Knowledge integrator nodes in teams or networks in multinational enterprises

Ronel Erwee
Leslie R. Brown
University of Southern Queensland,

Lee Guan Poh
Lucent Technologies

ABSTRACT

The concept of the emergence of a knowledge integrator node in project teams or internal and external networks of a firm is explored. Aspects of the literature on the knowledge creation process and key actors and their roles and knowledge management in boundary-spanning networks development in multinational companies are presented. A grain trading and exporting case study illustrates the concept of knowledge integrator nodes and organisational learning. The concept of knowledge integrator nodes is again explored in Singapore-based multinational telecommunications companies and expanded to include an investigation into knowledge management roles in internal project teams. Further recommendations for research are included as well as how knowledge integrator nodes (KINs) may have application in 'knowledge-based' industries.

INTRODUCTION

The objective of this paper is to analyse whether an actor (or actor node) is needed to integrate dispersed knowledge within an organisation. This proposition and the focus of this research in relation to existing research is that the role of this actor node is seen as being distinct from those set out by Nonaka and Takeuchi (1995, pp. 151-8) in the roles defined in their concept of the 'knowledge creating crew'. However, the limitations of the existing research by Nonaka and Takeuchi is that they link their concepts of three crew titles corresponding to three levels of employee, i.e. 'front line employee', 'middle manager' and 'top manager'.

We contend in this paper that there is a role such as a knowledge integrator node (to be defined at a later stage in this paper) in organisations, especially those in which knowledge is a product. A further perspective is that this knowledge integrator node is closer to the concept of the Nonaka and Takeuchi 'knowledge engineer/middle manager', yet it differs in that it plays a much more crucial role in the evolution of an organisation. This paper is therefore a conceptual paper supplemented with two cases from different contexts but in industries in which knowledge is the product.

This paper therefore begins with an overview of the relevant extant literature on knowledge management within organisations. A further section is devoted to the knowledge creation process, followed by a section on key actors and their roles. Some information is then presented about knowledge management in boundary-spanning networks without exploring core business networks in great depth as it is beyond the scope of this paper. A case study of a grain trading and exporting firm introducing the concept of a 'knowledge integrator node' and knowledge creation is presented. This is followed by a case study of Singaporean telecommunications companies in which the roles of key actors in internal networks as well as the 'knowledge integrator node' concept is again explored. Future research directions are formulated and conclusions and implications for business research and practice are formulated.

Knowledge has been recognised as a strategic asset and a source of competitive advantage especially in multinational enterprises and their subsidiaries (Nonaka & Takeuchi 1995). Whereas tangible assets such as land, labour, machinery, raw materials etc. are relatively easy to access, the basis of sustainable competitive advantage is therefore more centred on assets which are 'rare, durable, not easily traded and difficult to imitate' (Amit & Schoemaker 1993, Barney 1991). The management of such knowledge is critical to the effective use of such knowledge. However, the process by which knowledge of potential value to the multinational or its subsidiaries, prior to its application, is extracted and shared, needs to be investigated.

Many current management and organisation theories point to the importance of knowledge to organisations but there are few studies on how knowledge is created within or between business organisations (see Nonaka & Takeuchi 1995; Sanchez & Heene 1997; Davenport & Prusak 1998). These researchers are moving beyond the articulation and transfer of tacit knowledge to focussing on the creation of explicit knowledge.

The difficulty with the management of organisational and individual knowledge is that because of its intangibility, it is not readily measurable and as such cannot be readily quantified as a firm-specific strategic asset. The complexity of multinational companies with subsidiaries operating in dispersed locations each with diverse teams and part of international networks, adds to the difficulty in researching the knowledge creation process. The discussion in this paper builds on contentions and propositions that have

been developed from the literature on institutional knowledge creation and development that augment prior research in this area. The authors' contention is that although knowledge of key actors in a multinational enterprise or a subsidiary has been seen as a strategic asset of the firm, its importance lies in extracting or building firm-specific competencies from knowledge rather than merely establishing information channels and sources.
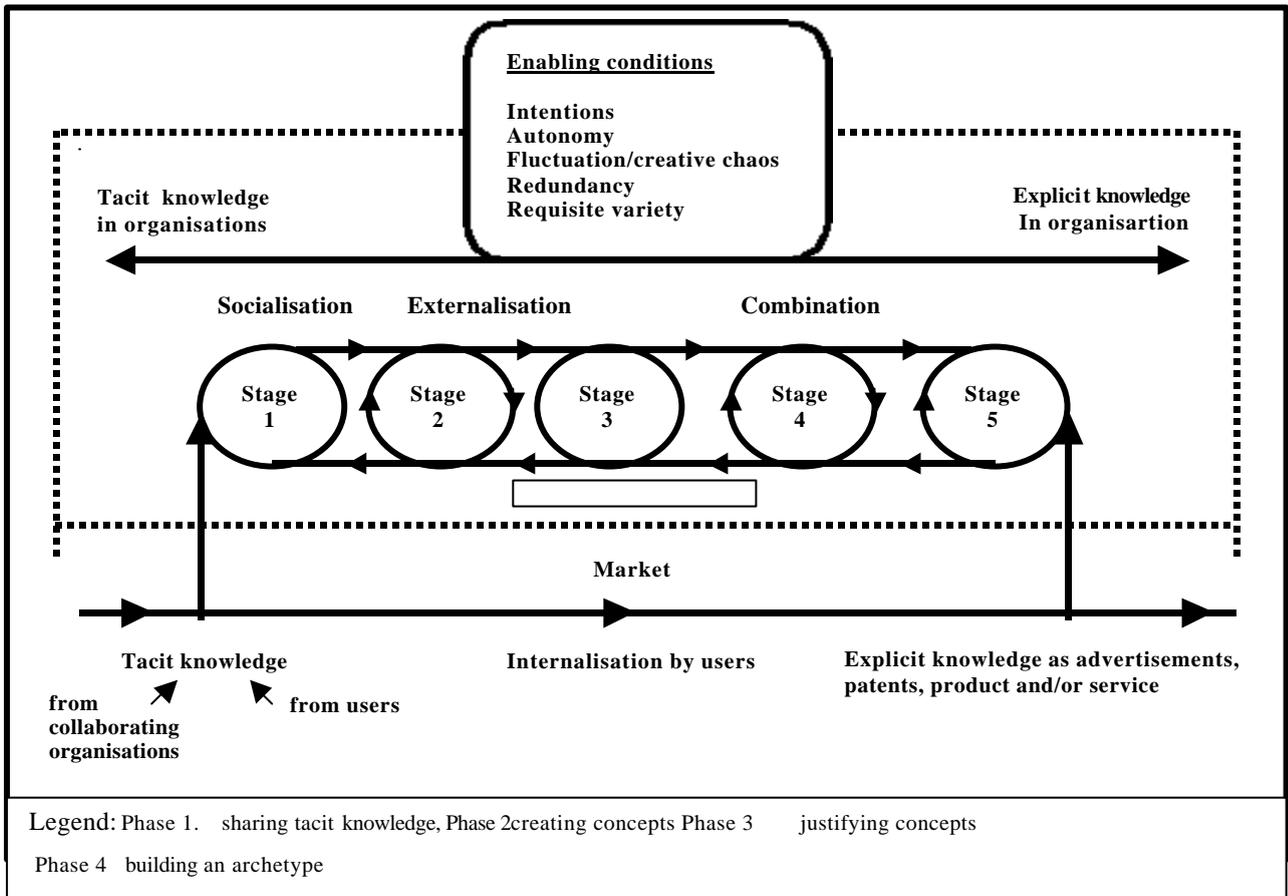
THE KNOWLEDGE CREATION PROCESS

