# BUILDING INNOVATIVE CAPABILITIES IN SMES THROUGH VIRTUAL AND KNOWLEDGE NETWORKS

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***ABSTRACT***

*Small and medium enterprises (SMEs) are constantly confronting formidable and competitive challenges. In their midst, to stay abreast of larger firms or international markets, a small number is still able to insulate themselves from the pervasive effects of competition, technology advancement and dynamic environments. These SMEs have to be flexible and adaptive, which necessitates technical skills, knowledge and capacity to survive as viable entrepreneurial organisations. Many SMEs face difficulties in responding to such challenges because they lack the absorptive capacity or capabilities in the organisation. This study focuses on how virtual or knowledge networks can build innovative capabilities in SMEs and investigates the absorptive capacity evident to facilitate capability development through a mentoring program. The data collected involved a series of interviews and workshops with firms, mentors and local and state government representatives.*

*Keywords: Organisational capabilities, SMEs, absorptive capacity, knowledge, networks*

## 1. INTRODUCTION

Organisations are confronted with global competition, increasing complexity and rapid change. Small and medium enterprises experience greater pressures in this intense and dynamic marketplace as compared to larger, established firms. They lack the resources, funds, expertise and capital for technology investment to withstand competition, and often fail after a few years of operation. The literature on entrepreneurial work differentiates small firms from large companies. SME managers are more sales oriented and do not plan well. The most significant concern for the SME manager is maintaining market share (Mahon, 2001). In another study, Dodge and Robbins (1992) found that out of the SMEs that failed, 64 percent did not have a business plan. Similarly, SME managers relied on tacit knowledge in supply chain planning, rather than systematic techniques (Park and Krishnan, 2001). The growing intensity of competition has forced SMEs to focus on their resources and capabilities to survive and excel in high-velocity markets. Resources are those (tangible and intangible) assets in the organisation (Maijoor and Witteloostujin, 1996); whereas capabilities refer to the firm's ability to exploit, combine and reconfigure resources through organisational routines to accomplish targets (Amit and Schoemaker, 1993). Besides developing capabilities and acquiring resources, SMEs can also capitalise on suitable types of assistance and government programs available, to be successful or establish and rely on networks in order to develop their capabilities. This study investigates two virtual forms of

knowledge networks commissioned to assist SMEs in Australia, and how they effectively build innovative capabilities as a result of mentoring programs.

## 2. LITERATURE REVIEW

### *2.1* *VIRTUAL ORGANISATIONS AND NETWORKS*

There are various interpretations in the plethora of literature on what virtual organisations are. Virtual organisations' definitions range from 'a seamless system of interacting parts spanning multiple organisations that work together towards competitive advantage via customer satisfaction in the shortest possible cycle time' (Poirier and Reiter, 1996; p.226), 'legally separate but operationally interdependent companies focused on responding to a market opportunity' (Greis and Kasarda, 1997; p.58), 'a network or coalition of suppliers, manufacturers, and administrative services to accomplish specific objectives' (Fitzpatrick and Bruke, 2000; p.13), to 'any association of people who are linked through electronic networks and sharing information' (Hunt, 2000; p18). These various definitions converge on the centrality that the virtual organisation is a loosely related group of companies formed to enable collaboration towards mutually agreed goals. The characteristics include flexibility and speed to meet market needs (Grabowski and Roberts, 1999), achieve cost reductions, higher productivity and satisfaction (Kavan, 1999) because of the integration and greater focus (Magretta, 1998). Virtual organisations deal with the union of companies that work with or without technology, aiming to establish a network of information in which knowledge is shared and exchanged.

Knowledge networks provide opportunities for members to build capabilities and expertise and connect additional contributors to the knowledge web. As such, they are powerful sources of both expertise and organisational capacity-building. The members in virtual organisations or knowledge networks have the flexibility, ownership and various focal points. As such, they cannot be managed in the same way as employees, and are free to withdraw or participate depending on the level of interest they have for the current project or topic' (Debowski, 2005; p.74). The success of an optimal network relies on true partnering, with high levels of trust and accountability. From these, solutions and savings are worked out for the benefit of the total network (Poirier and Reiter, 1996, p.267). The network begins with partnering characteristics which is formed with good levels of trust, accountability, and communication management, alignment of goals and with the philosophy of sharing gains. The benefits for businesses to be part of virtual organisations or knowledge networks are the flexibility and the agility to achieve goals. Bahrami (1992) illustrates that that they can rapidly change course to take advantage of an opportunity or to side-step a threat, and this allows for versatility and the capability to do different things and apply different skills depending on the needs of a particular situation. They combine core competences or multiple competencies in temporary alignments. New alignments are formed as customer requirements change. Thus, flexibility is extended beyond the single organisation into the area of multiple organisations in the network.

