Knowledge transfer, exchange and integration in an SME industry network

Professor Denise Jarratt
Centre for Research in Complex Systems
Faculty of Business
Charles Sturt University
Bathurst, NSW, 2795, Australia
Ph: #61 2 63 384 293 Fax: #61 2 63 384 769
Email: djarratt@csu.edu.au

Dr Glen Duncan
School of Marketing and Management
Charles Sturt University
Bathurst, NSW, 2795, Australia
Ph: #61 2 63 384 780 Fax: #61 2 63 384 769
Email: glduncan@csu.edu.au

Word count: 6898 (without references or Appendix)

Track: Knowledge and Learning

*The authors acknowledge the research assistance of James Thompson
Knowledge transfer, exchange and integration in an SME industry network

Summary

Through adopting a combined ethnographic and case study methodology, our research examined the processes and influencers of knowledge interactions. Our research context was a regional, industry network which comprised direct and indirect competitors, and aligned and supporting organisations.

An embedded unit of CEO’s exchanged and integrated knowledge of all types. It was anticipated that competitors would be reluctant to collaborate due to the fear of losing customers or the risk of improving a competitor’s operations. This mindset certainly existed when the business network first formed. However, personal bonds developed as the core group came together through formal and informal structures, and as they recognised values in, and common challenges experienced by, others with whom they could closely relate. Trust was important but insufficient to support knowledge integration in this core group. A collectivist approach was required to build inter-organisational collaboration at multiple levels, providing a platform for knowledge integration.
Knowledge transfer, exchange and integration in an SME industry network

Introduction

Industry based networks are negotiated in an ongoing process of communication and are not necessarily dependent upon market or formal structural control mechanisms (Hardy, Phillips and Lawrence 2003). Such networks exhibit relational as opposed to transactional ties, and generally do not incorporate an overarching interlocking directorate (Heracleous and Murray 2001; Mizruchi 1996). Havila and Salmi (2000) argue that dyads (connection between two members) are "generators, recipients and transmitters of change in networks" (p. 106). Spanning each dyad, connections may be formed at multiple levels, from interaction at board/CEO level, to business unit and functional ties, or through jointly established new venture teams. These connection layers build embeddedness and facilitate knowledge integration. The primary advantage that networks have over market forms is the extent of access to new knowledge (Grant and Baden-Fuller 2004).

Simultaneous cooperative and competitive behaviour between organizations (coopetition) has been studied between organizational units, and also between organizations seeking to achieve, simultaneously, individual organisational goals and the collective growth goals of a business network (Tsai 2001; Hackney, Desousa and Irini 2008). However, most network research has focussed on cases that address structural and knowledge sharing properties between medium and large organizations, which exhibit complementarity in resources, and hence cooperative behaviour (Halinen and Moller 1999; Nassimbeni 1998). Many SME industry clusters/networks exhibit coopetition (concurrent cooperation and competition), as networks are formed between organizations with complementary and as well as analogous resources, collectively seeking to advance regional performance and competitiveness, and in doing so, enhance their own organisation’s performance. How the tension between achieving ‘self’ and ‘network’ goals in a cooperative yet, at the same time, competitive environment shapes network structural properties and knowledge sharing activities, warrants further investigation.

Knowledge transfer (i.e. acquiring and using knowledge from a network), or knowledge exchange (i.e. the exchange of knowledge between network actors to establish new platforms for operational synergy) and knowledge integration (i.e. the collaborative pooling of knowledge to address new challenges) provides a platform to stimulate cooperation, efficiency, effectiveness and innovation (Kogut and Zander 1992; Tsai 2001; Jarratt 2006). Importantly, both formal and informal coordinating mechanisms are required to foster knowledge transfer, exchange and integration. Formal mechanisms are reflected in processes, performance management goals and policies that stimulate and support knowledge interaction, while informal mechanisms such as social exchanges can generate trust, a key phenomenon underpinning collaborative and cooperative behaviours (Morgan and Hunt 1994; Johnson, Anderson and Fornell, 1995; Gulati and Singh 1998; Gulati and Garguilo 1999; Van Montfort, Masurel and Van Rijn, 2000). While coordinating mechanisms and social interaction facilitate knowledge exchange and provide a platform for knowledge integration, key aspects associated with regional industry networks, such as network members vying for the same local contracts, seeking to outperform each other, competing for scarce, local resources and building opposing competitive market positions, are anticipated to impact negatively on knowledge exchange and integration activities. Interestingly, Tsai (2001) concluded from his study on intra-organisational units that: “the structure of social interaction and the structure of competition jointly determine an organization's ability to transfer knowledge internally,” and “external market competition rather than internal
Knowledge transfer, exchange and integration in an SME industry network

resource competition influences interunit knowledge sharing, suggesting that organizational units are more interested in getting knowledge from other units with whom they compete in the marketplace than from units with whom they compete for internal resources” (p. 188).

