

KNOWLEDGE EXCHANGE IN A REGIONAL NETWORK

Dr Peter Lake
Prof Ronel Erwee

ABSTRACT

This study explored the explicit knowledge in a regional business network and how members make tacit knowledge explicit. The one case at the regional level is made up of fourteen embedded cases. Twenty-four interviews were conducted among different categories of members in the HunterNet network. The main contribution to theory is that knowledge within HunterNet is primarily exchanged through informal conversation that includes the knowledge exchange processes of socialisation, externalisation, combination and internalisation. HunterNet members have an ability to understand engineering related explicit knowledge externalised by members in conversation. The HunterNet members thus build knowledge as individuals or a group, and build relationships and trust through the process of knowledge exchange inside and outside their organisations. Members have a learning intent, which is a prerequisite for learning and knowledge exchange.

INTRODUCTION

This study explores knowledge exchange in a formal business networking group in a regional industrial cluster in Australia. The HunterNet Cooperative is a ten year old industry group promoting member engineering businesses in the Hunter region of NSW, Australia. HunterNet members offer highly specialised and innovative engineering capabilities in information technology, mechanical and electrical engineering services, manufacturing, machining and electronics. Established and progressive member firms promise a commitment to quality certification and continued improvement with a focus on market and customer orientation through the sharing of information and resources.

Background

In the 1999-2000 year, Hunter manufacturing turned over almost \$6 billion, out of the \$74 billion NSW manufacturing base and the \$231 billion Australian manufacturing base. This figure is larger than manufacturing in Tasmania, Northern Territory and the Australian Capital Territory. Manufacturing turnover per capita was \$10,298 in the Hunter and \$12,065 for Australia and the Hunter produces some 36% of Australia's coal and 35% of Australia's aluminium (Hunter Valley Research Foundation 2002). Newcastle is the largest coal port in the world and the largest export port in Australia. HunterNet members have a combined turnover in excess of \$400 million and employ more than 2000 people. Collaborating with a competitor for mutual benefit did result in initial tensions, but time overcame these tensions. HunterNet members use trust and cooperation to match or better the efficiencies of a vertically integrated entity (HunterNet 2002). HunterNet members believe that HunterNet has benefited their businesses by increasing opportunities for individual work through increased awareness of capabilities, and through group tendering for projects (HunterNet 1999). The

Professor Ronel Erwee is the Director, Australian Graduate School of Business, University of Southern Queensland (erwee@usq.edu.au); Dr Peter Lake (PetLake@aol.com), currently an independent consultant based in Newcastle, Australia, has fulfilled all the requirements of the USQ DBA degree and the degree will be conferred at the graduation ceremony on 16 April 2005.

fact that HunterNet is still functioning after more than ten years, when so many networking groups have failed, indicate that HunterNet is a group worthy of research (HunterNet 2002). To maximise the benefit of a network, individual businesses need to align the network in their individual strategy and the network strategy needs to compliment the partners' strategies. The strategy must be implemented and be measured across the network by agreed measures (Buttery & Buttery 1994).

Burton-Jones (1999) uses the word 'hub' to describe a network with a dominant player, as well as equal non-dominant players. Individual members can offer the hubs creativity and unique customer service, both attributes containing large components of tacit knowledge. In networks of equals, trust, informality, redundancy, commitment and interdependency have been shown to be critical success factors. Trust is earned and collaboration is facilitated by informality between business participants at the personal and social level (Saint-Onge & Armstrong 2004). Too much knowledge exchange and domain overlap appears to facilitate the development of networks (Burton-Jones 1999). Equal commitment from participants aids the success of the network, as does mutual interdependency and an opportunity to continue to build relationships by demonstrating competence (Saint-Onge & Armstrong 2004). Whilst similar geographic location continues to be common in business networks, more sophisticated communication mediums have enabled networks to be spread over diverse locations (Burton-Jones 1999).

Networks offer ongoing frequent, flexible and open knowledge exchange, sometimes without the need for formal contracts. The problem solving nature of horizontal networks offers participants the opportunity to build tacit and explicit knowledge within the firm and tacit knowledge between cooperating firms, thus offering some protection from copying of competitive advantage or knowledge (Burton-Jones 1999).

The proportion of tacit and explicit knowledge in a relationship, and the ability of a firm to absorb, internalise and utilise knowledge, are major determinants in how replaceable is a partner in a relationship. If knowledge is explicit, diffusion to a partner is relatively easy provided the partner has the capability to absorb the knowledge. If there is a large proportion of tacit knowledge in a relationship, diffusion is much more difficult, even if a partner has the capability to internalise and utilise that knowledge. It may be much more difficult to replace the tacit knowledge of a partner, as tacit knowledge is rarely identical in new partners (Anon 2002).