Knowledge-based theory (KBT) is a contemporary concept which supports the assertion that the ability of a firm to integrate knowledge is a strategic asset (Grant 1996; Lorenzoni & Lipparini 1999). However, this is qualified by the ability of the enterprise to transform 'dispersed, tacit, and explicit competencies into a wide body of organizational knowledge' (Lorenzoni & Lipparini 1999 p. 320; Nonaka 1994). Grant 1996). If the knowledge is refined into two dimensions, tacit knowledge and implicit knowledge it creates a mutual understanding that has a strategic implication for management. The Nonaka & Takechui (1995) model of four modes of knowledge conversion deals with the process of converting tacit knowledge to explicit knowledge by socialisation, externalisation, combination and lastly, internalisation, which are now addressed in turn (see Figure 1).

The socialization process aims at getting key actors to share personal or tacit knowledge. Key actors in an internal or external network of a multinational enterprise each have tacit knowledge on market trends, consumer preferences or the strategy formulation of the enterprise or the subsidiary. At this stage the knowledge is still primarily the personal possession of employees or key actors or the collective possession of teams.

Externalisation creates new, explicit concepts from tacit knowledge. If key actors share this knowledge with other team members or peers through metaphors or analogy, such metaphors can create a common 'network of new concepts' (Nonaka & Takeuchi 1995, p.67). In a multinational enterprise operating in countries with a variety of languages, cultures and business practices, the creation of common metaphors may be part of the challenge.

Figure 1. A five phase model of the knowledge creation process.

Enabling conditions

Intentions
Autonomy
Fluctuation/creative chaos
Redundancy
Requisite variety

Tacit knowledge
in organisations

Explicit knowledge
In organisartion

Socialisation   Externalisation   Combination

| Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 |

Market

Tacit knowledge   Internalisation by users   Explicit knowledge as advertisements,
patents, product and/or service

from
collaborating   from users
organisations

Legend: Phase 1.   sharing tacit knowledge, Phase 2 creating concepts Phase 3   justifying concepts

Phase 4   building an archetype

(Source: developed from Nonaka, & Takeuchi 1995; Poh 2000a)

Combination involves integrating different bodies of explicit knowledge. In many cases this happens if key actors exchange information through documents, meetings, telephone conversations, e-mail or Intranet discussion groups. If the information is sorted, categorised or combined by manual or computerised methods, further discussion of this explicit knowledge can lead to the creation of new knowledge. In a multinational enterprise this knowledge will be dispersed across teams within the headquarters and teams in the subsidiaries and their networks.

Externalising such codified knowledge allows it to be transmitted rapidly and to larger audiences whereas tacit knowledge is initially shared slowly in face-to-face situations under conditions of trust. Enterprises differ in the kinds of knowledge development systems that they adopt. Some firms adopt a 'theorising and codifying' form of learning

bias, whereas others develop learning-by-doing systems that lead to 'tangible knowledge integration' (Sanchez & Heene 1997, p.11). Finally, key actors internalise the explicit or new knowledge to make it part of their own expanded repertoire of tacit knowledge. In very large multinational corporations the vast volume of information and diversity of actors places high demands on the technical systems used to integrate and disseminate knowledge and on the actors to absorb and act on the knowledge.

A five phase model of knowledge-creation was developed by Nonaka and Takeuchi (1995). In the first phase, individuals from different functional areas share their skills and experiences (or tacit knowledge) in order to meet common goals. In face-to-face dialogue jointly shared tacit mental models are developed. This process of social interaction accesses knowledge that is embedded in people. This original formulation by Nonaka and Takeuchi (1995) does not take into account the complexities of operations in a multinational, its subsidiaries and their external networks.

In the second phase, concepts are created as members collectively reflect on the shared tacit mental models developed in phase 1. Creative thinking converts the tacit knowledge accessed in phase 1 into explicit knowledge. Ideally, this process occurs amongst small units in an environment free of excessive control or over-management (Pascarella 1997) and is considered as an iterative process (Nonaka & Takeuchi 1995). In a multinational enterprise this proposition may be applicable in teams within the headquarters or in subsidiaries.

In the third phase, concept justification, new concepts are screened. This process of evaluation looks for organizational 'fit' and societal alignment. Some writers argue that this is the province of senior and middle management, and is based on their understanding of organizational vision and strategy (Nonaka & Takeuchi 1995) At this stage 'boundary-spanning' activities may occur. The concept of boundary spanning and integration is viewed as of key importance in multinational enterprises, their subsidiaries and external networks.