Our research examines these mechanisms, and the process and influencers of knowledge interactions within a regional, industry network structure which comprises direct competitors, indirect competitors, aligned organisations and supporting organisations. We are particularly interested to learn more about knowledge transfer, exchange and integration in such an environment. The questions guiding our research are:

1. What are the structures and inter-relationships that define the SME industry network and how have these emerged?
2. How can network embeddedness (i.e. the depth of interconnectedness between members) be conceptualised?
3. How do structure, social capital and trust influence network knowledge transfer, exchange and integration?

Literature Review

Organisations are increasingly seeking to extend the economic value they can create through strategically determined partnerships that form their core business network. This change in operational focus has encouraged a steady interest by academics in knowledge sharing in the context of alliances and networks (Kogut 1988; Crossan and Inkpen 1994; Cravens, Piercy and Shipp 1996; Nassimbeni 1998; Van Montfort, Masurel and Van Rijn, 2000). It has been established that intra-organisational learning is facilitated by structures that encourage interaction between all organisational members irrespective of their status or expertise (Hedlund 1994). Many have investigated the competitive advantage and outcomes of networks and their member organizations (Dyer and Nobeoka, 2000; Gupta and Govindarajan, 2000; Dyer and Hatch, 2004), with some describing performance as dependent on the ability of the network to leverage the knowledge and other wealth creating potential that resides in its network of stakeholder relationships (Sawhney and Zabin 2002; Dyer and Hatch 2004). As organisations are moving towards network forms, the structuring of those networks becomes a critical dimension affecting learning, innovation, network performance and firm performance.

The intersection of structure and knowledge

Seminal research by both Coleman (1988) and Burt (1992) addressing connectivity and structural holes (connection gaps between network members who provide overlapping information) has provided a foundation for understanding network properties such as power locus, dependency, control, information exchange, commitment and trust between network partners. Coleman (1988) described the mutual interconnectedness between network members as network closure, and important for network norms and sanctions to be put in place. On the other hand, Burt (1992) proposed that a firm can maximise its non-redundant information by uncoupling network linkages to create structural holes. For example, if firms A and B are connected, then, firm C need only connect to A or B to access the same information (Borgatti and Foster 2003). Although Dyer and Noeboka (2000) identified a successful knowledge sharing network as one with few structural holes, the number of structural holes in a network has been posited to influence network performance, especially if the purpose of the network is to innovate (Soda, Usai and Zaheer 2004).
Knowledge transfer, exchange and integration in an SME industry network

Case research has suggested the importance of structure in facilitating knowledge exchange, innovation and network performance (Dyer and Noeboka 2000). However even through structural dimensions are critical to facilitating interaction and knowledge exchanges, popular network classification schemas have been based on the purpose served by the network, or macro-structural dimensions, and thus provide little guidance for managers on how a network should be structured to facilitate knowledge interactions critical to achieving objectives, and thus maximize an organisation’s and/or the network’s desired performance outcomes (Achrol and Kotler 1999; Nassimbeni 1998; Cravens, Piercy and Shipp 1996).

Three types of knowledge objectives that might be present independently or collectively in network member firms are transfer, exchange and integration (Jarratt 2006). Organisations can join networks to learn about best practice (for example, trade associations), with network knowledge being used by these firm to advance the performance of their company. In these networks there is no ‘rule’ or norm requiring reciprocal knowledge sharing with other network members, nor punitive measures for withholding intellectual property. Baum and Ingram (1998), Kotabe, Martin and Domoto (2003) and Inkpen and Tsang (2005) all speak of the benefits accessing and using knowledge acquired from networks or network members i.e knowledge transfer. Organisations seek productivity and performance outcomes as a consequence of knowledge transfer, however, addition to learning from other network members, an exchange of ideas (knowledge exchange) can lead to new options for enhanced productivity or other operational outcomes for all members individually to draw upon. Knowledge integration, the third knowledge objective, exists where organisations work collaboratively and pool expertise to innovate/or address emerging opportunities or challenges. IBM’s network pre 1991 was one of exploitation, building its network around embedded ties with equity partner organizations and adopting a strategic emphasis of leveraging the IT hardware knowledge of the network. With increasing emphasis by major competitors on solutions rather that hardware, IBM required a strategic change within its network configuration to build solution innovation. In stage 1 of IBM’s exploration strategy, increasing emphasis was placed on network relationships with new, non-equity partners that were flexible and therefore easy to exit once a particular joint research agreement was completed. In stage 2 of the exploration strategy there was “increased complexity in the network configuration” (Dittrich, Duysters and de-Man 2004p. 16), with embedded, closed sub-networks facilitating the development of new capabilities in telecommunications and browser software. During stage 3, the number of embedded sub-networks decreased, indicating IBM’s absorbance of these market driving capabilities, and the need to build research agreements with new partners to stay at the cutting edge of developments.

