaking, and not subscribed to by the organization you are working for. Investment in creating training programmes, resource silos, etc. just add to their burden of administrative tasks and takes up valuable time. They would rather spend their time on their projects and clients rather than worry about bureaucracy and red tape from within the firm.

They expressed that firms with rigid rules and procedures only serve to undermine their abilities as professionals and capable of making the right decisions.

Social Identity

The lack of formal hierarchy fosters a strong sense of worker autonomy and egalitarianism. Project Managers exhibit a strong sense of professionalism as well as comradeship. As everybody is somewhat involved in the running of the office, the citizenship in the firm is very strong.

Firm B

Firm B is a family-run business which is struggling to retain their top-management staff by offering them a larger say in the running of the business.

Work Practices
The firm has recently been organized into separate teams, with each team handling their own portfolio of projects, accounts etc.

Each team is accountable for their individual team's costs, profits, loss and growth. This was intended to give each team director more autonomy on the types of projects, staffing, implementation of individual team strategies and management procedures. The teams, however, all share a common administrative core and contribute to a common knowledge base and information technology.

The owners were looking to create a variety of little companies within the umbrella of a larger organizational brand name and reputation. Although the team directors are not promised profit sharing, they have been promised year-end bonuses that reflect the performance of their teams. Within these teams, projects are staffed according to the stage of the project. Teams therefore consist of one design architect, a couple of project architects, a building maintenance officer, a lead technical officer and several drafting officers. The team director heads each team and is predominantly responsible for bidding and winning projects.

The team is characterised by a conglomeration of very distinct specialities which give rise to problems in a lack of continuity in projects as well as a more pressing problem of a lack of learning between functions.

Knowledge Management Practices
Across the teams, the firm has implemented compulsory weekly meetings, forums, site visits, external training programs and talks. These events are meant to springboard an exchange of knowledge and learning across the teams.

One of the directors interviewed underlined the difficulties in getting people to commit to the knowledge sharing process as teams within the firm are actually competing with each other for similar jobs and profits. For example, recently a client who was approached for a large residential project requested two separate proposals, to which two separate teams were assigned. The chosen scheme was to go on to win the bid to pursue the project.

There is a propensity to hoard knowledge as the resources expanded in codifying knowledge learnt are attributed to the particular project and team whereas the benefits are organization wide.

Due to the competition between teams, there are separate repositories for drawings, specifications and other documents particular to that team. Although the firm is attempting to codify a common standard of specifications, quality standards and quality control procedures, this has been a difficult and arduous task.

Knowledge transfer, therefore, only occurs informally based on close personal relationships between the personnel of the different teams. So while there seem to be many formal sessions and avenues for sharing knowledge, these are only superficial avenues for such transfer.

Social Identity
We found this firm to be in a very confused state of being. Although many formal hierarchies are dictated, with a seemingly clear set of rules and regulations, 'do's and 'don't's; many of the firms' objectives seem contradictory. On the one hand, the firm advocates sharing and cooperation between the teams to promote a common brand and reputation; on the other, the firm pits each team against the other in terms of performance reviews, profit sharing and promotion opportunities.

We have found that individuals are more attached to their projects than they are to fellow team members or the organization as a whole. Individuals draw on their personal networks (often Architects from other firms or other consultants from the project team) to acquire information and knowledge rather than seek solutions within the firm.

Firm C

Work Practices

Firm C is yet another firm that divides projects undertaken into phases – design, tender, working drawings, construction, occupation, defects, maintenance and legal. Each phase is led by a 'specialist'. The director in charge tends to be involved in most projects to some extent.

Knowledge Management Practices

Interim sessions and design critique sessions are organized ad hoc during each phase. These are not compulsory meetings but are highly encouraged by the directors in charge who often lead the presentation and discussions after.

Project personnel involved are usually compensated by way of time off. Although these presentations are scheduled after office hours and are not compulsory in attendance, turnout is usually to full capacity. Project managers interviewed value these sessions as opportunities to reflect on their own projects and lessons which may be applied. It also gives them a break from the myopia that may occur when project managers have too much autonomy over their projects[31].

After completion of each stage, project managers are given time off to recharge and find time to codify knowledge acquired during the course of the project. However, project managers confess that they seldom access documents from other projects (codified knowledge in the company databases). Instead, they rely on person-to-person knowledge transfer. "When a project is underway, no one has the time to sit and sift through someone else's reflections on lessons learnt. You'd rather find that person and ask him/her questions about the project. The person would most likely be able to tell you more relevant things about your particular problem than if you had to go figure it out from the database entries yourself."

Moreover, people are cautious about filing reflections on lessons learnt as these may be personal and/or incriminatory to mistakes one might have made in the process of the project. People are more willing to admit such mistakes as a cautionary tale in an informal session; than to put it in black and white in a company database.

Social Identity

The way the project is split into tasks also demand high levels of communication between the 'specialists'. For example, the Design department has to communicate with the Construction and Maintenance departments to ensure that the designs can be built efficiently and be of low maintenance.

As each individual identifies themselves as a 'specialist', many are dedicated to the advancement of specific knowledge in their field and are driven to share that knowledge with other departments. This also serves to minimize the range of problems that occur when the project is handed over to them. For example, the Defects team would be keen to elaborate on their experience with effervescence that occurs in marble and ensure that Designers choose the right type of marble; Construction managers check that proper preparation and installation of the marble occurs etc.

The formation of these 'specialist teams' seem to have a positive response and staff appear to be highly motivated to share knowledge across the firm.

Firm D

Firm D is a firm with more than half of her projects overseas. Teams are organized around the geographical locale of their projects – Singapore, China, India, Malaysia etc.

Under the requirements for ISO 9000, overseas projects do not need to be audited. However, the firm has implemented similar procedures across the board, irrespective of the geographical locale of the projects.

Griffith & Harvey (2001) suggest integrating both a resource-based and a market-based view to create a dynamic capabilities framework within

which an organization may enhance its competitive advantage in a global, overseas environment. The main components to this framework are to facilitate a customization of the individual country strategies while maintaining the unique features of the parent country's environment and practices.