In the fourth phase, the 'justified/approved' concept is converted into a tangible or concrete 'archetype'. This could be a marketing strategy that has evolved by combining newly created explicit knowledge with existing knowledge (Nonaka & Takeuchi 1995).

In the fifth and last phase, which is seen as the 'cross-levelling' of knowledge, the concepts that have been created, justified or approved and modelled are used to activate

new cycles of knowledge creation (Nonaka & Takeuchi 1995). This new knowledge has the potential to trigger further knowledge creation across the organization as well as, in the case of networked organizations, with peripheral network members such as service providers, customers, supplier and competitors (Choo 1998; Poh 2000a). This created knowledge is seen as the core memory of the organization and as such should be preserved to avoid loss and subsequent re-invention (Liebowitz 1998). The created knowledge is an outcome of the 'boundary-spanning' process that became important in the fourth stage. It may exist not only within one organization (multinational), but also within its subsidiaries and external networks. Other theoretical models of the knowledge creation process are the 'knowledge process model' of Wilstrom and Norman (1994 – column A) and the 'knowledge building activities model' of Leonard-Barton (1995 Column C). These models are contrasted in Table 1.

Table 1. A comparison of theoretical models of the knowledge-creation process

Knowledge processes (Wilstrom & Norman 1994, column A)	Knowledge-creation phases (Nonaka & Takeuchi 1995 column B)	Knowledge building activities (Leonard-Barton 1995, column C)
Generative processes-Generating new knowledge	Sharing tacit knowledge	Shared problem solving
	Creating concepts	Experimenting and prototyping
Productive processes-Operationalising new knowledge	Justifying concepts	Implementing and integrating new processes and tools
	Building an archetype	
Representative processes-'Diffusing and transferring new knowledge	Cross-level knowledge	Importing knowledge

(Source: adapted from Choo 1998, p. 130; Poh 2000a)

In each model there are three distinct activities, firstly the generation process or phase, secondly the production and operationalisation/implementation phase or stage and finally the diffusion of knowledge across the organization. It can be seen that both

Nonaka and Takeuchi (1995 column B) and Leonard-Barton (1995 column C) decomposed the first two stages or phases into more specific processes than those in column "A" (Wilstrom & Norman 1994). However, the overall models are generally synchronous in their trajectories. This then leads to the conclusion that an organization creates and generates new knowledge in the following ways:

- By sharing and converting the tacit knowledge of its members and working in groups to reflect on and solve problems collectively,
- By operationalising (developing and testing) new concepts, and
- By distributing, sharing and transferring new knowledge across the organization and in some cases beyond organisational boundaries into business networks.

KEY ACTORS AND THEIR ROLES

This paper is not concerned with general knowledge workers in multinational companies, but specifically those key actors involved in the creation of knowledge or the 'knowledge creation crew' (Nonaka & Takeuchi 1995, p.152), namely knowledge practitioners, knowledge engineers and knowledge officers. In contrast Davenport and Prusak (1998), argue that knowledge management will not succeed if it is solely the responsibility of a small specialist group, but needs to be a pervasive part of everyone's job.

Knowledge practitioners within multinational companies could be made up of two complementary groups, knowledge operators and knowledge specialists. The knowledge operators accumulate or generate tacit knowledge by being exposed to operating conditions of the firm and through action learning experiences. Specialists generate or analyse well-structured explicit knowledge usually in the form of scientific or other technical data. These practitioners usually have high intellectual standards, have a wide variety of experiences within and outside the firm and are able to dialogue with customers as well as colleagues (Nonaka & Takeuchi 1995, p.154). Practitioners acting as boundary spanners in marketing networks, may also act as knowledge buyers who are searching for knowledge to solve a complex issue and want to acquire insights, judgements or understanding that another key actor possesses (Davenport & Prusak 1998).

Knowledge engineers serve as a bridge between visionary ideals of leaders and the realities faced by knowledge practitioners. They 'remake reality -or engineer new knowledge- according to the company's vision' (Nonaka & Takeuchi 1995, p154) and are most often found at middle management level in dispersed companies. They are able to synthesise the tacit knowledge of both practitioners and senior executives, make it explicit and incorporate the knowledge into new products or systems. This implies that they not only need to be able to engender trust among network members but also that they should be able to envision a future course that members can identify with. The knowledge engineers are usually skilled in project management, can formulate hypotheses or metaphors to create new concepts, and need to have the ability to 'integrate different methodologies to create knowledge' (ibid p 156). Skilled knowledge engineers in a boundary spanning network may become knowledge sellers if they have a reputation of substantial knowledge about a process or subject, are able to articulate the tacit knowledge and willing to share the information or insights (Davenport & Prusak 1998).

Knowledge officers within firms manage the total organisational knowledge-creation process at the corporate level by articulating the company vision, 'establishing a knowledge vision' and setting the standards for 'justifying the value of the knowledge that is being created' (Nonaka & Takeuchi 1995, p.156). These officers could play a knowledge brokers (gatekeepers or boundary spanners) role as they have a macro view of the multinational and realise that certain sellers can be connected to specific buyers (Davenport & Prusak 1998), especially in external marketing or business-to-business networks. The officers usually also have the ability to select project managers and have a capability to 'create chaos in the project team by setting inordinately challenging goals' (Nonaka & Takeuchi p158). The latter perspective focuses on their roles within an organisation but could be applicable between members in the firm's boundary spanning networks. Most of these researchers describe a knowledge creation crew within a firm. In the agribusiness research the focus is on how members of this internal crew start spanning organisational boundaries to create marketing networks and create knowledge within business-to-business networks (Brown & Erwee 1999; Erwee & Brown 2000). In the Singaporean based telecommunications companies the roles that

project team members played during the phases of creating a project proposal to develop solutions for a customer are investigated (Poh 2000b).

Knowledge integrator nodes: Another dimension of the creation of knowledge which extends the knowledge-creation process of these models and particularly that of Nonaka and Takeuchi (1995), is that of the concept of knowledge integrator nodes (K.I.Ns)' which was developed by Erwee and Brown (2000). The concept concentrates more on the way in which 'knowledge is managed in order to ensure the creation and extraction of value to the organization in the knowledge creation process' (Erwee & Brown 2000, p. 13 KINs). KINs are persons who deliberately integrate explicit knowledge gained from peers in knowledge creation crews and then disseminate it across organisational boundaries.