Table 1 (developed from Jarratt 2006) offers a network taxonomy that de-emphasises network purpose and direction (Achrol and Kotler 1999; Nassimbeni 1998; Cravens, Piercy and Shipp 1996) and focuses on the basic dimensions of structure and knowledge objectives that define and bound behaviour and performance. The schema reveals the strategic potential and limitations of each network category and identifies that restructuring and building embedded ties is required to achieve additional strategic imperatives. An interesting example of knowledge transfer and exchange is the Toyota network (Dyer and Noeboka 2000). Initially, knowledge transfer increased production and technology advances in Toyota’s supplier. However, following achievement of productivity efficiencies, knowledge exchange between all members was required to ensure the network continued to operate at global best practice. Structural changes to the network were required to achieve this second network imperative.
For new knowledge to be created, the structural aspects of learning must be present (Garvin 1993; Slater and Narver 1995; Kasper 2002). Within organisations, innovation has been shown to thrive, exhibiting heterarchial as opposed to hierarchical forms (Hedlund 1994). However, innovation is also exhibited though hierarchical forms that incorporate flexible structures (Takeuchi and Nonaka 1986). Within organisations, lateral integration mechanisms and established relationships facilitate the development of new knowledge (Gupta and Govindarajan 2000; Hansen 2002). However, as Hansen (2002 p232) points out “these lines of research on linkages have, however, not incorporated opportunities for knowledge sharing based on commonality in knowledge content among subunits, but has taken this aspect as given”.

The network which is the focus of this current project exhibits an embedded unit that contains members exhibiting commonality in their knowledge base and others that have specialised linked knowledge. The members are laterally related, with some having previously established interpersonal relationships. Embeddedness is often employed in the academic literature, but rarely explained. Anderson, Hakansson and Johanson (1994) speak of connectedness (a dimension of embeddedness) as a) delivering identity benefits beyond those specified, b) transportability of knowledge and solutions, c) complementarity leading to scale effects d) indirect links to knowledge residing in partner institution’s partners and e) preparedness to solve problems cooperatively.

**Trust as a facilitator of knowledge exchange and integration**

A business network has been defined as "a set of actors connected by a set of ties" (Borgatti and Foster 2003 p.992) characterised by "repetitive exchanges among semi autonomous organisations that rely on trust and embedded social relationships to protect transactions and reduce their costs" (p. 995). Trust is embedded in that definition as a facilitator of knowledge exchange and integration (Marshall, Nguyen and Bryant 2005).

In their seminal research on trust and commitment, Morgan and Hunt (1994, p. 23) explained trust in a business-to-business context as a steady state of “confidence in an exchange partner’s reliability and integrity.”. However, new executive appointments, changes in relationship managers, and/or poor relationship performance are likely to negatively affect communication, benevolence and relationship benefits, creating distrust. Trust as a dynamic state is captured by Kramer, who stated “interactional histories become a basis for initially calibrating and then updating trust-related expectations” (Kramer, 1999, p. 576).

Shared membership of a business network will normally result in regular interactions, with opportunities to reinforce trust perceptions (Brewer, 1981). Where collaborative work is planned, potential network partners will be assessed on characteristics of ability, judgment, character, cooperativeness and perceived benevolence (Morgan and Hunt 1994; Mayer, Davis and Schoorman, 1995). As interactions in the early stage of the relationship development occur, trust of potential partners is reinforced as assessments about network partners’ trust characteristics of credibility and integrity are made (Kramer, 1999). A positive categorization reinforces cognitive trust, facilitating project collaborations.

Building on the work of Dyer and Nobeoka (2000), Marshall, Nguyen and Bryant’s (2005) findings revealed a cyclical model of trust and knowledge exchange. Calculative trust (such as a willingness to invest in joint resources), apparent at the formation stage fostered
Knowledge transfer, exchange and integration in an SME industry network

*technical* knowledge exchange, while dyadic relationships created additional trust dimensions (social capital, benevolence, mutual understanding and integrity) which fostered exchange of *systematic* and then *strategic* knowledge. It is anticipated that a network will reflect multiple stages of development in the network’s dyadic relationships, with exchanges of technical, systematic and strategic knowledge exchange all apparent.