The underlying concept being that the organization may facilitate learning or knowledge transfer between projects in various countries and the unique ways their international partners approach problem-solving, to create a competitive advantage for the organization in another country.

Despite the opportunities, however, firm D reflects a lack of practices or policies to develop such dynamic capabilities. Most of their overseas projects are based on following local Singaporean clients into the overseas arena, and knowledge acquired from projects there is hardly diffused to the rest of the organization.

Work Practices

There is an impetus to creating cross-national project learning systems as these are costly, difficult to initiate, implement or maintain. Project personnel are hardly transferred from projects across international boundaries unless a formal request is made by the individual. Having said that, however, there appears to be a great deal of knowledge sharing and transfer within projects of the same geographical locale.

Due to the unique cultural and government policies faced in the different countries, knowledge repositories are seen as more relevant within the team than across the organization.

Meetings are supposed to be held bi-monthly, but it is difficult to get everybody in the same country at the same time. Project managers interviewed feel that the confines of their project team delineate the boundaries of the company to them. However, they do feel like they belong to a larger, global family.

As projects are fairly large in size, project teams are organized around the idea of 'pairing' where two or three project managers are assigned to any one project. In common industry practice, the practice of 'pairing' occurs where firms assign additional people on projects so that two or more people are available to do the same job. This hardly occurs in Architectural practice unless seen as more a 'mentor and apprentice' training scenario as the firm is unable to explain the redundancy 'pairing' produces. However, this form of pairing also increases the chance that knowledge is captured and transferred between two individuals.

In this scenario, however, the firm views their projects as too important and complex for any one project manager to handle.

Knowledge Management Practices

As address to the constant travel its members undertake, the firm has set up a complex intranet system where members are able to log on to chat and post enquiries or comments to problems via a forum on the world-wide-web. A quick survey showed that almost 70% of the organization's personnel spend at least an hour each morning checking postings on the forum and attending to emails from other colleagues, be it personal or work-related.

Social Identity

The practice of assigning at least two individual project managers to a single project increases dialogue and exchange of ideas which is seen to benefit the project as a whole. However, this also increases the tendency for cliques to form and knowledge is seldom transferred beyond the boundaries of the project.

There is also a lack of the autonomy seen in the other case studies. Directors are very hands-on and because of the 'pairing' policy, most decisions are made jointly. Knowledge sharing appears to be more vertical than horizontal; although these formalities may be more a means of managing the client interface than a structure for knowledge sharing within the firm.

Firm E

Firm E is a firm with projects only within the residential sector.

Work Practices

Project teams are created around the Project Architect who oversees the project from inception to completion. Client relations are emphasised as everybody's responsibility and employees are encouraged to know what everyone else is doing.

The firm's structure is organized into hierarchies of mentors and 'apprentices'. This loosely follows Collins et al (1989) description of 'cognitive apprenticeship' where the learner or apprentice is given an opportunity to observe the process before being assigned the task. After observing the process, the learner attempts the tasks with a decreasing amount of support. This arrangement increases the chance that the learner develops cognitive skills to understand the reasoning that made the solutions valid.

Apprentices are usually fresh graduates recruited from the local university. They are assigned to Project Architects with at least four to five years' experience. However, not all Project Architects are assigned 'apprentices' as this is dependent on the nature of the project, scale and budget as well as the demeanour of the Project Architect in question. Within their first four to five year tenure with the firm, therefore, 'apprentices' may have two or three mentors.

Knowledge Management Practices

The firm has in place an extensive resource repository documenting regulations, codes, materials, drawings and other tangible information about all their projects to date. Intranet forums and fortnight meetings and regular site visits are also on the list of deliberate attempts to disseminate knowledge about projects to staff.

At the initial stage of any project, project and team members invite someone from another similar project type and size to sit down with them to give them the benefit of his/her experience.

A Quality Team consisting of various middle-management personnel periodically audit projects to comply with the firm's ISO 9000 certification. Bi-monthly meetings are e also forum for discussion on their findings. These audits are minuted and posted on the intranet.

As the auditors are well respected in the organization and are fairly tactful, there have been no complaints about antagonistic behaviours. Project managers interviewed felt that the procedures in place for learning have given real value to the organization. The knowledge repositories are good places to search for knowledge and the bi-monthly meetings are forums to ask for directions into the repositories.

'It makes you very aware of decisions you are making because although you are somewhat autonomous in that (decision), you might be put up to scrutiny afterwards.' The 'scrutiny' is seen as a positive step of articulation for reflective practice which seems to be widely practiced in Firm E.

'...but of course the auditors also try to help you a lot... which is really good because sometimes even though you know something, it is only when you hear someone else articulate it for you that you realise it.'

The Project Managers interviewed, however, also cite time constraints as the major impediment to learning and knowledge transfer. As each Project Architect is commonly assigned at least two projects at any one time, the pressures of time may often be daunting[32].

Unless they are being 'audited', many fail to attend the bi-monthly meetings. In order to see better results in the knowledge management policies, therefore, project managers felt that the firm needs to first sort out the amount of work and time pressures currently placed on their staff.

Social Identity

As with Firm D, there is a seemingly lack of autonomy in junior roles (apprentice positions). In

this case, however, Apprentices interviewed acknowledge that they are not ready for such work pressures to be placed on them. The structure has, instead, promoted a strong, elite, professional identity amongst those who 'graduate' from their apprentice positions, and especially those who are requested to become 'mentors'. Firm E holds a strong reputation for 'training' apprentices. This is a matter of great pride on the part of management and the staff who are highly motivated to share knowledge across the firm.

SECTION SIX: Overview and Research Findings

Despite the difficulties in establishing a quantitative link in explaining the strategic perspective of the relationship between learning effectiveness and overall firm performance (Refer Appendix A.2), we have observed that articulation and codification[33] of knowledge remains an important aspect of architectural firms' strategy in maintaining a competitive advantage. We have also observed that the attitudes and commitment of the individual professional[34] within the organization to learning policies and knowledge transfer is fundamental to the success of such an environment.