As Poh (2000a) further elaborates, the concept of the K.I.N. means that:

' The creation of knowledge is no longer the activity of an organization (network component) working in isolation, but the collaborative result of its members working closely in internal groups and in partnership with other organisations'.

This statement encapsulates the concept of *'boundary-spanning'* by knowledge nodes because it includes and emphasises the way in which they take knowledge gained from working with intra firm knowledge creation crews and progress this knowledge both within the organization and its peripheral stakeholders but also progressively upwards within the organization to more senior management levels as potential inputs into corporate policy decisions. In facilitating this knowledge creation and adoption process, the management of knowledge is critical to the efficient functioning of the networked multinational or other company.

KNOWLEDGE MANAGEMENT IN BOUNDARY SPANNING NETWORKS

Organisational knowledge creation can be a spiral process starting at individual level and involving a 'community of interacting individuals with different backgrounds and mental models' (Nonaka & Takeuchi, 1995, p.73) who through the modes of socialisation, externalisation, combination and internalisation can create new knowledge. Learning in organisations therefore takes place through dynamic participation in activities and activity systems in firms emerge to interconnect and build the competencies of key actors and the firms (Sanchez & Heene 1997).

Articulating and codifying knowledge limits its transferability within an organisation to other members and limits the benefits if the knowledge cannot be leveraged quickly (Sanchez & Heene 1997). This view is contrary to the perspective that tacit individual and organisational knowledge are strategic assets that should be guarded so that it could not inadvertently be revealed to competitors. Their suggestion is that practical (know-how) and theoretical (know-why) knowledge can be shared wider than organisational boundaries but strategic (know-what) knowledge is sensitive and valuable information that should not be leaked beyond the firm.

Davenport and Prusak (1998, p.37) argue that 'knowledge markets' cluster around informal and formal networks within firms. As informal networks function through personal contact or word of mouth, trust can be fostered between members but this is usually undocumented and circumscribed. An informal network may transform into a '*community of practice'* (ibid) if the members of this group decide to meet more regularly to exchange information, develop a system for exchange (eg. videoconferencing) or tend to document information (eg. Intranet discussion groups).

The incompleteness of information, insufficiency or 'asymmetry' of information and '*localness'* of knowledge (Davenport & Prusak 1995, p.40-41) can cause additional inefficiencies in knowledge markets. In such cases knowledge need to be sourced from outside an enterprise and from other key actors in the enterprise's external networks. Furthermore, if an enterprise's current competence in creating new knowledge is constrained by its learning bias, it may need to form alliances or expand its networks to gain access to information or knowledge creation competencies. Another inefficiency that needs to be overcome is that the knowledge may not be timely or relevant. The way in which knowledge is shared and structured between 'data processing agents' within and between enterprises and their subsidiaries is influenced by the culture of the firms (Boisot et al. in Sanchez & Heene 1997, p.67). The concept of data processing agents could also be incorporated into the concept of knowledge integrator nodes. The authors' contention is that both concepts can overcome the inefficiencies in knowledge markets in enterprises.

KINs in interfirm networks may be able to organise knowledge transfer, access, usage and further development in '*dynamically competitive domains, and in contexts where complex knowledge is scattered or specialised'* (Lorenzoni & Lipparini 1999 p. 320).

Long-term business relationships can develop between enterprises that could be *'embedded in unbounded value-creating workflow systems of interdependence governed by business network relationships'* (Blankenburg Holm, Eriksson & Johanson 1999, pp. 467, 481). It implies that such enterprises or subsidiaries of a multinational enterprise share interdependent activities that enables them to achieve greater value than if they were not involved in a business relationship. This dependency in the relationship is an outcome of adapting to exchange partner's *'unique needs and operations'* (Barney and Ouchi, cited in Cannon et al. 2000, p. 181) and thus strengthen the interdependency because of the *'switching costs'* involved in finding and accommodating the needs of partners.

In the Hoffmann model, communication refers to both formal as well as informal sharing of meaningful information between enterprises (Anderson & Narus 1990). Network identity is seen as the perceived attractiveness (or repulsiveness) of an exchange partner due to its unique set of connections to other firms, links to their activities, and mutual ties (Anderson, Hakansson, & Johanson 1994. p.4). Organisational learning is considered to be the development of new knowledge or insights through the potential to influence behaviour (Slater & Narver 1995). Trust is described as a willingness to rely on an exchange partner in whom one has confidence (Morgan & Hunt 1994). Commitment is defined as an enduring desire to maintain a valued relationship (Moorman, Zaltman & Desphande 1992). Sustainable competitive advantage is seen as the prolonged benefit of implementing some unique value-creating strategy not simultaneously being implemented by current or potential competitors along with the inability to duplicate the benefits of this strategy (Hoffman 2000, p.14).

In our adapted model, the three critical constructs which relate to future research are strategic competitive advantage, and its antecedents organisational learning and network identity. The broken lines (figure 2) illustrate the relationship between these. The contention is that organisational learning enhances strategic competitive advantage. Organisational learning is facilitated by the way in which knowledge is created and shared by knowledge creation crews. Network identity can be enhanced by KINS in the network that actively integrate knowledge and distribute it across business boundaries in the network. Therefore, this model clearly shows the necessity for effective knowledge

creation and management within multinational enterprises with a networked configuration.