Virtual organisations involve collaboration, cooperation and communication (Hughes *et al*., 2001). Wognum and Faber (2002) consider that organisations have been forced to collaborate with others in order to be competitive and maintain their positions in the market. Coordination and communication are requisites for a well-structured collaboration between partners in virtual organisations. Stojanovic *et al*. (2003) discuss

different success factors and contend that some factors are grouped together because they have very similar meanings, such as co-operation, co-ordination, and collaboration. Collaboration can be regarded as the most intensive level of partnership. It is described as a mutually beneficial and well-defined relationship which involves people from different agencies or sectors of the community which join together to achieve a common goal. Usually, that goal could not be achieved as efficiently (or not at all) by any individual organisation. The result is a highly shared endeavour in which members eventually drive themselves as much to the common goal as to the interests of their own organisations. Different industries have entered into the virtualisation of their processes. For instance, Song and Nagi (1997) exemplify a manufacturing virtual enterprise where cooperation and collaboration among partners enables them to be competitive when facing dynamic environmental uncertainty. Willey (1993) envisioned a trend of collaboration by virtual partnerships. He states that decisions will rely less on the top level management, and that collaboration among virtual partnerships to create new products will become a trend. Additionally marketing is expected to play an important role in future.

There are various roles that members can play in virtual organisations or networks. Lipnack and Stamps (2000) reported that experienced virtual organisation practitioners observe a number of generic roles in action, characterised as: Executive Champion, Socio-net Manager, Tech-net Manager, Disseminator, Designer and Coordinator. Zhou *et al* (2001) also suggested that three functions need to be established in supporting virtual enterprise operations – a coordinator function, a collaborator function and a communicator function. There is an embedded assumption here that modern virtual organisations will have some form of IT enablement or support. These roles can be illustrated in the table below:

| Function | Generic Role | Breeding Network | Virtual Organisation |
|---|---|---|---|
| **Strategic, system and concept development functions** | Champion | Establishes broad vision and goals for the network | Facilitates the development of shared goals for specific initiatives |
| | Socio-net architect | Defines network scope and formalises norms, such as codes of behaviour | Defines governance, risk management and problem resolution practices |
| | Tech-net architect | Defines system architecture and enables communication tools | Integrates communication, technical data exchange and project management tools |
| **Operational functions** | Coordinator | Organises network events, markets capabilities. | Initiates work with collaborators, acts as the client interface |
| | Collaborator | Provides external linkages, identifies generic issues to be dealt with | Understands and manages participant expectations, facilitates decision-making on issues |
| | Communicator | Keeps network members informed of breaking news, upcoming events / opportunities and celebrates achievements | Keeps network members informed of breaking news, upcoming milestones and project performance |

**Table 1. Generic roles to be enacted in the effective formation and operation of a virtual enterprise (adapted from Beckett, 2006)**

### *2.2 KNOWLEDGE THROUGH NETWORKS*

Knowledge is traditionally seen as a result of information cognitively processed and information can be a result of codified knowledge. Nevertheless the coupling of knowledge and information is far more complex (Fransman, 1998). Knowledge can be created with no new information as a result of cognitive and social processes. Additionally, there is always a degree of interpretative ambiguity, which means that knowledge is subjective, contextual and open-ended. These characteristics of knowledge indicate that there is always the need for knowledge sharing and integration in organisations, since there is no clear right answer to a given problem and the truth of knowledge is usually a social construction. The ability to acquire and utilise knowledge effectively is critical for the firm's innovation activities and performance (Cohen and Levinthal, 1990). The way knowledge processes are managed within and between firms has emerged as a major theme in recent research (Jantunen, 2005). Firms are increasingly dependent on their customers, suppliers and even competitors as initiators of product and process improvement and sources of new ideas (von Hippel, 1988). In order to utilise externally generated knowledge, they need an ability to internalise it and then combine the information and new insights with the existing knowledge base.