This suggests the importance of deliberate strategies which enhance emergent learning mechanisms in the creation of the dynamic capabilities of the firm. However, we are unable to quantify whether these capabilities contribute to a competitive or sustainable advantage.

6.1 Work Practices

The first question posed was 'Is there an observable relationship between work practices and the way in which knowledge is captured and transferred in Professional Service Organizations?'

Work Autonomy
In addressing this, we have found that work practices with high levels of personal autonomy afforded to individual staff showed equally high levels of motivation and collaboration in knowledge sharing activities.

However, these activities are often seen occurring only within the boundaries of the project. Although management seems to be relying on professional norms to influence behaviour around work tasks, these norms do not necessarily extend to the organization as a whole. Individual employee's sense of professionalism is directed towards a personal reputation and sense of achievement on the tasks at hand (the project in question) and not necessarily to the organization.

The Role of Incentives
It is interesting to note that none of the firms studied have an incentive system that rewards contribution or application of lessons learnt. Apart from Firm B, all the other firms do not even have a predetermined budget for knowledge management or transfer. Most firms do not even invest in external training required by the Singapore Board of Architects for the renewal of practicing certificates for their professional staff.

Despite this lack of incentive and other formal structures to learning within the organization, the research findings reflect a high degree of knowledge capture and transfer amongst staff and projects[35]. These are mainly achieved through social interactions among the staff.

When questioned over the alarming lack of policy related to assuring that knowledge is captured and transferred between projects and personnel, one director commented that it is mainly due to the near impossibility to measure, assess or collect quantitative evidence that such investment is worth the returns[36]. This makes it difficult to justify spending that money to the directors or shareholders[37]. Learning and knowledge sharing becomes more a personal quest to constantly improve oneself and the environment one lives in; rather than working towards a figurative returns on investment. There can never be a simple outcome to knowledge codification because it is

an ongoing process of learning and re-learning. Moreover, firms acknowledge that much of the learning that takes place in the project is intangible and rooted in the practices and skills of the individual professional[38].

They caution against the role of incentives as rewards on selected 'best practices'[39]. This rewards imitation and emulation as organizations dictate 'how' everybody should learn. In an organization of professionals, such policies may serve to undermine the creativity, work autonomy and professional pride in its members[40].

Spatial Design in moulding Work Practices
As part of a 'practice what you preach' profile, all the firms interviewed place a great deal of emphasis on design of spaces to encourage human social interactions as part solution to creating a better environment for all employees.

Using spatial systems and concepts of nodes, meeting points and enclaves, the firms attempt to use the design of the office space to create an environment conducive to learning and sharing. In particular, firms A and E have large pantries that seem central to the office layout. These serve as informal meeting spaces where staff is encouraged to linger over morning coffee or afternoon breaks to discuss their projects. Articles posted on the walls to the pantry provide light entertainment, informative and interesting reading, including updates on government policies and/or new building materials.

The offices are organized around an open plan concept where directors often walk in and around project teams to pause and chat.

6.2 Knowledge Management Practices

The second question posed was 'What types of knowledge management practices reap the most successful outcomes in Architectural firms?'

Documentation
The case studies showed that little reference was made to project documentation. All firms studied relied instead on personal knowledge and knowledge acquired through social networking and face-to-face encounters. Most project documentation was instead used for presentations or as tools for face-to-face meetings and discussions.

Although all the firms interviewed are ISO 9000 certified, the reviews and procedures required for such certification are rarely enforced, and even where it is enforced, reflects little more than a meaningless box-ticking exercise. For example, one of the common procedures is the project review that is conducted at the end of the project and which forms part of the organization's quality assurance checklist. However, we find that little is done to check on the quality of the outputs after such post-completion reviews. This is usually due to the fact that once the project is complete; personnel are deployed immediately into other tasks. Moreover, there are no fees for services rendered in a 'follow-up' session, making such time spent difficult to justify to the accounts department.

The project-based natures of the tasks, where a project may last several years and change hands several times during that course, also mean that learning experiences that take place at the beginning of the project are not captured until the end of the project, if at all.

We have found a great reliance on interpretative activities in the firms studied. Therefore, while we may be able to document a design or a favourable outcome from the Planning Authorities, the process of reaching that outcome can never be fully documented, or replicated in another project. The individual professional involved is required to legitimise any such knowledge claim.

Knowledge Retention
On a practical note, therefore, resolving the problem of high staff turnover is of particular significance to knowledge management practice. In greater staff retention, not only does knowledge remain within the firm (as employees

are seen as repositories of the firms' most vital knowledge); but the social connection enabling such knowledge transfer may also be improved[41].

In the case of Singapore, high turnover is seen as a societal norm where firms are constantly competing to attract better talent. With a high turnover of projects, and an increasingly competitive business landscape, Architectural firms are finding it increasingly difficult and expensive to invest in the slow process of knowledge creation. They look instead at importing knowledge and rely on the individual to develop and maintain their individual competitive edge in the job market.

We propose that Singaporean Architectural firms no longer look to training/learning creation strategies as the way forward. Instead, they look at 'poaching' as an alternative. Firms win projects, using these to build capability and gain experience and this in turn enables them to attract talented people to work for them.

6.3 Social Identity

Our third question 'What role does social identity perform in the process of knowledge management in the Professional Service Firm?' attempts to review both the institutional as well as organizational influences on the individual member.

Professionalism

As above, we have seen that the individual employee's sense of professionalism, although promoting behavioural norms that encourage knowledge sharing activities, also traverse organizational boundaries. The professional's allegiance to their profession rather than their place of employment increases the organization's vulnerability in losing not only the individual's ability to create knowledge within the organization, but also in losing the individual to another firm altogether.

Organizations, therefore, need to couple the individual's strong professional identity with an organizational identity so as to tie the professional to their place of work.