Knowledge sharing communities (Botkin 1999; Saint-Onge & Armstrong 2004) can be within or across organisational boundaries. Informal groups tend to share knowledge, but groups are often purposely formed to share, build and use knowledge. The driving force for forming knowledge sharing communities is that no one person is capable of holding all knowledge in a particular domain in an increasingly complex world. Knowledge sharing communities operate across a domain or area of knowledge in which they practice and have a purpose for acting as a community. Examples of purpose may include more tangible reasons such as solving particular problems. Working within the knowledge domain towards the community's purpose results in members building relationships through demonstrated competence, discussion, problem solving, application and celebration of successful outcomes. Whilst membership can be mandated, relationships can only be facilitated because trust bonds the informal relationships that make up the knowledge sharing community. Realisation of intangible or tangible value promotes interaction through which relationship bonds are

strengthened. Promoting participation increases the chance of interaction and resultant knowledge sharing, knowledge building and knowledge application (Botkin 1999; Rylatt 2003; Saint-Onge & Armstrong 2004; Wenger et al. 2002).

At this stage a distinction needs to be made between communities of practice and informal knowledge networks. Communities of practice refer to a specific kind of community who is focused on a domain of knowledge, accumulate expertise in this domain, develop shared practice by interacting around problems, solutions and insights, and build a common store of knowledge (Wenger et al. 2002). Allee (2003) points out that members of a community of practice participate because they personally identify with the topic and enterprise of the community, are more like volunteer organizations and redefine itself in an emergent, organic way. She postulates that the focus in informal knowledge networks is on building or expanding relationships continuously, that such networks could have a short term existence with the aim to collect and share information, or they may develop a set of tools or conventions for knowledge dissemination. She states that networking does not make for a community of practice as communities require a 'sense of mission' based on their shared understanding, but does concede that 'communities of practice emerge in the social space between project teams and knowledge networks'. In this paper the focus is on knowledge exchange in a formal business networking group in a regional industrial cluster in Australia.

The authors postulate that the focus on the corporation by Abell and Oxbrow (2001) is relevant to a formalised network in a regional engineering cluster because of the shared interest participants have in engineering. The passion with which engineers discuss technical problems can be used to develop a shared solution to client needs and can be leveraged into honing business skills so that members can continue to be employed in their area of interest within the Hunter Region. That is, the common passion for the engineering sector and the Hunter Region motivates individuals to interact and builds relationships across a business network, namely, HunterNet. From the discussion in this section, the following research issue evolved, 'What knowledge is explicit in the network?' This leads to two questions in the interview protocol, namely, how the respondents encourage their staff to build and share knowledge inside, as well as outside, their organisations.

Converting tacit knowledge to explicit knowledge in networks

Poh (2001) observes that whilst many definitions of knowledge management emerge, the following summary can be accepted

'Knowledge management is the systematic process of finding, selecting, organising, distilling, and presenting information in a way that improves an employee's comprehension in a specific area of interest. Knowledge management helps an organisation to gain insight and understanding from its own experience. Specific knowledge management activities help focus the organisation on acquiring, storing, and utilising knowledge for such things as problem solving, dynamic learning, strategic planning, and decision making. It also protects intellectual assets from decay, adds to the firm's intelligence, and provides increased flexibility' (Poh 2001 p.17)

The authors postulate that in order to be applied to a network, this definition can be rewritten as: **Knowledge management in regard to networks involves cooperating across organisational boundaries to systematically find, select, organise, distil, present and**

share authorised information that meets the strategic and operational learning intent of all parties to a cooperation. The assumption in this definition is that all parties have in place strategic policies to protect unauthorised transfer of confidential information and those parties to the cooperation do not source unauthorised information, but do willingly share authorised information.

The knowledge creation process is a model developed by Nonaka and Takeuchi (1995) to explain knowledge creation using tacit and explicit knowledge (see also Poh 2001). There must be a constant attempt to ensure all four of the knowledge generation processes are used to maximise the learning experience. Conversation is one of the means for using the full knowledge exchange range of processes, namely socialisation, externalisation, combination and internalisation (Delahaye 2003). A conversation that is equal, positive and informal is a medium for knowledge exchange and knowledge building. Rational discourse involves active participation in a conversation, with each participant trying to put forward their point of view and understand the others point of view (Delahaye 2003; Von Krogh et al. 2000).

The authors postulate that in regard to HunterNet, Nonaka and Takeuchi's model (1995) does not adequately cover the constraints on actively sharing knowledge across organisational boundaries. That is, the model assumes that individuals are happy to share knowledge, whereas the reality in a network is that people have to trust each other, understand what is confidential and what is shared across boundaries, earn respect for each party's technical competence and actively search out knowledge termed in contexts that may or may not exist in their existing schemata. The limited interaction of network members and the constraints across organisational boundaries means that the socialisation phase of the model may not convey the difficulties and importance of relationship building across boundaries. Delahaye (2003) makes the point that knowledge is expanded when existing frames of reference and schemata are challenged. What Delahaye (2003) terms the 'positive transfer climate' in promoting informal learning in organisations needs to be extended to Nonaka and Takeuchi's model (1995) if knowledge is to be converted from tacit to explicit knowledge and back to tacit knowledge in networks.