**The role of social capital**

Network social capital, defined as ‘the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by a social unit’ (Gold, Malhotra, and Segars, 2001 p. 187), underpins network relationships (Coleman, 1988). Network social capital is portrayed in knowledge that is transferred, exchanged and integrated, which occurs where a) there is efficiency in process-driven knowledge storage, transformation and transfer, b) information is drawn from a broad range of sources and c) knowledge combination is approached with flexibility (Appleyard, 1996; Grant, 1996; Nonaka and Konno, 1998; Sawhney and Zabin, 2002). Others encourage the integration of dimensions of structure (network locus), relationship (trust) and a shared perspective in its definition (Li 2005: Nahapiet and Goshal 1998; Tsai and Goshal 1998)

Social capital emerges from changes in the relationships between individuals, facilitates action in network dyads (McFadyen and Cannella Jr. 2004; Reagans and McEvily 2003; Coleman, 1988) and integrates both physical and human capital (Nahapiet and Ghoshal 1998). Social capital holds the potential to generate new sources of value for future growth, and has been viewed as a strategic resource contributing to performance (Madhavan, Koka and Prescott 1998; Burt 1992). Learning is intrinsically social and collective, requiring structures and routines (patterns of interactions) that facilitate joint contributions to enhance understanding of complex problems and support broad communication of that understanding (Teece, Pisano and Shuen 1997). Thus, networks in which there are high levels of interconnectivity and social capital can draw on the network's intellectual capital, integrating knowledge to take advantage of emerging opportunities.

In an industrial district network structure, Inkpen and Tsang (2005) describe social capital structurally as dynamic, with members joining and exiting, and as having social, non-hierarchical ties. They recognise that goals in these network forms are neither shared nor necessarily compatible, and describe trust as personal and process based. Our research is focused around the dimensions of structure, knowledge, trust and social capital to understand how these dimensions are perceived by network members to have interacted over time.

**Research Method**

Consistent with Barley’s (1990, p.220) view that “all research comes from and remains caught in a tangled web of practice, personal and theoretical agendas,” and that “good ethnography is not simply taking copious, journalistic notes on one’s chumming with the natives”, in an initial ethnographic phase we established ‘quasi’ network membership, and credibility, integrity and benevolence with network members to observe interactions and avoid impacting on those interactions. At this stage of the research there were no closely formulated hypotheses, and personal relationships and acceptance by network members were foreground. Through these interactions, qualitative observations were developed on the involvement of key participants in “what existed and why it existed”, “what is now and why is it that way” to guide the case study phase. Through attending regular network meetings
over a six month period, trust was established with network members, which assured openness in the formal interviews of the case study and full participation by the entire network. In addition, and subsequent to the case study phase, researchers were requested to present their findings from the case analysis and asked to stimulate discussion on ways forward for the network. Researchers are now facilitating workshops with network members to explore specific challenges and options that were identified through the research, commencing a final, action research phase of the project.

The information sought was embedded and complex, and the research objective, to map the structural dimensions of a business network and to understand how those structures and other dimensions affect the exchange of tacit and explicit knowledge across network members, directed a field-based approach. The combination of ethnographic, case study and action research phases provided a methodology to generate theory that is 'grounded' in data, (Drumwright 1994) to focus on how the network was operating rather than on output measures (Richards and Richards 1991) and to test out associations previously established in the literature.

Relationships between actors within the network were foreground in the analysis (Halinen, Salmi and Havila 1999; Havila and Salmi 2000). The structure, strength and nature of the interrelatedness among network actors were studied from the perspective of embedded groups. Interviews were undertaken with each network member as well as a member who had exited the network. Relevant documentation on network governance, annual reports and reviews were content analysed, and network objectives identified in these documents used to probe when interviewees failed to instigate discussion on key objectives.

Each interview lasted approximately one and a half hours and explored the theoretically derived dimensions presented in Appendix 1. Data was collected through tape recording and transcribed, categorising data on each transcription. Emergent themes were shaped from the data through employing NVivo, Leximancer and Excel. Themes were compared to prior established theoretical positions, then revisited, reviewed, and revised or rejected. Within NVivo, data from each respondent was examined within emergent themes, adjusting, and then examined for consistency with those cases categorised first (Dey 1993; Marshall and Rossman 1989). Leximancer is a computer-aided datamining package that provides systematic, semantic analysis of the interview data. The automatic taxonomy discovery provided a platform to interrogate the data, particularly the visual location of interviewees to the automated thematic taxonomy. These themes and their subsequent interrogation were compared to those themes emerging from the NVivo analysis. Network history mapping was analysed from staged data recorded on an Excel spreadsheet.