The research findings suggest that rigid rules and procedures stifle the process of learning and sharing in Architectural firms; and that Architectural firms downplay formal structures and hierarchical controls in lieu of emphasizing achieving coordination through social norms. This may be due to the following four factors:

(a) Architects see themselves as professionals and experts in their field. Their importance as individuals leads to a desire for autonomy. Close control would therefore induce exits from the organization
(b) Architects are regulated by a common set of values and norms that result from many years of formal education (a minimum of 5 years university education) as well as a Board of professional conduct (Board of Architects, Singapore)
(c) Projects involve only a few people within the same firm, especially when the project is small
(d) Projects are unique and have a high degree of risk and uncertainty. Formal structures would only impede the individual's ability and need for quick decisions and innovative solutions to problems that may arise.

Culture

Singapore has a large workforce of foreign workers. Architecture firms we interviewed consisted of about 40% foreign talent. Although we have pooled only a small percentage of Architectural firms in Singapore, it is our impression that this is common throughout large to medium size architectural firms in Singapore.

As Singapore culture and regulatory systems are based on inputs from many diverse cultures and influences, one might suspect that the level of cultural difference would be relatively uniform

across the board. However, the research findings show that a predominantly Asian culture permeates the implementation of the firm's strategies and policies[42].

The issue of culture has a direct relationship with organizational citizenship and psychological contracts between the individual and the organization. We have found that foreign talent are more participative in organizational behaviour than local employees. They attribute acceptance of a greater power distance to tolerance of how different ethnic cultures perceive equality. The fact that they have left their own countries to find work in Singapore also makes them more tolerant as they see themselves as 'guests' to the country. In addition, their usual lack of a social support system outside the confines of the organizational 'family' increases the importance of the social network of the organization to them. Relationships formed within the organization often extend into after-office hours.

Firm-wide Culture

We have found a particular firm-wide culture of professionalism that is embedded in the mindset of the individuals participating in this research.

Even with new additions to the teams/firms, there is a common understanding of high standards and ethical concern for the projects and for delivering value to the clients. This is enhanced by the individual professional's need to establish a reputation in the market. As projects are commonly a recombination of various clients and consultants within the market, information about individuals and firms is diffused throughout the network fairly rapidly. Reputation, therefore, becomes an important social control in deterring deceptive and non-cooperative behaviour.

SECTION SEVEN: Conclusion

Given that knowledge is the new form of capital that defines an organization's competitive advantage, the important thing for organizations to grasp is how to achieve coordinated action by connecting and integrating their individual member's knowledge within the firm.

We have shown that as knowledge transfer involves a process of transmission and receipt, the willingness of the individual to transmit knowledge as well as the absorptive capacity of the recipient determines the success of the entire process[43]. This suggests that the 'absorptive capacity' of an organization depends in part on the ways in which knowledge is retained and distributed. Turnover of staff, an organizations' internal and external communications, structure and its political and cultural environments are therefore important influences (Kanter, 1990).

We suggest that as Architectural practices are professional service organizations, they fall into a category relatively ignored by most knowledge management literature. Bound by their professional institutes and sense of professionalism, these organizations operate on different rules and require more flexible policies to accommodate growth and sharing of knowledge.

We have debunked the common myth that incentive structures play a major role in the operational success of knowledge capture and transfer policies. We propose, however, that incentive structures are not the main impediments to knowledge capture and transfer within an organization; but it may be the main determinant to retaining knowledge within the organization.

We suggest, therefore, that it may be profitable instead for firms to devote scarce resources and managerial attention to develop learning capacities of organizational units through an understanding of communicative practices: one such tool reflected here is the understanding of spatial systems and the impact of office design in fostering unplanned encounters.

Further Study

Further study should, therefore, explore the impact of patterns and frequency of

communication between work individuals on knowledge capture and transfer within the organization. This should include a study on how spatial configuration within an office design may influence work related communications.

BIBLIOGRAPHY

Alavi & Leidner (1999) 'Knowledge Management Systems: Emerging Views and Practices from the field' Proceedings from the 32nd Hawaii International Conference on System Sciences, 1999

Amesse & Cohendet (2001) 'Technology transfer revisited from the perspective of the knowledge-based economy' *Research Policy* 30: 1459-1478

Ancori, Bureth & Cohendet (2000) 'The economics of knowledge: the debate about codification and tacit knowledge' *Industrial and Corporate Change* 9(2): 255-287

Argyris & Schön (1978) *Organizational Learning: A Theory of Action Perspective.* Reading MA: Addison-Wesley

Ayas & Zeniuk (2001) 'Project-Based Learning: Building Communities of Reflective Practitioners' *Management Learning* 32(1): 61-76

Barlow (2000) 'Innovation and Learning in Complex Offshore Construction Projects' *Research Policy* 29: 973-989

Baumard (1999) *Tacit Knowledge in Organizations.* London: Sage

Binney (2001) 'The Knowledge Management Spectrum – understanding the knowledge management landscape' *Journal of Knowledge Management* 5(1): 33-42

Boisot (1995) 'Is your firm a creative destroyer? Competitive learning and knowledge flows in the technology strategies of firms' *Research Policy* 24: 489-506

Boud & Solomon (2003) 'I don't think I am a learner: acts of naming learners at work' *Journal of Workplace Learning* 15(7/8): 326-331

Bresnen, Edelman, Newell, Scarbrough & Swan (2003) 'Social Practices and the Management of Knowledge in Project Environments' *International Journal of Project Management* 21: 157-166

Cavaye (1996) 'Case Study Research: a multi-faceted research approach for IS' *Information Systems Journal* 6: 227-242

Cohen & Levinthal (1989) 'Innovation and Learning: the two faces of R&D' *The Economic Journal* 99: 569-596

Collins, Allan, Brown & Newman (1989) 'Cognitive Apprenticeship: Teaching the crafts of reading, writing and mathematics' in Resnick & Lauren (ed.) *Knowing, Learning and Instruction: Essays in Honour of Robert Glaser.* Hillside NJ: Lawrence Erlbaum Associates