An issue that was raised by interviewees during a pilot study was about how knowledge is protected in companies or in a network. A model by Burton-Jones (1999) was adapted for the research project in order to examine the importance of internal firm based and external market based knowledge protection strategies.

From the discussion in this section, the next research issue evolved, 'How did HunterNet manage to make tacit knowledge explicit?' The interview protocol, therefore, contained questions on how respondents learn from HunterNet, what type of knowledge protection strategies do they use, and which knowledge management applications and technologies they found useful for communicating across boundaries (Willcoxson 2003; see Table 1).

Table 1: The KM Spectrum: Knowledge management technologies and applications

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and creation
Knowledge Management Applications	Case based reasoning Help desk applications Customer service applications Order entry applications Service agent support applications	Data warehousing Data mining Business intelligence Management information systems Decision support systems Customer relationship management Competitive intelligence	Intellectual property management Document management Knowledge valuation Knowledge repositories Content management	TQM Benchmark Best practice Quality management Business process re-engineering Process improvements Lessons learned Methodology SENCMM ISO9XXX Six Sigma	Skills development Staff competencies Learning Teaching Training	Communities Collaboration Discussion forums Networking Virtual teams Research and development Multi-disciplined teams
Enabling Technologies	Expert systems Cognitive technologies Semantic networks Rule-based expert systems Probability networks Rule induction Decision trees Geospatial information systems	Intelligent agents Web crawlers Relational and object DBMS Neural computing Push technologies Data analysis and reporting tools	Document management tools Search engines Knowledge maps Library systems	Workflow management Process modelling tools	Computer based training Online training	GroupWare E-mail Chat rooms Video conferencing Search engines Voice mail Bulletin boards Push technologies Simulation technologies
Portals, Internet, Intranets, Extranets						

(Source: Willcoxson 2003)

METHOD

The critical realism paradigm is used in this study because the assumption is that reality is imperfectly understood. The reality of HunterNet is that it is a complex/dynamic business market with limited existing information. The exploratory nature of the research, the contemporary issue of networking, and the critical realism paradigm justify the choice of case study methodology (Yin 1994). Interviews and requests for documents are the primary means of collecting primary data for the case. The research question is termed in the how/why of exploratory research, there is no behavioural control and the issue of business networks is contemporary, so a case study methodology is justified. Purposive sampling is the method of selecting cases that are information rich and offer maximum variation across the HunterNet member classes. The domains to which the HunterNet study's findings can be generalised include engineering and manufacturing networking groups within a regional geographic boundary. A literature review was used to identify the final research issues and research problem and both of the pilot interviews were guided by prior theory. In this case study, cases are selected to establish literal replication where the aim is to predict similar results or

theoretical replication where contrasting results are for predictable reasons. Purposive sampling is used to select the most information rich cases in regard to the research framework and question.

HunterNet has four membership classes. Patron members are large businesses with a presence in the Hunter region that support the concept of HunterNet. Sponsor members are businesses in the Hunter who offer support and services to other member businesses. General members are small to medium sized businesses involved in the engineering manufacturing and services sector in the Hunter region. Associates are micro businesses that offer services and support to HunterNet. The membership classes participating in the embedded case studies are General Member and Patron. Revenue, rather than employee numbers, was used to determine the business size. Small businesses are defined as being turnover ranging from 1 to 10 million dollars, medium businesses as turnover ranging from 10 to 100 million dollars, and large businesses as turnover greater than 100 million dollars.

There is one case at the HunterNet level made up of fourteen embedded cases (see Table 2). Each embedded case is a HunterNet General Member or Patron (see Yin 1994). Guidance from the HunterNet executive officer as to member businesses who are information-rich case study participants helps the researchers reach the final decision based upon the overall research framework and question. Active participation in the network is assumed to be an indicator of information richness. Whilst longevity in the network does not on its own indicate success, it can be argued that longevity could be a further indicator of information richness due to the history surrounding membership and relationships. The greater number of embedded case studies from the membership class of General Member reflects the positioning of HunterNet as 'the competitive edge in engineering'. Willingness to cooperate is, of course, another factor in determining the embedded cases.