Figure 2. An adaptation of Hoffman's theoretical model of dyadic relationship success within a network context
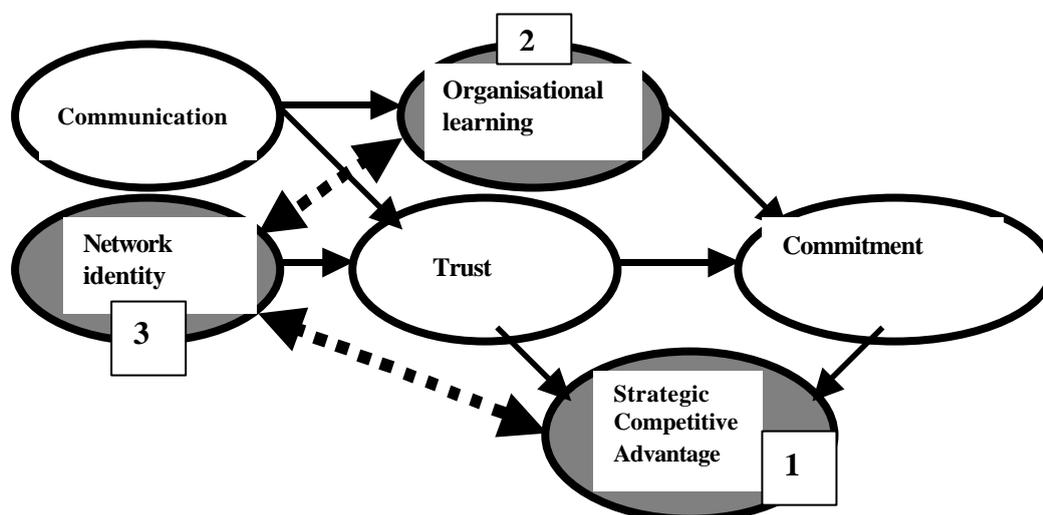
Source: adapted from Hoffman 2000, p. 13. by the inclusion of additional directional arrows.

In summary, this approach differs from existing process models of knowledge management in that it re-evaluates these by acknowledging that these models do not consider changes in market behaviour as a moderating factor.

KNOWLEDGE INTEGRATION IN ACTION: THE CASE OF A GRAIN TRADING AND EXPORTING FIRM

The role of experiential knowledge in the internationalisation process has been highlighted in models of internationalisation such as the Uppsalla model (Stopford & Wells 1972; Johanson & Vahlne, 1977). Furthermore, the role of appropriate knowledge acquisition in enabling SMEs to undertake successful entry into overseas markets has been noted (Wiederscheim-Paul 1978; Craig & Douglas, 1996). However, the role of information and knowledge acquisition as an integral part of developing and maintaining firm strategic competitive advantage has not been explored to any great extent in the literature (Liesch & Knight 1999).

In this case study, a preliminary in-depth interview revealed that at least one knowledge manager within an internationally networked global agribusiness firm used this process constantly in the dynamic environment in which his subsidiary operated.

This case is that of an Australian privately owned 'born global' firm, which trades futures in specific agribusiness commodities globally, as well as exporting some commodities directly to Asia. In the last fourteen years the firm has grown from five staff to sixty and turnover from one million dollars to seventy million dollars. In the firm, traders in the five divisions use the Internet for market information and intelligence, particularly from sources such as the Sydney Futures Exchange and the Chicago Board of Trade, information on crop prospects and climatic information from satellite reports. They also use contacts including fellow brokers and agribusiness experts in various countries as well as local informal contacts such as growers.

In 1997, the Internet and in particular, the development by the firm of their Web page provided the catalyst for the internationalisation of the firm. Not only were they able to become more widely known, but also they in turn were able to widen their information sources. This immediately thrust the firm into exporting as well as an internal restructuring. Although all players in the international market are able to access information about general market conditions print and electronic media, the internet enabled this firm to use information developed by each individual trader in the firm as strategic assets of the firm which are factored into decisions about the buying an selling of futures contracts each day. However, clients are told of the reasons why a particular price is offered (in order to maintain trust and commitment). Furthermore, there are alliances between sources in the vast international network, for example: 'I have got a net with somebody that is not in the profession' and 'it is vital, no competition will share that information'. Traders are using opportunities to span boundaries in networks 'you can cross the groups provided you know the group, but not many people know each others groups' (networks). Both major customers and brokers external to the firm are viewed as key partners in alliances as they alert the company's agents to market needs or provide access to their information and knowledge systems (whenever there is a perceived value outcome from the exchange of information.

The MD at the start of using the Internet realised the value of the knowledge that the firm was accumulating eg. 'so what happens to the knowledge, how do we share the knowledge in the company?'. A system was developed to channel information via the MD and owner to the appropriate trader (in terms of knowledge access) to make trading decisions. Daily meetings between the MD and owner place them both at the hub of the

centre of the information flow and strategic decisions based on accumulated knowledge. The MD argues that the ability to forecast is a skill developed through experience and constant discussions with people in local and international networks but that this skill cannot be easily taught. He notes both implicit and tacit knowledge 'this is the information and these are the vibes in the market' and we can talk to twenty people in one hour and you will have enough information for you to really know whether you should take that risk'. The traders have to filter a vast amount of information and use their accumulated knowledge to discern which information is trustworthy to take calculated risks in trading. Every decision has to be documented in a reliable form to ensure that that verbal agreement can be honoured.

Comments on the pilot grain trading case: In this grain trading case the information flow between the owner, managing director (MD) and traders are immediate and all market intelligence is shared daily. The tacit knowledge of internal and external sources of information that is accumulated daily is mobilised, shared and is then used by the owner and managing director (MD) to advise traders and collectively to make decisions. This combined knowledge has to be internalised and documented before the new trading cycle. The knowledge spiral of socialisation, externalisation, combination and internalisation is therefore more rapid than in other cases and is imperative for the continued success of the firm. The MD has the opportunity to draw alliance partners such as customers or brokers into the knowledge spiral. The owner and MD seem to be using some elements of a knowledge engineering role (knowledge conversion) as well as an element of the knowledge officer namely formulating a knowledge vision. Both MD and the traders operate in both dimensions of knowledge practitioner roles.

In contrasting this grain trading case with two other related cases in Australian agribusiness, it appeared that there are divergent consequences for the knowledge integrator nodes (Brown & Erwee 1999). In Case 'A' the K.I.N. consists of a single operative and therefore the influence is unidirectional. Case 'B' has a larger core group consisting of a seven-member knowledge integrator node and therefore has a more fluid structure and in which the boundaries are more permeable. The information flow is enhanced and relationships are strengthened by the continuous information. The larger core group adds more value through sharing their wider range of core competencies. In the grain trading case, the owner and MD are the core K.I.N., but all the traders in the

entire firm can be viewed as K.I.Ns. who integrate the information they gather from their networks to feed into the firm. There are multi-directional influences between the traders and they do protect their market intelligence from competitors outside the firm.