Dale (1994) 'Learning Organizations' in Mabey & Illes (ed) *Managing Learning.* London: Routledge

Davenport, Delong & Beers (1998) 'Successful Knowledge Management Projects' *Sloan Management Review* 39(2): 43-57

DeFillippi (2001) 'Project-Based Learning: Reflective Practices and Learning Outcomes' *Management Learning* 32(1): 5-10

DeFillippi & Arthur (1998) 'Paradox in Project-Based Enterprise: the case of film making' *California Management Review* 40(2): 125-140

Druker (1993) *Post-Capitalist Society.* Oxford: Butterworth-Heinemann

Galbraith (1977) *Organizational* Design Reading MA: Addision-Wesley

Gann & Salter (1998) 'Learning and Innovation Management in Project-Based, Service-Enhanced firms' *International Journal of Innovation* Management 2: 431-454

Gann & Salter (2000) 'Innovation in Project-Based, Service-Enhanced Firms: the construction of complex projects and systems' *Research Policy* 29: 955-972

Gann & Salter (2003) 'Project Baronies: Growth and governance in the project-based firm' paper presented at the DRUID Summer Conference 2003 on Creating, Sharing and Transferring Knowledge, Copenhagen June 12-14, 2003

Grant (1996) 'Towards a Knowledge-Based Theory of the Firm' *Strategic Management Journal* 17: 109-122

Gratton & Ghoshal (2003) 'Managing Personal Human Capital: New Ethos for the 'Volunteer' Employee' *European Management Journal* 21(1): 1-10

Hansen (1999) 'The Search-Transfer Problem: the role of weak ties in sharing knowledge across

organizational subunits' *Administrative Science Quarterly* 44: 82-111

Hansen, Nohria & Tierney (1999) 'What's your strategy for Managing Knowledge?' *Harvard Business Review* 77(2): 106-118

Hobday (1998) 'Product Complexity, Innovation and Industrial Organization' *Research Policy* 26: 689-710

Hobday (2000) 'The Project-Based Organization: an ideal form for managing complex products and systems?' *Research Policy* 29: 871-893

Hofstede (1980) *Culture's Consequences: International Differences in Work-Related Values.* Thousand-Oaks CA: Sage

Hofstede (1985) 'The Interaction between national and organization value systems' *Journal of Management Studies* 22(4): 347-357

Iansiti (1998) *Technology Integration: making critical choices in a dynamic world.* Boston MA: Harvard Business School Press

Jones, Hesterly & Borgatti (1997) 'A general theory of network governance: exchange conditions and social mechanisms' *Academy of Management Review* 22(4): 911-945

Kanter (1990) *When Giants Learn to Dance.* London: Unwin Hyman

Keegan & Turner (2001) 'Quantity versus Quality in Project-Based Learning Practices' *Management Learning* 32(1): 77-98

Kogut & Zander (1992) 'Knowledge of the Firm: Combinative Capabilities and the replication of technology' *Organization Science 3:383-397*

Kolb (1984) *Experiential Learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall

Krackhardt & Hanson (1993) 'Informal Networks: the company behind the chart' *Harvard Business Review* 71(4): 104-111

Kvale (1996) *Interviews: An introduction to Qualitative Research Interviewing.* London: Sage

Lado & Wilson (1994) 'Human Resource Systems and Competitive Advantage: a competency-based perspective' *Academy of Management Review* 19(4): 699-727

Levinthal & March (1993) 'The myopia of Learning' *Strategic Management Journal* 17 (Winter Special Issue): 93-107

Lowendahl (1997) *Strategic Management in Professional Service Firms.* Copenhagen: Copenhagen Business School Press

Machlup (1980) *Knowledge: Its Creation, Distribution and Economic Significance.* Princeton NJ: Princeton University Press

Mintzberg (1991) *The Strategy Process.* Prentice-Hall

Mowday, Porter & Steers (1982) *Employee-organizational linkages: the psychology of commitment, absenteeism and turnover.* New York: Academic Press

Nonaka (1994) 'A Dynamic theory of Organizational Knowledge Creation' *Organizational Science* 5(1): 14-37

Nonaka & Takeuchi (1995) *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation.* New York: Oxford University Press

Ofori (2003) 'Preparing Singapore's Construction Industry for the Knowledge-Based Economy: Practices, procedures and performance' *Construction Management and Economics* 21(2): 113-125

Organ (1988) *Organizational Citizenship Behaviour: the good soldier syndrome.* Lexington MA: Lexington Books

Pan & Scarborough (1999) 'Knowledge Management in Practice: an exploratory case study' *Technology analysis and Strategic Management* 11(3)

Prencipe & Tell (2001) 'Inter-project learning: processes and outcomes of knowledge codification in project-based firms' *Research Policy* 30: 1373-1394

Pitt & Clarke (1999) 'Competing on Competence: A Knowledge Perspective on the Management of Strategic Innovation' *Technology Analysis and Strategic Management* 11(3): 301-316

Pisano (1997) *The Development Factory – unlocking the potential of process innovation.* Boston MA: Harvard Business School Press

Polanyi (1958) *Personal Knowledge: towards a post-critical philosophy.* Chicago: Routledge and Kegan Paul Ltd

Polanyi (1996) *The Tacit Dimension.* Gloucester MA: DoubleDay & Company

Raelin (2001) 'Public Reflection as the Basis of Learning' *Management Learning* 32(1): 31-48

Rockart (1998) 'Towards survivability of communication-intensive new organization forms' *Journal of Management Studies* 35(4): 417-420

Rousseau (1995) *Psychological Contracts in Organizations: understanding written and unwritten agreements.* Thousand Oaks CA: Sage

Sanchez (1997) 'Managing Articulated Knowledge in Competence-based Competition' in Sanchez & Heene (ed.) *Strategic Learning and Knowledge Management.* Chicester: John Wiley

Schein (1997) *Organizational Culture and Leadership.* San Francisco CA: Jossey-Bass

Schön (1983) *The Reflective Practitioner: How Professionals Think in Action.* New York: Basic Books