Table 2: Cross case analysis by size of business

Size of business	Small	Medium	Large
	C5 (Z,Y)	C3 (Z1,Z2)	C12 (Z,A)
	C8 (Z)	C4 (X)	C13 (Z)
	C9 (X)	C6 (X,Y)	C14 (Z1,Z2)
	C10 (Z,Y)	C7 (B,Y)	
	C11 (Z,Y)		
Totals	5 cases, 8 interviews	7 cases, 12 interviews	2 cases, 4 interviews

Legend: C= represents one case distinguished by a unique number
 A= represents one interview Projects Manager
 B= represents one interview Operations Manager
 X= represents one interview General Manager of the firm in a case
 Y= represents one interview with the Marketing Manager of the firm in a case
 Z= represents one interview with the Owner/Manager of the firm in a case

The interview protocol includes the size of the company in turnover, number of employees, core competences of the business and the ownership structure before going onto the questions under the headings of the research issues.

RESULTS

The first research issue, namely, 'What knowledge is explicit in the network?' leads to two questions in the interview protocol, that is, how do the respondents encourage their staff to build and share knowledge inside, as well as outside, their organisations.

Frequencies were calculated for each group of members and assigned to the appropriate column in tables. Data was grouped in terms of similarity and a number is then assigned to answers that enjoy a common pattern to facilitate further data reduction, as illustrated in the tables. Data reduction was then carried out by reducing data into statements that combined similar patterns. Frequencies in the data displays are used to identify patterns, not as quantitative analysis. Patterns or themes within a case are identified from interviews and cross checked from other sources such as prior theory, pamphlets, and company policies. Key informants reviewed the case study summary for accuracy.

How do you encourage your staff to build and share knowledge inside your organisation?

Table 3 illustrates responses given by interviewees regarding sharing and building knowledge inside their organisation. 'Encourage communication with each other to foster continuous improvement through knowledge sharing' was the most frequent response (75% to 92% of responses), followed closely by 'meetings such as tool box talks or information sessions' (63-100% of responses). There was a realisation by interviewees that 'knowledge in the organisation was tacit' and that much of that 'knowledge was gained from previous projects and employment'. 'People's skills, knowledge and experience as key assets' were a frequent response, as was the related assertion that 'attracting and retaining good managers encourage knowledge sharing'. 'Structured work procedures, formalised training and quality accreditation' were identified by interviewees as assisting in their understanding of their responsibilities. 'Technical and safety alerts' and 'good news sent by e-mail' was also noted as means of sharing and building knowledge.

Table 3: How do you encourage your staff to share and build knowledge inside your organisation?

Statement	Membership n=24		Size n=24			Ownership n =24	
	General n = 20	Patron n= 4	Small n = 8	Medium n = 12	Large n = 4	Owner n = 10	Non Owner n =14
Knowledge in organisation - tacit	70 %	0 %	63 %	75 %	0 %	80 %	43 %
Knowledge gained from previous projects and employment	60 %	100 %	63 %	58 %	100 %	60 %	71 %
Skills, knowledge and experience are key assets	45 %	100 %	38 %	50 %	100 %	50 %	57 %
Our knowledge is in our people -attract and retain good people	40 %	0 %	25 %	50 %	0 %	50 %	21 %
Managers encourage knowledge sharing and are knowledge facilitators	55 %	0 %	38 %	67 %	0 %	70 %	29 %
Encourage communication to foster continuous improvement through knowledge sharing	90 %	75 %	88 %	92 %	75 %	90 %	86 %
Meetings such as tool box talks or information sessions about projects, quality and occupational health and safety	80 %	100 %	63 %	92 %	100 %	90 %	79 %
Technical alert, safety alert, good new stories sent by e-mail	25 %	50 %	38 %	17 %	50 %	30 %	29 %
Understand responsibilities, make decisions and perform	60 %	0 %	63 %	58 %	0 %	60 %	43 %
Structured work procedures, formalised training, quality accreditation	60 %	100 %	63 %	58 %	100 %	60 %	71 %

The assertion that ‘knowledge in the organisation was tacit’ was emphasised by General Members, medium businesses and owners. Patrons and large businesses highlighted ‘knowledge gained from previous projects and employment’. The ‘core competencies of people’ were stressed as important to a greater extent by Patrons and large businesses. The importance of ‘attracting and retaining good people’ was selected more frequently by General Members, medium businesses and owners. ‘Knowledge sharing’ was chosen by a higher proportion of medium businesses and owners. Encouraging communication to foster continuous improvement was a more frequent response by General Members, small and medium businesses. Work related meetings such as ‘tool box’ talks were given greater emphasis by Patrons, large and medium business, and owners.

How do you encourage your staff to build and share knowledge outside your organisation?

Table 4 illustrates responses to building and sharing knowledge outside the organisation, the most frequent response (67 to 100 percent) being ‘encouraging people to match their competencies to the market’. The next most popular item (38 to 100 percent) was ‘through deliverables such as reports’ with the statements ‘encourage formal education’ (20 to 100 percent) and ‘knowledge is network and relationship based’ (50 to 80 percent) almost as popular. Respondents tried to ‘gravitate towards people who value their input’, but acknowledged that ‘clients have to trust them before they ask for their input’. Interviewees also mentioned that the culture of the company encourages knowledge sharing.