Sharing and exchanging knowledge is the principal focus of network activities. Information is taken in the context of the virtual characteristic of the network, which is not formally or physically seen but its existence is conventionally recognised and accepted. Knowledge was considered as justified true belief. The generation of knowledge is the key element that enables an organisation to renew itself and expand its boundaries (Barney, 2001), especially in a virtual organisation or network. People develop an understanding of the way things work in a particular way, and how they can be replicated in other settings. This in turn triggers another kind of knowledge that involves exploration and problem solving (Hyland *et al*, 2003). Knowledge networks and virtual enterprises need to be very flexible and agile, and concurrently incorporate new (product and process) technologies that enable them to develop and exploit better practices. Capabilities can only be developed over time by the progressive consolidation of behaviours, or by strategic actions aimed at reorganising the stock of knowledge. Knowledge and information can be termed as a key driver for innovative capacity since, in such virtual or knowledge networks, people acquire and generate new knowledge internally and once it has been acquired there is a push to utilise this new knowledge in innovative ways (Soosay and Hyland, 2004). While knowledge and information is transferred within the network, it is often based on information acquired from customers, suppliers and competitors. The ability to reap the benefits from this process is influenced directly by the absorptive capacity of individuals or firms to utilise new knowledge. The greater the absorptive capacity, the more prolific is the use of knowledge stock to create innovative capabilities.

### *2.3 THE ABSORPTIVE CAPACITY FOR INNOVATIVE CAPABILITIES*

Cohen and Levinthal (1990) define absorptive capacity as the ability of an organisation to recognise the value of new, external information, assimilate it, and apply it to commercial ends. These authors argue that knowledge is what is absorbed by an organisation, in order to be used later in practice. One of the factors that influence the development of any virtual organisation is the ability to embrace new knowledge, new technologies or embrace new business practices. Learning new knowledge through communication seems to be the core characteristic of this type of organisation. It is

argued that if a firm is currently running with minimal resources to optimise efficiency in current operations, it may not be well prepared to take on something new.

The process of absorptive capacity relates to three aspects of knowledge. Firstly, an ability to understand the language of the new initiative, secondly, learning process skills that facilitate initial trial of the ideas, and thirdly, an ability to gain leverage from something new to deliver real benefits (Cohen and Levinthal, 1990). This absorptive capacity comprises organisational routines and processes, by which firms acquired, assimilate, transform, and exploit knowledge to produce a dynamic organisational capability. Daghfous (2004) also illustrates that acquiring absorptive capacity consists of building the firm's ability to access external knowledge, which requires a knowledge-sharing culture; and the firm's ability to transform and implement external knowledge within the company to enhance its core competencies. In explaining the process, there are four dimensions, namely the acquisition, assimilation, transformation, and exploitation of knowledge. Firstly, acquisition is the ability to recognise, value, and acquire external knowledge that is critical to a firm's operation. Acquisition depends on the following: prior investment, such as R&D, prior knowledge, intensity in terms of capability to develop new connections, speed of a firm's efforts to acquire external knowledge, and strategic direction. Secondly, assimilation refers to the organisation's ability to absorb external knowledge. It can also be defined as an organisation's routines and processes that allow it to understand, analyse and interpret information from external sources. Thirdly, transformation is the ability to develop routines that facilitate combining existing knowledge with newly acquired and assimilated knowledge. Transformation can be achieved by adding or deleting knowledge, or interpreting existing knowledge in a different way. The exploration is the ability to apply new external knowledge commercially to achieve organisational objectives (Dagfous, 2004).

From the organisational perspective, we need to consider internal factors such as the organisational structure, size, strategy, prior knowledge base, and organisational responsiveness. External factors on the other hand take into account the external knowledge environment and the organisation's position in knowledge networks. According to research conducted by Tsai (2001) at Pennsylvania State University, it was found that the central position of an organisation in the network is crucial in having the best access to reliable new knowledge. Therefore, the central position in the network is critical to developing new products or innovative ideas. This position reveals its ability to access external information and knowledge whilst occupying a central position in the network or virtual organisation. A business is more likely to access desired strategic resources. Such resources will energise the organisation's innovative activities by providing the external information necessary to generate new ideas.

## 3. METHODOLOGY

This research investigated how SMEs can benefit from networks in Australia and examined two virtual organisations that were developed to facilitate the growth and development of SMEs. The Venture Capital and Commercialisation Unit (VCCU) set up a virtual organisation to mentor start-ups and SMEs in a growth phase. On the other hand the Tooling Industry Federation of Australia (TIFA) established a collaborative project called RELINK that aimed at enhancing the position of small firms. The data collection for these case studies involved a series of interviews, workshops, focus groups and visits to operations and observational studies of network and mentoring