Schön (1987) *Educating the Reflective Practitioner.* San Francisco CA: Jossey-Bass

Senge (1990) *The Fifth Discipline.* London: Random House

Soekijad & Andriessen (2003) 'Conditions for Knowledge Sharing in Competitive Alliances' *European Management Journal* 21(5): 578-587

Starbuck (1992) 'Learning by Knowledge-Intensive Firms' *Journal of Management Studies* 29: 713-740

Szulanski (1996) 'Exploring Internal Stickiness: impediments to the transfer of best practice within the firm' *Strategic Management Journal* 17: 27-43

Teece (1998) 'Capturing Value from Knowledge Assets: the New Economy, Markets for Know-How and Intangible Assets' *California Management Review* 40(3): 55-79

Teece, Pisano and Shuen (1997) 'Dynamic Capabilities and Strategic Management' *Strategic Management Journal* 18(7): 509-533

Thompson (2003) 'Teaching to Foster Implicit Knowledge' *Information Systems Education Journal* 1(2) http://isedj.org/1/2/. ISSN: 1545-679X

Turner, Keegan & Crawford (2000) 'Learning by experience in the Project-Based Organization', http://www.eur.nl/WebDOC/doc/erim/erimrs20001219091359.pdf

Uzzi (1996) 'The sources and consequences of embeddedness for the economic performance of organizations: the network effect' *American Sociological Review* 61(4): 674-698

Von Krogh, Roos & Kleine (1998) *Knowing in Firms.* London: Sage

Wenger (1998) *Communities of Practice: Learning, Meaning and Identity.* Cambridge: Cambridge University Press

Wenger, McDermott & Snyder (2001) *Cultivating Communities of Practice.* Boston, MA: Harvard Business School Press

Wenger & Snyder (2000) 'Communities of Practice: The Organizational Frontier' *Harvard Business Review* Jan-Feb: 139-145

Winch (1998) 'Zephyrs of Creative Destruction: Understanding the Management of Innovation in Construction' *Building Research and information* 26(5): 268-279

Yin (1994) *Case Study Research: Design and Methods.* London: Sage

Zack (1999) 'Developing a Knowledge Strategy' *California Management Review* 41(3): 125-145

Zollo & Winter (2001) 'Deliberate Learning and the Evolution of Dynamic Capabilities' *Organization Science* 13(3): 339-351

NOTES

1 Grant (1996) denotes this knowledge-based view as an extension to a resource-based view theory of the firm and points to the recognition of knowledge as the principle source of economic rent.

[2] This follows Mintzberg (1991) depiction of innovative organizations.

[3] Druker (1993) suggests that Knowledge workers play a vital role in defining this age and is the major source of competitive advantage.

[4] Teece et al (1997) argue that dynamic capabilities enable organizations to renew competences and strategically manage the resources required for them to maintain performance in the face of changing business conditions.

[5] Plato suggests that learning involves both formal education and experiential learning. He suggests that formal learning should occur after experiential learning so that the science may provide a framework for the experience. In modern day, this process is transformed into systems for reflective practices after the event and knowledge articulation and codification as part of the learning process.

[6] Machlup (1980) and Baumard (1999) are but a few who attempt to conceptualize the boundaries of a definition of knowledge. Some authors attempt to define

knowledge as different from information and information as different from data in a hierarchical structure of usefulness. However, this shall not be a topic of debate in this paper.

[7] This follows Nonaka & Takeuchi (1995) considerations that knowledge embodies both tacit (personal and context-specific) and explicit (transmittable in formal systematic language) knowledge.

[8] The transferability of knowledge is shaped by the degree to which it can be codified and its complexity. Knowledge that is readily codifiable and simple is more easily transferred than knowledge that is embedded in the culture and work principles of an organization or individual (Grant, 1996).

[9] Levinthal & March (1997), however, argue that experience is often a poor teacher as learning from experience involves personal memory plagued with the inferential limitations of the individual.

[10] Deficiencies in the concept of creating a community of reflective practitioners are that if the organization is unable to persuade the individual knower to remain, knowledge that has been accumulated is lost. The organization must therefore supplement reflective practices with systems to codify the process of knowledge articulation.

[11] Davenport et al (1998) make their case for companies to incorporate reflective practices into their project management processes as a way of capturing and transferring knowledge between projects. Although there may be high initial costs involved in the process of codification; the organization is able to reap the long-term benefits to the process.

[12] Senge (1990), Argyris & Schön (1978) depict this as 'double loop learning'. Double-loop learning encourages people to examine their own behaviour, take personal responsibility for their own action and inaction, and surface the kind of potentially threatening or embarrassing information that can produce real change.

[13] However, cognitive transfer – the application of knowledge acquired in one situation to other situations – is difficult, even within the same individual. People are generally poor at recognizing similarities and find difficulty in drawing on analogous solutions, even when these solutions reside in their own experience.

[14] Jones et al (1997) suggest that organizations manage the structural embeddedness to balance social mechanisms within the organization. Parties should neither have too strong ties (which might develop into tight, isolate cliques); nor too weak ties (that individuals are unaware or uninterested in knowledge sharing activities).

[15] Rockart (1998) is another author who suggests that the intensity of communication is an important characteristic in organizing firms and their strategies. Where traditionally, organizations were designed to simplify and reduce the need for communication due to the cost in the exchange of ideas and information; new technologies and international competition have changed this mode of organizing altogether.

[16] Hofstede (1985) defines culture as a 'collective phenomenon' and mentions five dimensions of culture that includes: power distance, uncertainty avoidance, individualism, masculinity and time horizon.

[17] One source which studies the implication of organizational structure and patterns of control within the organization on how knowledge is effectively captured and transferred between projects and within the organization is Gann & Salter (2003).

[18] Sanchez (1997) notes the importance of managerial knowledge as managers are the trustees of the knowledge the organization holds. Managers' decisions on how the organization is to function, learn and develop have significant consequences on the competitive advantage of a company.