When differences between responses are viewed across categories, trends begin to emerge, as illustrated in Table 4. The ‘culture of the company encouraging knowledge sharing’ was emphasised by General Members when compared to Patrons, medium size businesses when compared to small and, in turn, large businesses, and owners when compared to non-owners. ‘Knowledge sharing being network and relationship based’ had a greater response frequency by General Members than Patrons, more by small and medium business respondents than large business, and more by owners than non-owners. ‘Gravitating towards people who value our input’ was selected to a greater degree by General Members compared to Patrons, selected to a greater degree by small businesses than medium and large businesses, and owners than non-owners. ‘Encouraging people to match their competencies to the market’ had a higher frequency by Patrons when compared to General Members, as well as large businesses when compared to medium and small businesses. ‘Deliverable’s such as reports’ had a higher response frequency by Patrons when compared to General Members, large and medium businesses when compared to small businesses and non-owners when compared to owners. The ‘encouragement of formal education’ was selected by Patrons more than General Members, large business more than medium businesses and small businesses, and non-owners more than owners.

The next research issue (How did HunterNet manage to make tacit knowledge explicit?) refers to questions in the interview protocol on: (a) how respondents learn from Hunternet; (b) what type of knowledge protection strategies do they use; and (c) which knowledge management applications and technologies they found useful for communicating across boundaries.

How do you go about learning from HunterNet, including from members?

It should be noted at the outset that Table 5 has the highest percentage of interviewee generated responses across all categories on all items. Interviewees learn from the network in a number of ways, the dominant mode being 'networking at meetings through participation'. 'Discussions about specific or common problems' and 'learning based upon relationships' were also popular responses. 'Taking the time to talk to people about issues', 'having an open mind', and 'involve themselves outside meetings' rated nearly as highly. Other responses with a high frequency included 'share information to gain recognition as a contributor' and 'the executive officer and active participants are knowledge sources within the group'. Attendance at some of the courses was emphasised the least (21 to 50 percent).

Knowledge protection strategies

Table 6, derived from the model by Burton-Jones (1999), displays the most important frequency across all three categories of most important, neutral and less important. It should be noted that all interviewees placed a great deal of importance upon internal firm-based protection strategies, whilst only large business and Patrons placed great emphasis upon the full range of external market-based protection.

Examining the interviewee responses in the categories of membership, size of company, and ownership identifies the emergence of certain trends. In regard to an indication of more important in internal protection of firm knowledge, 'knowledge tacitness', and 'firm specificity of knowledge' were in the highest frequency category (83 to 100 percent). 'Knowledge complexity' and 'knowledge embedding' were the next most popular items (71 to 100 percent). 'Organisational job design' and 'incentives for knowledge workers' were the least popular response category (50 to 100 percent).

'Copyrights', 'legal contracts', 'industry concentration' and 'time to imitate' had the highest frequency (30 to 100 percent). 'Patents', 'trade secrets' and 'time to market' had a frequency response range of 30 to 75 percent. Large businesses and Patrons gave all seven examples of external market based protection at 75 percent or greater, as did owners for the examples 'industry concentration' and 'time to market'. These responses contrasted with General Members, medium and small businesses and non-owners, which had all responses below 75 percent frequency.

Table 4: How do you encourage your staff to build and share knowledge outside your organisation?

Statement	Membership n=24		Size n=24			Ownership n =24	
	General n = 20	Patron n= 4	Small n = 8	Medium n = 12	Large n = 4	Owner n = 10	Non Owner n =14
Company culture encourages knowledge sharing	50 %	0 %	38 %	58 %	0 %	50 %	36 %
Network and relationship based	75 %	50 %	75 %	75 %	50 %	80 %	64 %
We gravitate towards people who work with us and value our input	55 %	0 %	63 %	50 %	0 %	60 %	36 %
We encourage people to look outward and understand their market	70 %	100 %	75 %	67 %	100 %	80 %	71 %
Deliverables - reports, specifications, tender proposals, site visits, trade nights, industry expositions, and solving problems for clients	70 %	100 %	38 %	92 %	100 %	60 %	86 %
Encourage formal education	45 %	100 %	25 %	58 %	100 %	20 %	79 %

Table 5: How do you go about learning from HunterNet, including members?