This process follows that proposed by Wollin (1996:7), and combines both theory generation and theory imposition approaches to data analysis. 'The process adopts the basic model of building theory...., but with the sequential and iterative processes of analytic induction,... within a scientific realist epistemology'. Themes emerging from the content analysis of relevant documents were integrated within this iterative process. Starting from the premise that the world exists independently of it being perceived (Hunt 1990), and the philosophical position that knowledge is real, but capable of being mistaken (Wollin 1996), it is important to consider information not only within the 'research participant's world as they construct it' (Jones 1985:56), but also within the context of the theoretical frameworks and relationships represented within the bodies of knowledge underpinning the research objective(s).
Results

Case description
Local councils and a regional development agency determined to develop initiatives to address a regional shortage in skilled trades people, and stimulate regional economic growth. R11 (interviewee – Figure 1) was jointly funded by these bodies and assigned the task of instigating discussions with engineering industry participants and large employers in a related industry with a view to establishing a business network. R1, R12 and R13 were invited to assist in this pre-network phase (represented by yellow lines in Figure 1). R1 and R12 were both successful engineering firms. They were not direct competitors as they serviced different markets, but competed with each other and R13 for skilled trades people. R1 was linked to a number of different networks and therefore had the ability to draw on knowledge located in these adjacent networks. R1 had already developed relationships with R2 and R3, which were government funded agencies involved in skill development and placement (R1’s linkages to networks and support agencies are represented by brown lines in Figure 1). R13 was a major employer of skilled trades people, and remunerated these staff at a higher level than local engineering firms. R13 contracted work to local engineering firms as well as firms outside the region (red lines in Figure 1).

Invitations were sent to all engineering, aligned firms and support organisations in the region, but only a few engineering firms and aligned firms became members of the network. The balance of network membership comprises organisations responsible for skill education (R3) and placement (R2), a media representative to build brand awareness and facilitate communication about the network’s activities (R5), and a government agency that oversees major regional infrastructure project tendering and management (R9). The network formation stage is fully depicted in Figure 1.

The network’s key objectives were articulated in documentation as addressing skills shortages, facilitating joint tendering for projects, and developing a Centre of Excellence in the region. Over the first three years of network establishment, interrelationships supporting knowledge interaction are represented by the green lines in Figure 2. An embedded unit in the network representing knowledge integration is captured by the blue triangle.

Flows of change in structure, trust, knowledge objectives and type of knowledge exchanged as the network evolved
Transfer of knowledge occurred at regular network meetings when expert speakers and specific network members delivered sessions on, for example, Workcover policy, group purchasing arrangements, processes for sharing skilled resources, Lean Manufacturing policies and practices. This is classified as technical knowledge transfer as the group was not actively engaged in developing alternative solutions. Trust was not a pre-condition for technical knowledge transfer to occur.

Our data did not support a general pattern of technical knowledge transfer, leading to systematic knowledge exchange and then strategic knowledge integration. Some members only engaged in technical knowledge transfer (particularly R4 and R12) and did not seek to build trusting relationships with other network members. These members had either joined because they sought access to new business, or believed that network knowledge exchange or integration had no relevance to them.
Trust was as integrating theme in conversations of R1, R10, R11, R7 and R8, in descending order of importance. Not only was trust identified as being critical to the functioning of the network’s relationships, it was also identified as being a fundamental driver for the successful operation of the business network itself: “The relationships and trust that we're building up with each other and the understandings forged that we can get with each other, I think that's the first key driver.”(R7).

Many of the network members acknowledged that it takes time to develop trust and that trust within a relationship requires a track record (credibility and integrity trust). An example of this is one newly arrived engineering CEO from a major city initially used other engineering companies from that city in a supplier role but gradually moved work over to network members as the relationships developed (R10): “Essentially, we didn't do any engineering work anyway, it was more a labour hire business. But there was no track record in place, as far as local guys. I had come from (major city), so I continued to use the contacts that I'd had down there, and it was just a case of building that trust.”

Discussions about the various operational challenges of their companies enabled the CEOs to see that they were among others like them that had similar, values, behaviour problems and issues. From this a community of practice was formed. Both the informal and formal aspects of the network meetings also contributed towards ensuring benevolence within this core group (R1, R7, R8 and R10) “To do that (i.e. feel a bit relaxed and talk about what they're doing in their company) you have to build the trust. …. and know that they are not going to be undercut by the people around that table (R3) and “if we can work with people we know and trust, it just makes that operation so much easier, because you've got a level of transparency that means you're not always worried about the guy that's doing this work doing you over’”(R10)