Therefore, our contention is that key actors (knowledge integrator nodes – K.I.Ns) can be seen as one of the tools that firms use to articulate and manage knowledge in their international networks. The new types of customised mixed structures of firms and subsidiaries are influenced by the embeddedness of these key actors in the network as well as by their personal core competencies in managing knowledge.

Figure 3 illustrates a process for knowledge-related activities. In this figure, the starting point is a network instigator with a concept of value ('A') who drives the way in which the network is established. A partner (B) is selected for its unique knowledge (asymmetry) on the one hand and being trustworthy on the other. This process is influenced by the objective to add value to both partner's firms. Within these mutual objectives, knowledge asymmetry provides opportunities for both parties to extract value from exchanges of information because of its complementarity.

Figure 3.   The value-creating network process
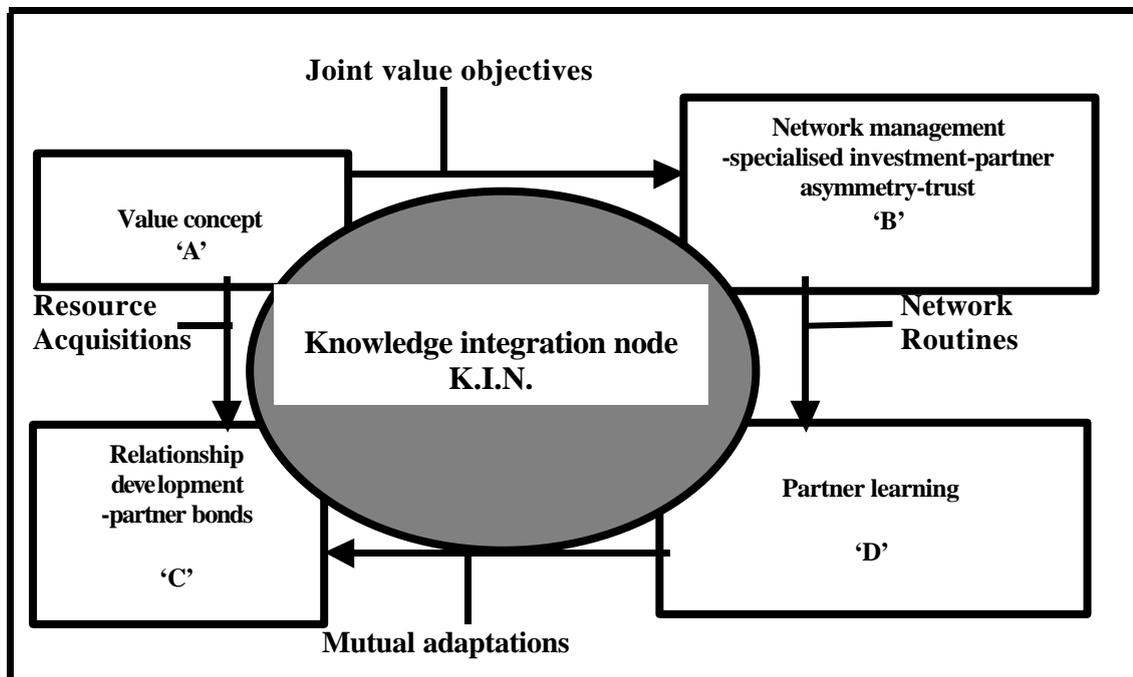
Source: Adapted from Campbell & Wilson, 1995 p.137

Partner 'A' is interested in developing the relationship to ensure bonding between partners ('C'). This process is influenced by resource acquisitions and the extent of their need to externalise some functions. As all parties see that they can each extract value from the liaison, the relationship bonding is expected to grow. Mutual learning ('D') between partners takes place facilitated by network routines. As the partners learn they mutually adapt and this again develops the relationship and bonding. The authors' contention is that this process described by Hoffman needs to be deliberately managed and that a KIN could be the key actor that is instrumental to such intervention.

Figure 3 illustrates a process for knowledge-related activities. In this figure, the starting point is a network instigator with a concept of value ('A') who drives the way in which the network is established. A partner (B) is selected for its unique knowledge (asymmetry) on the one hand and being trustworthy on the other. This process is influenced by the objective to add value to both partner's firms. Within these mutual objectives, knowledge asymmetry provides opportunities for both parties to extract value from exchanges of information because of its complementarity.

In Figure 3, Partner 'A' is interested in developing the relationship to ensure bonding between partners (see block 'C'). This process is influenced by resource acquisitions and the extent of their need to externalise some functions. As all parties see that they can each extract value from the liaison, the relationship bonding is expected to grow. Mutual learning (see block 'D') between partners takes place facilitated by network routines. As the partners learn they mutually adapt and this again develops the relationship and bonding. The authors' contention is that this process described by Hoffman needs to be deliberately managed and that a KIN could be the key actor that is instrumental to such intervention. The authors contend that the process should be more dynamic and on-going and should be described in a much more in-depth model than described by the short overview provided by Campbell and Wilson (1995).

KNOWLEDGE INTEGRATION IN ACTION: SINGAPOREAN BASED TELECOMMUNICATIONS COMPANIES

In this section, a related second case in Singapore-based telecommunications companies will be discussed. As in the previous grain trading case, the Singaporean cases are in industries where knowledge is the product. It was beyond the scope of this paper to

compare these two cases to others in industries where knowledge is not the product. In the grain trading case knowledge and organisational learning was generated by knowledge integrator nodes as one of the tools to articulate and manage knowledge in their international networks. In the Singaporean companies, we aim to again test what the role of the knowledge integrator nodes was in internal networks between project teams (Poh 2000b) to create organisational learning and strategic competitive advantage (see Figure 2), externalisation (see Figure 1) and knowledge building activities (see Table 1).

In this larger study there were a number of research issues, however, the research issue relevant to this paper to complement the research done in the grain trading case was 'What roles do the various project team members perform during the different phases of developing the customer proposal'? The roles of staff members in the grain trading case were not explored but the roles of the internal networks (i.e. project teams) could be analysed in the Singaporean companies. Furthermore, the concept of a knowledge integrator node was discovered in the grain trading case and therefore had to be investigated in greater detail in the Singaporean companies.