activities. This is an iterative process of data collection. At the initial stage, data were collected on existing capabilities to identify if they were congruent with the literature. The study was exploratory in nature as there has been no reported empirical research conducted on mentoring and capability development in virtual organisations or networks. According to Yin (2003), the research must identify some situations in which all research strategies might be relevant. The "how" and "what" questions are asked about a contemporary set of events over which the investigator has little or no control. The identification of capabilities and capacity for growth is essentially exploratory in the sense that the main objective is to refine a research idea to facilitate further research (Kervin, 1992). To this end, the information gathering stage can be viewed as a preliminary investigation, identified by Emory and Cooper (1991) as a core method of conducting such research. It is common for exploratory research to rely on expert opinions and focus groups at the initial stages. This was conducted in the two cases. The justification for the adoption of the exploratory approach for this particular study lies in the nature of the subject area, and the set of interacting variables that influence mentoring and capability development. The data came from both primary sources (such as direct observation and interviews) and secondary sources (such as documents and reports).

The qualitative approach and exploratory nature of the research question influenced the data collection method. Research conducted within the qualitative paradigm is characterised by its commitment to collecting data from the context in which social phenomena naturally occur and to generating an understanding that is grounded in the perspectives of research participants (Bryman, 1988; Lofland, 1971; Marshall and Rossman, 1995; Miles and Huberman, 1994). Consequently, the data was collected from participants in their working environment using focus groups. This method allowed the capture of data rich in detail about the research problem; and gave the researchers the flexibility to explore additional issues raised by participants. This study used purposive sampling. Purposive or theoretical sampling was used as it offered the researchers a degree of control rather than being at the mercy of any selection bias inherent in pre-existing groups (Mays and Pope, 1995).

The empirical research looks at two forms of mentoring networks implemented – Mentoring for Growth Program by the Department of State Development and Innovation in Queensland and the RELINK program in Victoria. The paper identified and compared how a network-based approach can form collective norms of reciprocity and trustworthiness which SMEs can tap as a source for innovative capacity. The research questions, therefore, are 'How do repositories of social capital in networks build innovative capabilities in SMEs?' 'What absorptive capacity is evident in these networks to facilitate the process of innovation?'

## 4. THE VCCU CASE STUDY

The VCCU has facilitated the development of a virtual organisation that addresses the failure of the market to assist small start up firms and growth businesses in regional centres to raise equity capital. The organisation consists of a set of collaborative learning networks that use a holistic approach to building business competences within a regional setting. The networks are supported and facilitated by staff based in regional offices that are able to draw on the expertise and network of contacts of the VCCU based in Brisbane. Each network has differing strengths and weakness, and these relate

to contextual factors within the region in which they operate. For example in some regions it is more difficult to either source or attract all the expertise necessary to develop a mature capital raising pipeline than it is in a capital city. None the less, all networks are operating efficiently. The central strength of the process is the group mentoring sessions. This form of mentoring is relatively unusual and allows mentors and mentees to learn and build their skill set in a non-threatening and low risk environment. The challenge for the networks is to continue to maintain and grow the enthusiasm of the mentors. In the capital city for example, some mentors meet socially outside of the network for meals or other activities such as sailing. This socialisation process strengthens the relationships between mentors and is seen as a reward for working together to benefit other businesses in the community.

The process provides a focus that addresses how SMEs can access expertise in a short time frame from multiple sources. The process is not overly prescriptive but can be modified to suit regional contextual differences. This framework enables the replication of the concept in a way that recognises community culture and needs; and allows for regional community ownership which is essential for any ongoing commitment. Three other outcomes also support ongoing commitment; these are delivering stakeholder value for all participants by mobilising intellectual assets that are often under-valued and under-recognised and, importantly, mobilising capital that would otherwise be invested in less beneficial activities in other regions. The mentoring process is a successful approach to growing businesses and is a low risk strategy for government. The networks have built the credibility of regional government offices or State Development Centres (SDC) in the communities. Each SDC operates the mentoring in different ways. For example, the selection of mentors is not uniform and the businesses being mentored are regionally specific. This lack of an overly prescriptive framework is a key strength of the pipeline and activities of the VCCU.

The learning and knowledge exchanges within networks are excellent but there is insufficient interaction between networks. Staff of the VCCU have acted as boundary spanning agents and have attempted and succeeded in transferring between networks. However the important knowledge encapsulated in the learning of the mentors, mentees and facilitators remains relatively trapped within regions. There needs to be an ongoing interchange between networks, and they should be actively involved in determining performance measures that can be used within regions and across regions. As networks become self-sustaining, and this will be hastened by inter-network activity, the role of the VCCU as a facilitator will become redundant and will allow the VCCU to pursue other activities in relation to commercialisations.