[19] Krackhart & Hanson (1993) is another source where one is presented a framework through which the social links within an organization may be mapped so as to help managers harness the real power in their organizations in revamping their formal structures to let the informal ones thrive.

[20] Unlike codified knowledge, personalized knowledge is dynamic, changing and often difficult to articulate (Alavi & Leidner, 1999).

[21] Zollo & Winter (2001) also reflect on the importance of knowledge codification as a process and not just as an outcome. They argue that frequency, heterogeneity and casual ambiguity of the task at hand are the main determinants for the success of learning within organizations.

[22] This refers back to Zack's (1999) depiction of benchmarking the competitive edge of an organization with others in the industry.

[23] Lado & Wilson (1994) describe how human resource systems may enhance or destroy organizational competences required to sustain a competitive advantage within organizations. The right management strategy must therefore be carefully selected to fit its purpose.

[24] Ofori (2002) describes the peculiarities within the project-based environment of the construction industry that challenge the practitioner in developing techniques and tools to learn and disseminate learning within the organization.

[25] Bresnen et al (2003) suggest that project tasks are often self-contained and idiosyncratic in nature. This high customization of products and services increases the level of human asset specificity involved in the project and therefore requires an organizational form that enhances cooperation, proximity and a social network for the efficiency and effective transfer of tacit knowledge between parties (Jones et al, 1997).

[26] Project processes that are temporary and unique are difficult to standardise and are not able to benefit from an economies of scale.

[27] Despite this characteristic, Prencipe & Tell (2001) theorize that project-based firms also embody 'quasi-genetic' traits which enable these firms to create knowledge repositories for transfer between projects. The analogies they use follow a biological metaphor where firms inherit knowledge through deliberate action and strategies to learn within and between firms.

[28] DeFillippi and Arthur (1998) describe how project-based organizations are designed around temporary alliances within and between organizations where human encounters and relationships start and end with every new project.

[29] Winch (1998) discusses how the individual firms' ability or contribution to the decisions taken by the project coalition is highly influenced by its role in that coalition. He goes on to give us a general overview of the problems in managing innovation and learning in the construction industry.

[30] As projects become more complex and grand in scale, we find trends of co-operation and joint biddings for construction projects. The recent winning bid for the HDB Duxton Plain competition by ARC Studio Architecture + Urbanism, Singapore, in collaboration with RSP Architects Planners & Engineers (Pte) Ltd, Singapore is one such example. Soekijad & Andriessen (2003) suggest that these co-opetitive' strategies are becoming more common and find that even in these scenarios, inter-personal relationships are conditions for successful inter-organizational learning. The analysis of the management practices involved in knowledge sharing in these alliances, in particular, what form of information (knowledge) do firms share with other firms involved in the project and how the patterns of knowledge sharing change over time are potential aspects for further study.

[31] This reflects Hobday's (2000) research on the particular problems associated with project isolation. He goes on to suggest a variety of cross-project communication and management control tools to enable and encourage more widespread organizational learning.

[32] Keegan & Turner (2001) research findings reflect that learning evades project-based organizations due to a constant deferral of learning as a result of short term pressure.

[33] This follows Zollo & Winter (2001) as discussed in Section 4.1.

[34] The fact that an individual or team has learned something does not necessarily mean that another individual or team may leap frog the process of learning through imitation. The process should be seen more as a new generation in the recipient than a mere transfer of knowledge.

[35] The research findings echo Gratton & Ghoshal (2003) call for individual employees to become mobile investors of his/her human capital (See Section 2.1).

[36] Grant (1996) also reflect on the difficulties owners of knowledge as a resource face in receiving returns equal to the value created by that resource (knowledge).

[37] Many of the Architectural firms in Singapore are still owned or co-owned by old Chinese businessmen who made their fortunes in the property boom and rapid infrastructure growth that transformed Singapore from a third world economy into today's advance economy within the last 20-odd years. The need for investment in knowledge management systems come at a time when Architectural practice in Singapore is no longer considered a lucrative business endeavour. As a maturing economy, Singapore is facing a shortage of building work. Most companies have already ventured overseas to South-East Asia, China and India, in order to survive. It is therefore increasingly difficult to

convince shareholders of the need for investment in training and knowledge management strategies. This difficulty is compounded by the inability to quantify relevant returns on investment.

[38] This follows conclusions reflected by Schön (1991).

[39] Levinthal & March (1993) describe the danger organizations may face in a rewards system that promotes an internal selection of successful practices. This creates an over-sampling of success within the organization and gives rise to an illusion of control to these individuals that may inhibit further learning.

[40] However, one may also argue that this promotes an elitist culture within the firm which may reinforce the professionalism in individuals. The concept we are struggling to address is the balance each organization should seek in attempting to provide some structure and incentive to learning while mitigating the freedom that individuals require in expressing their own creation/innovation.

[41] Greater stability in the social environment usually equates a more effective social network. This does not equate stronger social ties as reviewed in Section 2.3. We propose, however, that it increases the propensity to 'communicate'.

[42] For example, the concept of 'face' is different in different cultures. Face is more important in collectivist cultures because of the group dynamics. Although Hofstede clarifies that not everyone from an individualistic culture is necessarily less sensitive to embarrassment or failure, he suggests that the importance and preserving effect of any particular slight or shortcoming is greater in the collectivist society. In this context, we have found that members tend not to raise queries or confront speakers during formal presentations; relying instead on the coffee breaks between presentations to raise issues in person.

[43] Szulanski (1996) depict the lack of absorptive capacity of the recipient, casual ambiguity and an arduous relationship between the source and the recipient as the three constructs that represent the most important impediments to knowledge transfer.

APPENDIX A

A.1 Research Method

The paper draws on qualitative data collected from interviews with eighteen interviewees. The five case studies are the most representative of the results explored. The case study approach was adopted so as to enable a level of reality and detail by 'studying a phenomenon in its natural context' (Cavaye, 1996; Yin, 1994).