Following formal meetings a small group (R1, R7, R10, R11, one of the research team and infrequently, additional network members) gathered to discuss issues of common interest in a strongly social environment. It was as a consequence of these informal discussions, and the exchange of in-depth knowledge of system enhancement and strategies employed that an embedded unit within the network emerged. Calculative trust (i.e. the willingness to invest in joint resources) and benevolence were only observed in this embedded unit (R1, R7 and R10). Interestingly, the openness and collectivity of R1 and R10 realised a highly embedded network dyad, linkages formed directly cross middle management and sharing human and physical resources occurred. Although R7 was included in joint tendering, the high level of embeddedness did not extend from R1 and R10 to this relationship. Evidence from the thematic mapping encouraged the conclusion that the CEO of R7 adopted a strongly individualistic approach to the network, requiring all engagement to be channelled through him. Even though R7 contributed quite specialised engineering services, there were a range of levels upon which deeper embedded links could have been formed. The evidence suggests that although calculative and benevolence trust elements are preconditions to forming embedded network relationships, a collectivist as opposed to individualistic approach is required to achieve a multi-level embedded relationship. We therefore classify this as a hybrid embedded unit.
Developing strategies to address skills shortages involved a process of knowledge exchange (systematic knowledge), and, collaboratively working with the agencies (R2 and R3) to incrementally adjust education packages and develop placement strategies. Although not formally recognised as one, the involvement of R1, R2, R3, R6, R7, R8 and R10 constituted a working party as they were all engaged in developing a regional solution to address the issue. The credibility of network members in having the skills and knowledge to address the skills shortage issue was perceived by all to be high, but, there was also distrust of the major employer (R13). R13 was drawing apprentices that the engineering firms had training for up to three years through the lure of significantly higher salaries. Over time R13’s attendance of meetings became infrequent and, when the company did send a representative, less senior managers were involved, with little or no evidence of knowledge exchange or integration.

Figure 3 identifies the categories and the flow of dimensions observed in the data. The general pattern of flow is from left to right, although categorisation of business approach was placed above the line as it did not change with time. These categories of individualistic versus collectivity approaches were determined through examining the theme taxonomy and NVivo data classification and questioning the location of individuals against themes. While some members limit their network involvement to knowledge transfer, formal meetings and displaying credibility and integrity through discourse, others actively pursue all three knowledge objectives. This latter group displayed evidence of additional trust elements of calculation/commitment and benevolence, and exhibited a collectivist approach as they exchanged and/or integrated technical, systematic and strategic knowledge.

**Individual roles and behaviours**

The theme taxonomy generated from the data using Leximancer is depicted in Figure 4:

1. Work: this theme captured individual work interests, including the day-to-day operation of their own personal worksite, issues regarding staff, and discussions regarding work practices of others.
2. Business: embraced broader discussions about the industry
3. Group: this theme is central to almost all of the interviewees and consists of operational network issues such as meetings, people, members, location and communication.
4. The engineering network: reflects big picture theme of the network as a whole, as it is perceived by outsiders, and how it is developing.
5. Governance: capturing the role of the network organiser and the processes for meeting and management of projects.

Data were then interrogated to reveal explanations regarding the location of members in relation to those themes.

Members located adjacent to themes 1 and 2 (R1 and R10) revealed a strong social capital generation emphasis on network functioning and engineering industry solutions, and exhibited a collectivist orientation. “I didn’t come here to put somebody out of business. I came here to try and grow a business that was supportive of everybody else in the community. ..... and I don’t think anybody else had that. .....But now I think more and more of them are starting to get more of a community spirit about these things (R1).” The contribution to social capital generation of R1 and R10 was confirmed by R3: .. the way that the meetings were actually run and conducted, and I think that formed the social structure around it, so that the ones who, and you can see them now, R10 and R1, who were very strong players within it, took a lot of the forum.
Although R8 was located near R1 and R10, his contribution to social capital generation was lower, particularly in recently times.

The four engineering CEO members (R1, R7, R8, and R10) structured themselves into both a social network and a community of practice. At the conclusion of each formal network meeting, the engineering CEOs would gather at the bar for a drink. Here they would discuss both work and non-work related issues. Any work related issues were often only briefly mentioned and an agreement to follow up at a later time usually reached. In addition to these gatherings at the bar, dyads of engineering CEOs would talk or meet at other times to resolve or discuss work related issues. Collectively these behaviours were consistent with the operations of a community of practice.

R11 with some support from R9 represented government bodies financially supporting the network and thus the ultimate governance of the network fell to these two members. They provided secretarial and administrative support for the network, relaid relevant regulatory or industrial information and designed network formation and operational systems and processes.

Co-located with R11 and R9 near theme 4 were R4 and R12. Although, co-located members may be discussing the same theme, they do not necessarily share the same opinion. It was the negative views of R4 and R12 on the network’s ability to achieve goals beyond incremental change to the skills shortage situation that drove their position adjacent to theme 4, as opposed to the positive position on the network taken by R11 and R9.

The proximity of R9 and R7 was interesting and unexpected, particularly as R7 was working collaboratively with R1 and R10 as an embedded sub-group. An interrogation of the associations that placed R7 adjacent to themes 4 and 5 revealed an emphasis on network operational issues and a lack of engagement about connectivity with other network members. This individualistic orientation became more apparent as R1 and R10 continued to build embeddedness through connections at multiple levels of their organisations, while all engagement between R1 and R10 with R7 operated through R7, thus additional levels of connectivity were not established. This unwillingness by R7 to build additional levels of embeddedness has resulted in his exclusion from joint tendering on recent projects. R1 and R10 have now included R6 in this process, adding aligned design services in preference to expanding the scale of the foundation engineering competencies.