Statement	Membership n=24		Size n=24			Ownership n =24	
	General n = 20	Patron n= 4	Small n =8	Medium n = 12	Large n = 4	Owner n = 10	Non Owner n =14
Learning is an important part of membership	80 %	50 %	100 %	67 %	50 %	90 %	64 %
Networking within the network at meetings through participation	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Take the time to talk to people about issues	85 %	75 %	75 %	92 %	75 %	90 %	79 %
Discussions about specific or common problems from which all learn	95 %	100 %	88 %	100 %	100 %	100 %	93 %
Always have an open mind and listen during meetings or discussions	80 %	75 %	88 %	75 %	75 %	90 %	71 %
Involve yourself outside the meeting structure through committees	80 %	25 %	75 %	83 %	25 %	90 %	57 %
Phone people if you have a question	90 %	50 %	100 %	83 %	50 %	100 %	71 %
Executive officer and active participants are knowledge sources	75 %	100 %	75 %	75 %	100 %	80 %	79 %
Learning is based upon the relationship you build with others	90 %	75 %	100 %	83 %	75 %	100 %	79 %
Share information so others recognise you as a contributor- thus exchanging knowledge about common issues	80 %	100 %	75 %	83 %	100 %	90 %	79 %
We attend some of the courses which are tailored to members needs	40 %	0 %	38 %	42 %	0 %	50 %	21 %

Table 6: Knowledge Protection

<i>Internal Protection — Firm based</i>	General Member n=20	Patron n=4	Small Business n=8	Medium Business n=12	Large Business n=4	Owner n=10	Non Owner n=14
Knowledge tacitness — difficult to codify and diffuse	95 %	100 %	100 %	92 %	100 %	100 %	93 %
Knowledge complexity	85 %	100 %	75 %	92 %	100 %	80 %	93 %
Firm specificity of knowledge	90 %	100 %	100 %	83 %	100 %	90 %	93 %
Knowledge embedding — routines, directives, processes, products	80 %	100 %	75 %	83 %	100 %	100 %	71 %
Organisational job design	75 %	100 %	88 %	67 %	100 %	80 %	79 %
Incentives for knowledge workers	60 %	100 %	75 %	50 %	100 %	70 %	64 %
<i>External protection — market based</i>							
Patents	35 %	75 %	50 %	25 %	75 %	30 %	50 %
Copyrights	35 %	100 %	38 %	33 %	100 %	30 %	57 %
Trade secrets	60 %	75 %	63 %	58 %	75 %	50 %	71 %
Legal contracts with suppliers/collaborators	55 %	100 %	38 %	67 %	100 %	60 %	64 %
Industry concentration	60 %	100 %	50 %	67 %	100 %	80 %	57 %
Time to market	65 %	75 %	63 %	67 %	75 %	80 %	57 %
Time and cost to imitate/replicate	55 %	100 %	63 %	50 %	100 %	60 %	64 %

(adapted for this research from Burton-Jones 1999).

The knowledge management spectrum

Interviewees were asked to indicate on a table which knowledge management applications and technologies they found useful for communicating across boundaries. There was a response tendency for participants to be overwhelmed by the vast amount of information. However, large business members and Patrons were not overwhelmed to the same extent as other categories.

Table 2 is used as a basis for this discussion. In regard to knowledge management applications, 'innovation/creation', 'developmental' and 'process' applications were the most frequent responses (83 to 100 percent) whilst 'analytical' applications had a response of 50 to 100 percent. 'Transactional' and 'asset management' applications were the least popular responses (38 to 75 percent). In regard to enabling technologies, 'innovation/creation' technologies had the most frequent response (75 to 92 percent), whilst 'process technologies' had a response of 50 to 80 percent. 'Asset management' and 'developmental' technologies were in the next most popular category (38 to 75 percent) and 'transactional technologies' had a response of 25 to 75 percent. 'Analytical technologies' had the least popular response (13 to 25 percent). It should be noted that responses for knowledge management applications were generally greater in quantum than enabling technologies.

When difference of responses is viewed across categories, trends begin to emerge. In regard to knowledge management applications, 'transactional applications' were emphasised to a greater extent by Patrons, large businesses and non-owners. A higher frequency of Patrons and large businesses selected 'analytical applications'. 'Asset management applications' were selected to a greater extent by Patrons, medium and large businesses. It should be noted that there was no significant difference in responses across membership, size or ownership categories for 'innovation and creation', 'developmental' and 'process' applications.

When the respondents from the three categories of membership, size and ownership were asked to indicate enabling technologies used for knowledge management, a higher frequency of Patrons and large businesses than General Members, small and medium businesses selected 'transactional technologies'. Patrons and large businesses selected 'Asset management technologies' by a higher frequency. 'Process technologies' were highlighted to a greater extent by large and medium businesses, and owners. Developmental technologies were emphasised to a greater extent by Patrons and large businesses. 'Innovation and creation technologies' were selected more frequently by General Members and medium businesses. It should be noted that there was no significant difference across membership, size and ownership categories for analytical technologies.

DISCUSSION

HunterNet members clearly indicate an intention to learn and this is a key driver of membership—this finding is consistent with a number of authors (see Bergquist et al. 1995; Child & Faulkner 1998; Doz & Hamel 1998; Kaye & Hogan 1999; Hakansson & Sharma 1996). The intention to learn thus sets positive conditions for mutually beneficial relationships as learning is a benefit all members can enjoy.