The four companies, from which the six case studies of project teams were selected, were known for their leadership roles in the telecommunications industry; and sometimes pioneering technologies and applications in the global markets. A total of 24 interviews were conducted (Poh 2000b) that enabled the researcher to do within-case analysis and cross-case analysis for the above and other research issues.

All of selected multinational companies had operations in many countries globally; and with turnover exceeding more than US$10 billion in fiscal year 1999. They also had significant operations in Singapore. Besides managing the local market, most of their Singapore operations or subsidiaries also supported the businesses in some other countries in the region. Each multi-disciplinary proposal project team was required to determine the network design, systems, products, and services; and develop the offer and solutions that would best meet the requirements and specifications of a customer. Collectively, a project team had to develop the network design and systems engineering, technical and commercial compliance, project plan, services plan, and new pricing schedule. The proposal project team consisted of managers and specialists from the various functional groups – sales or account management, product management (optical,

data-networking, and network management), network planning and engineering, business management, proposal management, and professional services or project management (Poh 2000b).

Based on the analysis of the interviewee data, table 2 shows the functional and knowledge creation roles that each interviewee performed during the knowledge-creation process for the customer proposal projects. Most of the members performed more than one role in the knowledge-creation process although he / she might perform only one functional role; and the role he / she performed during the knowledge-creation process for the development of the customer proposal was consistent throughout the project. 'Every member of the team plays multiple roles in the development of the overall jigsaw [the solutions / offer]; and the three most important things are: teamwork, teamwork, & teamwork' (Poh 2000b). The functional roles were equally dispersed in each case. Each team has its own unique configuration of functional roles. Team A1 includes project proposal project manager, account manager, technical specialist and financial specialist whereas team B2 has a sales manager, a product specialist, a administrator and budget manager.

The knowledge specialist was the dominant role in 22 of the 24 interviews. The roles of knowledge operator and knowledge integrator node were each mentioned in 17 interviews whereas the knowledge engineer was noted in 11 interviews. A related important finding was that the role of knowledge officer was not relevant in the customer proposal project team (Poh 2000b).

In contrast to the grain trading case, where the knowledge integrator node role was hinted at, the knowledge integrator node role in the Singaporean telecommunications companies could be clearly identified by the interviewees and was highlighted as extremely important. In summary, the findings showed that the integration of the knowledge within the proposal team, during the knowledge-creation process, was critical.   This could contribute to partner learning within internal networks (see figure 3) as well as organisational learning (see Figure 2), communication and trust. Integration of the knowledge within the proposal team was performed at two levels namely on the overall team level, and on the specialist sub-group or team level further contributing to partner learning within internal networks (see Figure 3 and also externalisation in figure 1). The knowledge integration activity for the overall proposal

project team was performed in many cases by the sales or account manager and for the functional or specialist sub-group /team, it was performed by the senior specialist or relevant manager (Poh 2000b).

However, the role of knowledge officer was not seen as applicable in the knowledge-creation process of proposal project team. The teams that were interviewed apparently did not include people who manage the organisational knowledge-creation process at the corporate level by articulating a knowledge vision and this role may not have been clearly articulated in these Singaporean based telecommunications companies.

CONCLUSIONS AND IMPLICATIONS FOR BUSINESS RESEARCH

This research focussed on how key actors such as Knowledge Integrator Nodes unlock tacit and explicit knowledge in multinational enterprises and share this knowledge across organisational boundaries. The pilot case study suggested issues to be investigated. The Singaporean based telecommunication companies confirmed that a range of functional and knowledge creation roles are dispersed among project proposal teams. Evidence of the existence of knowledge integrator nodes was again collected. Research issues such as what techniques or strategies are used by knowledge integrator nodes to trade information between network members and how relevant explicit knowledge is recorded and shared, need to be included in future research.

The research questions in the agribusiness study sought to identify the extent to which Australian domiciled firms operating in international markets use knowledge management their networks in international marketing. The research questions in the Singapore based telecommunications companies covered eight research issues of which the roles selected in project teams were reported here. Both studies can therefore be considered as being confirmatory case study designs. Furthermore, prior theory will be used to generate data collection protocols and to generate theory from 'all cases in one operation of the data analysis' (Perry & Coote 1994, p. 5)

In this research, core business networks were not sufficiently represented apart from references such as Davenport & Prusak 1995; Lorenzoni & Lipparini 1999; Blankenburg, Holm, Eriksson & Johanson 1999; Anderson, Hakansson, & Johanson 1994; Campbell & Wilson, 1995. Therefore, further research on key actors and their roles could definitely use core business network research. Also the role of intra-firm as

external network actors should be investigated in connection with the knowledge integrator node notion.

CONCLUSIONS AND IMPLICATIONS FOR BUSINESS PRACTICE

The implications for practical application of the concept of knowledge integrator nodes and their roles in industries where knowledge is a product are that the firm needs to:

- Identify the tacit and explicit knowledge that knowledge crews share within a firm and ensure that the knowledge of members in project teams or knowledge crews is integrated during the knowledge creation process.

- Establish whether knowledge integrator nodes have emerged. Analyse if boundary-spanning is an integral part of the management processes of effective knowledge integrator nodes and identify what are the techniques or strategies used by knowledge integrator nodes to trade information of value with external network members.

As in the grain trading case, mangers could establish how a market opportunity or relevant explicit knowledge can be recorded and shared within an internal or external network. Some companies building external networks may monitor the extent to which asymmetry and complementarity play a role in the selection of partners in a network. This could lead to an understanding about differences in knowledge or information asymmetry and complementarities of network members.

REFERENCES

Anderson, J.C., Hakansson, H. and Johanson, J. 1994, 'Dyadic business relationships within a business network context', *Journal of Marketing*, 58: 1-15.

Amit, R. and Schoemaker, P. 1993, 'Strategic assets and organisational rent', *Strategic Management Journal,* 4: 33-46.

Barney, J. 1991, 'Firm resources and sustained competitive advantage', *Journal of Management',* 17(1): 99-120.