The co-location of R2, R3 R5, and R6 constituted those working to serve the requirements of the engineering company CEOs and the network as a whole. Their contribution included the provision of technical training, apprentice related services, design and project management services and publicity. Within this clustering, two members in particular worked very closely together because of the network objective to develop solutions to address the regional skills shortage even though they were from different organisations (R2 and R3). The development of this relationship over the period of network formation is reflected in the following by R3:

*It was there before the group. It is stronger on a personal level where R2 can come directly to me now by being on the group and having one-to-one contact on a personal level, we can solve the problems a lot quicker. Rather than the branch manager makes a statement that never gets dealt with, now we can deal with it,*
Overall there were three general clusters of network members (Engineering CEO’s, governance and service) and this constituted the fundamental structure of the network. Any member who was not discernibly associated with one of these clusters usually stood alone due to lack of engagement or commitment to the network, or due to lack of acceptance by the network.

Members within the network adopted one or more of four specific roles. Certain members of the group would act as drivers of social capital. This meant that they would actively seek to set the agenda for the knowledge needs of the group. Other members of the network would act as extenders or integrators of social capital. They would respond to the knowledge needs set by the drivers of social capital. These were usually members in the service clustering who sought to accommodate the knowledge requirements placed on them. Other members, usually in the governance clustering would adopt a governance role. Their responsibility was to ensure the smooth functioning of the network and to provide specific information to be used by both the drivers and integrators of social capital. The final role adopted by some members of the network was as a user of social capital.

**Collaboration and Competition**

Collaboration between network members occurred most prominently in the Engineering company CEO clusters and was a function of the formal network structure, their social network and their community of practice. Particular dyads of engineering CEOs would discuss specific issues associated with their businesses such as upcoming jobs, idiosyncratic problems, resourcing issues, effect of government regulation and training issues. The engineering CEOs would use the others as resourcing buffers so that in busy times, work was passed on to other companies to meet negotiated deadlines. During the interviews, the engineering CEOs were beginning to collaborate to the extent of joint bidding for large engineering projects, and sharing resources.

Interestingly, R1 and R10 who were in direct competition on most occasions were also the two companies that collaborated most closely. The engineering CEOs managed the collaborative/competitive tension in their relationship by adopting a diverse set of strategies and responses. There was tacit acknowledgement that ultimately they were competitors and that there would be times that direct competition would occur. However, the network whilst not obstructing the working of the market, had contributed towards taking some of the ruthlessness or harshness out of it. This is reflected in the following by R6:

“the other guys in there, basically, they would (be competitors), in the commercial world, if this network wasn’t there, they’d be all attacking the same job, and all trying to cut throat the other guy off in it (laughs).”

**Conclusion**

Our research objective was to understand how structure, social capital and relationship embeddedness influence the transfer, exchange and integration of different types of knowledge in an SME industry network. This was investigated through a method that integrated principles of ethnography and case study research.

The dynamic nature of the interaction between the structure, roles, types of knowledge and change in knowledge that occurred was consistent with Nonaka’s (1994) dynamic theory of knowledge creation which proposes a spiralling knowledge creation effect. This driving
knowledge creation occurred within the core cluster of engineering CEOs in their community of practice and social network. These four members transferred, exchanged and integrated knowledge of all types amongst themselves. This knowledge included technical, systematic and strategic knowledge. Amongst these members, the knowledge requirements of the network were also determined. Usually these knowledge requirements were issues that the community of practice was unable to resolve. Through network members acting in the role of drivers of social capital, this community of practice set the agenda for other network members to respond to. Usually it was the network members belonging to the service cluster who would respond to this challenge. Through a process of knowledge exchange between CEO and service clusters, technical and systematic knowledge would be reconfigured to create solutions to problems.

The phenomenon of business competitors collaborating in a business network is a paradox. On the surface, it would be expected that competitors in SMEs would be reluctant to collaborate due to the fear of losing customers to another competitor or the risk of improving a competitor’s operations. This mindset existed when the business network was first formed and is reflected in the following by R3:

“I think they’ve changed. If I take the collaborative working together, I think that’s honed in on about three companies within it, and the rest are a bit more peripheral.”

A particularly subtle characteristic that was observed in the relationship between the engineering CEOs was a very personal connection that occurred because they were amongst those with whom they could closely relate. This is a characteristic feature of communities of practice. They viewed each other as somebody who really understood the tribulations and stresses of their demanding positions. The value placed on the benefits of these cluster interrelationships was high.