Building and sharing knowledge inside the organisation

Learning within HunterNet emerges as a structured formal approach through training on a needs basis, and informal relationship-based discussions of issues, problems, and capabilities amongst members. Both the informal and formal approaches within HunterNet are used for

identifying or rectifying current or future knowledge gaps (see Burton-Jones 1999; Delahaye 2003). HunterNet members indicate interaction and relationship building as the means of acquiring and disseminating knowledge, thus enabling discussion amongst peers leading to wider and more diverse sources of knowledge (see Child & Faulkner 1998; Doz & Hamel 1998; Jarillo 1993). Knowledge exchanged within HunterNet occurs across a range of relationships—dependent upon the strength of the relationship—with reciprocity enabling greater access to knowledge and a strengthening of the relationship because of demonstrated competence (Child & Faulkner 1998).

The results indicate that tacit and explicit knowledge balance out a knowledge source. The authors proposed that individuals with an interest in engineering impacts upon knowledge within the network. Explicit knowledge within HunterNet is present in electronic and paper form, but the main form of explicit knowledge across the membership is tacit knowledge externalised for a discrete time during verbal communications. The object based nature (Poh 2001) of technical specifications, drawings and written communications within HunterNet are explicit knowledge that corporate members can easily store and access in their knowledge management systems (see Burton-Jones 1999). However, as individuals hold conversations, it is the individual HunterNet members who have the ability to access and store explicit knowledge through participation, rather than the corporations they represent. The verbalised knowledge can be regarded as explicit because of the shared domain of engineering held by members (see Abell & Oxbrow 2001; Botkin 1999; Delahaye 2003; Rylatt 2003; Saint-Onge & Armstrong 2004; Wenger et al. 2002). It follows that if individuals do not participate within HunterNet, the corporation they represent will miss much of the explicit knowledge available to members.

Building and sharing knowledge outside the organisation

The authors hypothesised that in regard to a formal networking group in a regional industrial cluster, Nonaka and Takeuchi's model (1995) does not adequately cover the constraints on actively sharing knowledge across organisational boundaries. Tacit knowledge conversion into explicit knowledge occurs through telephone calls and formal or informal meetings. Trust, relationships, continued interaction, and the bounds of confidentiality strengthen socialisation across boundaries. The mutual benefit from knowledge exchange in non-confidential business support areas allows socialisation and discussion across boundaries where relationships may not be as strong. The processes of combination and internalisation suggest knowledge exchange by rational discourse (see Delahaye 2003; Rylatt 2003; Von Krogh et al. 2000). The socialisation process relies upon observation, as well as listening (see Delahaye 2003), so the participation by members in informal conversation through problem solving, site visits and meetings facilitates the interaction necessary for socialisation.

Making tacit knowledge explicit

During telephone or face-to-face meetings common issues and problems are discussed amongst equals. The discussion may involve two 'equals' discussing a problem or a 'mentor' offering a 'new member' advice (see Burton-Jones 1999; Child & Faulkner 1998; Poh 2001). The diversity of skills and experience across HunterNet means that the roles of 'mentor', 'new member or student', and 'equals' may be interchangeable. This diversity of skills and experience mentioned above means that the codification and diffusibility of knowledge (Koulopoulos & Frappaolo 1999) depends upon the experience and knowledge of the participants, so explicit and tacit knowledge is dynamic within the relationships inside HunterNet.

HunterNet members indicated that explicit knowledge is exchanged physically or electronically (see Poh 2001) for the purpose of winning work, legislative requirements, process improvement, and finding out about others' capabilities. Explicit knowledge management applications and technologies (see Willcoxson 2003) used by members are primarily process, developmental, innovation and creation centred. However, there is a large component of know-how involved in gaining the most effective use of these applications and technologies, thus tacit knowledge is a key component to the effectiveness of these tools (see Wenger et al. 2002).

The authors postulated that in order to be applied to a network, the knowledge management definition needs to be rewritten. The results of this research support the rewritten definition. Confirmation of this postulation acknowledges that no individual company or person possesses all knowledge necessary in a complex dynamic environment, and that the social aspect of knowledge is not limited to individual companies (Botkin 1999; Delahaye 2003). The focus of HunterNet members upon problem solving through a learning intent confirms the community aspect of knowledge sharing (see also Saint-Onge & Armstrong 2004; Wenger et al. 2002).