Interviews were conducted on a semi-informal basis with interview questions prepared and used only as a guide (Kvale, 1996). Questions specifically addressed knowledge management policies, practices and tools, as well as incentive structures, if any, that were designed to foster these types of investments. Figure A depicts a sample of the questionaire prepared.

Of the five firms, interviewees covered at least one Project Director or Associate and one Project Architect. In most cases, an Assistant Architect or Junior Architect was included to form a three-layer interview design. This was to understand the perceived value of the organizations' policies and procedures from at least three different hierarchical levels in the firm.

Common Features
Government policy in Singapore has imposed that firms bidding for government jobs have to be ISO 9000 certified. In maintaining this certification, firms are required to develop a generic process framework not unlike a general road map that defines what the firm should do in order to maintain continuity (in spite of staff turnover), knowledge transfer (within projects) and an outcome of quality in the final product.

The firms interviewed are all ISO 9000 certified and therefore reflect at least a minimal attempt at knowledge codification and transfer. What we are attempting to research is the organizations' commitment to learning reflected in the articulation of these policies and procedures.

A.2 Limitations of Research

The limitation to the qualitative research approach is the difficulty in generalizing or validating any conclusion. Costs or quantitative elements would be more objective in reflecting success of procedures. There is no real benchmark especially between firms or within the industry as a whole. Qualitative data gathered here, therefore, needs to be complemented by quantitative data. The best approach would be to combine surveys with project-based performance indicators.

Iansiti (1998) describes a tool to analyse the effectiveness of a firm's organizational processes at the project level. Firms' organizational processes are quantified in order to analyse the interrelationships between project-level processes, project performance, project outcomes (product performance) and problem-solving processes. Iansiti's set of organizational indicators investigate the assessment between technology integration processes and project performance. He identifies three project-level mechanisms for technology integration: knowledge generation, retention and application.

Each is assigned a series of indicators (0-1 variables) where the sum of each variable gives an index of the technology integration capability of the firm. When associated with project performance indicators, the index explains the different project outcomes when differing organizational approaches are assigned to technology integration. Some of the project performance measures used are: lead time, project resources and project content.

Although Iansiti's methodology is based on the mainframe industry, similar applications may be made to our study as many of the elements of the project-based relationships are the same. However, the study of architectural firms is further complicated by the nature of its organization where many projects occur simultaneously within the same firm. Each project is differentiated by a different set of group dynamics which includes

many different firms. Iansiti's measures may therefore be debatable and difficult to identify. Irrespective, we agree that in order to quantify, appropriate indicators need to be identified and a structured questionnaire devised. Unfortunately, most of the firms approached were reluctant to neither diverge any quantitative data nor free up relevant staff to participate in these surveys.

The unique nature of the projects further complicates the base criteria by which projects may be compared. Also, interpretation of experience or knowledge is difficult. Findings presented here are therefore about the learning that occurs within the organization: mainly learning that occurs from other individual learners and from their project colleagues and competitors but are not really reflective of where any particular company stands in terms of success in its respective sector or of its strategies.

Figure A: Prepared Questionaire as structure to interviews

1. How is the organization of the firm structured?
2. Whose role is it that primarily decides organization of training/upgrading of skills etc.
3. Whose role is it that primarily decides allocation of training/upgrading of skills etc. to staff members? (Basically who gets training and who doesn't)
4. What sort of training programs does the organization engage in?
    a. Site visits
    b. Institutional training programs – CIDB; SIA; CPG conducted events
    c. In-house seminars
    d. Client/Consultant seminars
    e. Suppliers' presentations
    f. Mentor programs
    g. Project presentations
    h. NUS invited guests events
    i. Critique sessions
5. Are staff expected to disseminate training skills etc. after the event?
6. In what ways is this knowledge transfer managed?
    a. Internal office training programs
    b. Dissemination of reading materials
    c. Written report on salient points of training program
    d. Updated registry of trained personnel in event similar expertise is required
    e. Mentor programs for junior staff
    f. Reflective Pratices
7. Are these systems:
    a. An organization construct or
    b. Managed on an ad hoc basis?
8. Are costs to Investment in Training associated:
    a. To the organization as a whole annual budget? or
    b. On an individual project/team budget?

9. Is the budget for Investment in Training reviewed:
    a. On an annual basis?
    b. Based on expected profits and operating costs
    c. As and when required – eg. Change in government by-laws; Client requirements
    d. According to the individual project/team
    e. Targeted Return on Investment – if so, has the anticipated rate been achieved in the past 5 years?
10. Rate level of importance the following impact decisions to invest in training:
    a. Government legislation – keeping up with by-laws and accreditation
    b. Government grants/rebates on training programs conducted and/or amount of training employees received
    c. Maintain company profile – ISO certification etc
    d. Maintain company profile with clients – portfolio of accredited professionals
    e. Tenure of staff
    f. Citizenship of staff
    g. Position of staff – senior, junior, technical, professional etc
    h. Tasks that staff are expected to execute – Power-point presentations; 3D modeling; programming software; drafting skills etc.
    i. Expectations on staff loyalty/Employee turnover rate
    j. Relevance of training program to particular field of work staff is currently undertaking
    k. Attitude of staff towards training
    l. Expectations on successful knowledge transfer within organization
11. Rate how the following impact annual review of staff performance:
    a. Amount of training staff has undergone
    b. Participation of staff in training programs (in-house or otherwise)
    c. Role of staff in disseminating/training/education of fellow colleagues
12. Does the organization encourage staff to pursue personal training/education outside of the office?
    a. University degrees – Masters and/or PhD degrees
    b. Professional accreditation
    c. Related certification
    d. Unrelated courses like arbitration; mediation; psychology; interior design etc. which nonetheless increases value of staff in terms of its human capital
13. How does organization encourage these pursuits?
    a. Increased annual remuneration on successful completion of training program
    b. Grant of study leave/leave to pursue such courses
    c. Favorable review for promotion
    d. Reduction in workload/employment of an assistant to facilitate training pursuits
    e. Sabbatical leave
    f. Company loans at favorable interest rates