Blankenburg-Holm, D., Eriksson, K. and Johanson, J. 1997, 'Business networks and cooperation in international business relationships', *Journal of International Business Studies*, 27 (5) (Special issue): 1033-53.

Barney & Ouchi 1986 cited in Cannon, J., Achrol, R. and Gundlach, G. 2000 Contracts, Norms, and Plural Form Governance', *Journal of the Academy of Marketing Science,* vol. 28, no. 2, pp. 180-194.

Brown L.R. and Erwee, R. 1999, 'Key actors in networked international firms', in M. Uncles, Patterson, and J. Cadeaux (eds.) *Marketing in the Third Millenium'*, proceedings of the Australia and New Zealand Marketing Academy Conference, University of New South Wales , Sydney 28th November – 1st December (proceedings on CD ROM).

Choo, W. C. 1998, '*The knowing organization- How organizations use information to construct meaning, create knowledge, and make decision*s' Oxford University Press, New York.

Craig, C.S. and S.P. Douglas, 1996, 'Developing strategies for global markets: an evolutionary perspective', *Columbia Journal of World Business*, 31; 70-81.

Davenport, T. H. and L. Prusak, 1998, '*Working knowledge – How organizations manage what they know',* Harvard Business School Press, Boston.

 Erwee, R and L. Brown, 2000 '*Knowledge management in Australian agribusiness with international networks*'. Poster presented at the International Council of Small Business Conference, Brisbane, 8 to 10 June.

Gilmore, A. and D. Carson, 1996, 'Integrative qualitative researching in a services context', *Market Intelligence and Planning,* 14(6) :21-26.

Grant, R. M. 1996, 'Towards a knowledge-based theory of the firm', *Strategic Management Journal*, Winter Special Issue, 17:109-122.

 Healy, M, 2000, '*Structures and processes of the international networks of Australian small business*', Ph D. thesis, University of Southern Queensland

Hoffman, N. P. 2000, 'An Examination of the 'Sustainable Competitive Advantage' Concept; Past, Present and Future.' Academy of marketing Science review [Online] 00 (04) Available: http://www.ams.review.org/amsrev/theory/hoffman00-04.html

Johanson, J. & J-E Vahlne, 1977, 'The internationalisation process of the firm – a model of knowledge development and increasing foreign market commitments', *Journal of International Business Studies*, 8 (Spring/Summer): 23-32.

Leonard-Barton, D. (1995) '*Wellsprings of knowledge: building and sustaining the sources of innovation*', Harvard Business School Press, Boston.

Liebowitz, J. 1998, 'Expert systems : An integral part of knowledge management', *Kybernetics,* 27 (2): 170-175.

Liesch, P.W. and G. Knight, 1999, Information internalisation and hurdle rates in small and medium enterprise internationalisation' *Journal of International Business Studies*, 30(2): 383-394.

Lorenzoni, G. and A. Lipparani, 1999, 'The leveraging of interfirm relationships as a distinctive organisational capability: a longitudinal study', *Strategic Management Journal* , 20: 317-338.

McCampbell A. S., L.M. Clare,. & S.H Gitters, S. H. 1999, 'Knowledge management : the new challenge for the 21st century', *Journal of Knowledge Management,* 3,(3):172-79.

Moorman, C., Zaltman, G. and Desphande, R. 1992, 'Relationships between providers and users of marketing research: the dynamics of trust within and between organisations', *Journal of Marketing Research*, 29: 314-329.

Morgan, R.M. and Hunt, S.D. 1994, 'The commitment-trust theory of relationship marketing', *Journal of Marketing',* 58(3): 20-38.

Nonaka, I. and Takeuchi, H. 1995, '*The knowing creating company – How Japanese companies create the dynamics of innovation*', Oxford University Press, New York.

Parkhe, A. 1993, 'Messy' research, methodological predispositions and theory development in international joint ventures', *Academy of Management Review,* 18(2): 227-268.

Pascarella, P. 1997, 'Harnessing knowledge', *Management Review,* 86(9): 4-6.

Perry,C. Reige, A. & Brown, L. 2000, 'Realism's role among scientific paradigms in marketing research', *Irish Marketing Review*, Volume 22, No. 2.

Perry, C. Alizadeh, Y. and Riege, A. 1997, 'Qualitaitive Methods in Entrepreneurship Research', proceedings of the Small Enterprise Association of Australia & New Zealand 1997 Annual Conference, Novatel Opal Cove Resort, Coffs Harbour, 21-24 September, 547-567.

Perry, C. and Coote, L. 1994, '*Processes of Case Study Research Methodology*: *Tool for Management Development*?' paper presented at the Australian and New Zealand Association ANZAM '94 Conference, December, Victoria University of Wellington, Wellington, New Zealand.

Perry, C. 1998, 'Processes of a case study methodology for postgraduate research in marketing', *European Journal of Marketing*, 32 (9/10): 785-802.

Poh, L-G. 2000a, 'Knowledge management/creation in Singapore-based telecommunications companies for proposal project when responding to customer's RFP', paper submitted for Unit 55800- Contemporary Issues in Business Management, Faculty of Business, University of Southern Queensland.

Poh, L-G 2000b 'Roles of project team members during the phases of developing the customer proposal ' Chapter 4, section 4.3.6 of DBA dissertation, Faculty of Business, University of Southern Queensland.

Sanchez, R. and Heene, A. (eds.) 1997, '*Strategic learning anf knowledge management'*, John Wiley, New York.

Slater, S. and Narver, J. 1995, 'Market orientation and the learning organisation', *Journal of Marketing*, 58: 63-74.

Stopford, J. M. and Wells, L. T. 1972, *Strategy and structure of the multinational enterprise*, New York, Basic Books.

Weidersheim-Paul, F., Ohlson, H. and Welsh, L.S. 1978, 'Pre-export activity: the first step in internationalisation', *Journal of International Business Studies*, 9(1): 47-58.

Wilstrom, S. and Norman, R. 1994, *'Knowledge and value: A new perspective on corporate transformation'*, Routledge, London, U.K.

Yin, R.K. 1994, *Case Study Research Design and Methods (Second Edition),* Sage Publications, Thousand Oaks.