Knowledge protection strategies

HunterNet members primarily rely on internal knowledge protection in terms of the Burton-Jones (1999) model. The HunterNet members recognise that staff hold knowledge vital to the competitive advantage of the business; that the market influences the value of knowledge to a business; that deliverables to clients demonstrate competencies which influence repeat business. It can thus be argued that whilst the large component of knowledge held by employees is a potential threat to the business if employees leave, it may also prove a benefit in cooperative strategies that HunterNet members employ—an argument consistent with Burton-Jones (1999), Child and Faulkner (1998), Doz and Hamel (1998), Koulopoulos and Frappaolo (1999). It could be thus argued that a factor in the relative longevity of HunterNet is members' constant search for knowledge within the network, resulting in continuous improvement and relationship sunk costs reducing any risk associated with knowledge exchange.

The authors' proposition that in HunterNet sharing explicit knowledge among members is important was confirmed by the results of this study. Members highlight the importance of explicit knowledge (see Poh 2001) expressed as understanding other members' capabilities, their tender proposals and through observation in site visits or industry expositions. The constant reference by members to discussions focused upon problem-solving is indicative of the importance of explicit knowledge and trust built through the processes of knowledge exchange (Botkin 1999; Delahaye 2003). That is, the combined knowledge of members is increased through participating in the knowledge sharing process, and the strengthened relationships and trust built through interaction in the knowledge process increases the chance of continued community and individual benefits.

REFERENCES

- Abell, A & Oxbrow, N 2001, *Competing with Knowledge: The information professional in the knowledge management age*, Library Association Publishing, London.
- Allee, V 2000, 'Knowledge networks and communities of practice', *OD Practitioner: Journal of the Organisation Development Network*, vol 32(4).
- Anon 2, 2002, 'Learning and knowledge development in strategic networks: a conceptual approach', IMP Asia, Paper No 40, sourced from Professor Ronel Erwee, University of Southern Queensland, Toowoomba.
- Bergquist, W, Betwee, J & Meuel, D 1995, *Building Strategic Relationships: how to extend your organisation's reach through partnerships, alliances, and joint ventures*, Jossey-Bass Publishers, San Francisco.
- Botkin, JW 1999, *Smart Business: How knowledge communities can revolutionise your company*, The Free Press, New York.
- Burton-Jones, A 1999, *Knowledge Capitalism: Business work and learning in the new economy*, Oxford University Press, Oxford.
- Buttery, A & Buttery, E 1994, *Business Networks*, Longman Business & Professional, Melbourne,
- Child, J & Faulkner, D 1998, *Strategies of cooperation: Managing alliances, networks, and joint ventures*, Oxford University Press, Oxford.
- Delahaye, BL 2003, 'Human resource development and the management of knowledge capital', in *Human resource management: challenges and future directions*, B Millett & R Wiesner (eds.), John Wiley & Sons, Australia.
- Doz, YL & Hamel, G 1998, *Alliance Advantage: the art of creating value through partnering*, Harvard Business School Press, Boston, Massachusetts.
- Hakansson, H & Sharma, DD 1996, 'Strategic alliances in a network perspective', in *Networks in marketing*, Dawn Iacobucci (ed.), Sage Publications, London.
- HunterNet, 2002, 'The First Ten Years', HunterNet, Newcastle, Australia, HunterNet website 2002, <www.hunternet.com.au>.
- Hunter Valley Research Foundation 2003, website <www.hvrf.com.au>.
- Jarillo, JC 1993, *Strategic networks: creating the borderless organisation*, Butterworth-Heinemann, Oxford.
- Kaye, B & Hogan, J 1999, 'Improve teamwork', *Executive Excellence*, June, vol. 16, issue 6, p. 7.

Koulopoulos, TM & Frappaolo, C 1999, *Smart things to know about knowledge management*, Capstone USA, Milford, Connecticut.

Nonaka, I & Takeuchi, H 1995, *The Knowledge creating company—how Japanese companies create the dynamics of innovation*, Oxford University Press, New York.

Poh, LG 2001, *Knowledge management and creation of project teams for developing customer proposals when responding to customer's RFP (Request for Proposal); in Singapore-based telecommunications companies*, unpublished DBA dissertation, University of Southern Queensland, Australia.

Rylatt, A 2003, *Winning the knowledge game: A smarter strategy for better business in Australia and New Zealand*, McGraw Professional, Sydney.

Saint-Onge, H & Armstrong, C 2004, *The Conducive Organisation: Building beyond sustainability*, Elsevier Butterworth-Heinemann, Burlington, MA.

Von Krogh, G, Ichijo, K & Nonaka, I 2000, *Enabling Knowledge Creation: How to unlock the mystery of tacit knowledge and release the power of innovation*, Oxford University Press, New York.

Wenger, E, McDermott, R & Snyder, WM 2002, *Cultivating Communities of Practice: A guide to managing knowledge*, Harvard Business School Press, Boston.

Willcoxson, L 2003, 'Creating the HRM context for knowledge management', in *Human resource management: challenges and future directions*, B Millett & R Wiesner (eds.), John Wiley & Sons, Australia.

Yin, RK 1994, *Case Study Research: Design and Methods*, Sage Publications, London.