Our key contributions to theory are as follows:

1. Unlike members of supply chain and innovation networks (Jarratt 2006), the knowledge objectives of members of an SME industry network are diverse. Some seek to draw from the network knowledge that can advance their own individual business. They make no contribution to overall network objectives and can be classified as network pariahs. A second group are keen to exchange knowledge and work collaboratively to address specific network objectives that will benefit themselves and other network members. The third group of members are those organisations keen to integrate knowledge and other resources to address and create growth opportunities.

2. Trust is important but insufficient to support movement from knowledge exchange to knowledge integration. Our findings imply that personal attributes of openness and willingness to transfer, without reciprocity, technical knowledge that can advance operations of direct competitors within the network membership, reflect a collectivist perspective that facilitates the development of systems fostering knowledge integration. An individualistic, in-control, approach to business can create a barrier to developing connection embeddedness, while a collectivist approach encourages close inter-organisational collaboration across multiple levels and resource sharing, and thus provides a platform for knowledge integration. Our findings align with those of Abrams, Cross, Lesser and Levin (2003) in confirming the importance of informal networks as a structure through which dimensions of trust that support open knowledge exchange and knowledge integration can be developed. The discussions between those in this informal setting involved not only signalling areas of expertise
either within members or in aligned networks that could be leveraged to benefit network members, but also creating a sense of willingness to share.

3. Although some in the network are direct competitors and therefore overlap in served markets, niche skills reflect the diversity of these competitors and provide a platform for collaboration in times of economic growth. Here the economic environment acts as an enabler for collaboration as organisations are not necessarily worried about competitive threats as a consequence of there being work for all. In fact, to benefit from the economic boom they need economies of scale to successfully compete for larger projects, and are therefore willing to trade off smaller, less profitable projects to competitors with whom they are collaborating. Our findings are consistent with that of Tsai (2002) and Baum and Kom (1999) where intra-organisational units whose resources were more closely aligned demonstrated strong collaborative behaviour, while those with limited resource alignment, particularly those whose strategic imperatives were distinctly different from those of other units, demonstrated limited collaboration and social interaction. Further research is encouraged to investigate how these findings might be challenged in a time of economic downturn, where the competitive dimension of the inter-organisational relationship is brought to the fore and benevolence might not be possible where organisational survival becomes the primary imperative.

References


Knowledge transfer, exchange and integration in an SME industry network


Knowledge transfer, exchange and integration in an SME industry network


Appendix 1: Interview guide

1. Network Objectives
   a. Perceptions of current network performance objectives (short and long term)
   b. Understanding of the flow and/or integration of explicit knowledge and know-how between network members to achieving those objectives?

2. Governance
   a. Understanding of the network policies, processes and practices governing the network – how have these emerged?
   b. Perceptions of policies, processes and practices in terms of how they might facilitate or inhibit collaboration, information and knowledge exchanges and knowledge integration

3. Structure
   a. Discussion of current network structure
   b. Seek views on consequences of the network structure

4. Interrelationships within the network and between adjacent networks
   a. Describe interactions between individual members and groups within network and those in the network periphery (probe for separate meetings, working parties on specific projects i.e. structures that facilitate/inhibit knowledge exchange and integration)
   b. Explore embedded units influencing the development and direction of the network
   c. Explore links into other networks that are important for achieving performance objectives

5. Network history mapping
   a. Recall the formation stage of the network and explore four areas above
   b. Identify any other stage subsequent to formation of the network and prior to current stage and explore four areas above. Identify drivers of each stage.
Figure 1

Original Network Structure

Stage 1: yellow, red, orange links (pre-formation)
Stage 2: add black links (network formally established)
Key:  R = network member, LO = linked organisation, LN = linked network
Knowledge transfer, exchange and integration in an SME industry network

**Figure 2**

Network Final Stage: Development of embedded structures in the network

Stage 3: add dark green links (knowledge exchange), purple and brown links (knowledge transfer) and remove R12 and R13

Stage 4: add blue (embedded unit- knowledge integration)

Key:  R = network member, LO = linked organisation, LN = linked network
Figure 3

Flows of change in structure, trust, knowledge objectives and knowledge form

- **Business Approach**: Individualist, Collectivist
- **Network**: Stages 1 and 2, Stage 3, Stage 4
- **Trust**: Distrust, Credibility, Integrity
  - No trust, Benevolence, Calculative
- **Knowledge**: Technical, Systematic
  - Strategic
- **Knowledge objective**: Transfer, Exchange
- **Structure**: Formal Meetings, Hybrid collaborations, Dyadic collaborations CEO Level
  - Informal gatherings
  - Working party
  - Embedded unit collaborations - Linked middle management Sharing skill resources
Knowledge transfer, exchange and integration in an SME industry network

Figure 4

Location of participants in relation to each other and the theme taxonomy