## 5. THE TIFA CASE STUDY

Between 2004 and 2006 the Tooling Industry Federation of Australia (TIFA, now called Tooling Australia) facilitated a large-scale business collaboration (called RELINK) in conjunction with another industry association and two research organisations, supported by an Australian Government (AusIndustry Innovation Access) grant. The objective was to re-position small firms whose traditional supply chain linkages had been disrupted due to the effects of globalisation and changed client purchasing policies. The 'average' Australian toolmaking firm employs ten to twelve people, and few of the firms involved in the RELINK project employed more than 50 people. This meant that large numbers of firms had to work together to cooperatively take on large jobs. A few

of the firms had prior experience with smaller business networks, and they were expected to mentor the less experienced ones. In addition, the project technology diffusion strategy called for mentoring of other firms that subsequently wanted to try out the ideas. One of the research partners conducted a literature survey on business-to-business mentoring, which indicated the practice was relatively uncommon. Some examples were: Large defence industry firms in the USA helping small firms bid for defence contracts; Large firms mentoring small local firms in the adoption of best practice ideas; and peer groups of complementary regional firms sharing knowledge on current issues and their ideas for resolving them

A specific issue that arose in the TIFA case was that many of the firms involved saw each other as competitors and no previous instances of competitors mentoring each other were found. A way forward was found on the basis that firstly, mentors did not provide solutions, but facilitated transformational learning; secondly that the learning was sharply focused on a topic of common interest; and thirdly, that friendly spaces for learning through storytelling were provided. Informal discussions with RELINK project staff and interactions between participants during events such as trade missions, industry association network meetings and formal workshops were the main learning vehicles. It seemed easier to get things started with complementary firms, but harder to sustain the collaboration if they did not find a common theme and common technical language. Getting competitive firms to collaborate was initially quite difficult, but as they learned about ways they could complement each other, there was a rapid succession of spin-off activities. This is attributed to their common understandings of market requirements and use of a common technical language. The RELINK project was regarded as successful in that new market opportunities were accessed by the participants, a practical collaboration business model evolved, and momentum was built to continue to use the ideas beyond the life of the RELINK demonstration projects. It was observed that those demonstration projects that had some antecedent activity that had built social capital between the participants, even if those antecedent projects were not regarded as successful.

## 6. DISCUSSION

The two cases served as an exploratory study on how mentoring networks could assist SMEs through the development of knowledge and capabilities. The VCCU and TIFA networks represented forms of virtual organisations, where the intended collaborative actions could draw on facilitative social capital among the participants and in supporting business sustainability. The social relationships, as exemplified in the VCCU case were influential in establishing collaborative arrangements or transfer of knowledge across firms and individuals. In the VCCU case, mentee firms were able to learn and develop business strategies. These SMEs were also acquainted with the access to expertise relevant for their business operations or growth. Similarly in the TIFA case, mentee firms could assimilate business issues and ideas for resolving them, as well as adopt best practice ideas from successful established firms. There was transformational learning in the SMEs through the development of social capital within the networks. The evolution and success of these small businesses could be attributed to communities of practice formed as a result of mentoring activities. By using a network-based approach, the relations between firms and individuals in the network provided access to resources and support as highlighted.

Furthermore, the removal of the daily norms and a formal environment in the network facilitated conducive platforms for interaction. In addition, the social dimension allowed for behaviours (supporting the sharing of knowledge and opinions expressed through mentoring) to enable greater learning steps in the SMEs. As a result, social capital can be seen to escalate the efficiency of action by creating cogent ways of distributing information in the network. There was a high level of trust and sharing especially in the VCCU case, and through trade missions and formal workshops in the TIFA case. Firms reaped benefits from these networks because they cannot achieve goals as efficiently (or not at all) by themselves. The result is a highly shared endeavour in which SMEs and mentors eventually drive themselves as much to the common goal as to the interests of their own organisations. We affirm that knowledge and learning is critical to the sustainability of innovative capabilities in organisations. The learning process through mentoring programs in the case studies involved interpersonal exchanges between senior, experienced mentors who provided feedback, advice and development of business practices to SMEs. They enabled SMEs to embrace new knowledge, new technologies and new business practices. As a result, innovative capabilities could be developed through this new knowledge gained, which was complemented by rapid learning and absorptive capacity. The proficiency of these firms to exploit, combine and reconfigure resources enabled them to build capabilities for business operations in both cases.

The limitations to this study are its exploratory nature and concentration on two case studies. The findings report the actions of successful ventures within the networks, although there may have been some limitations of the mentoring programs implemented. For example in the TIFA case, we concede that firms initially regarded each other as competitors. This formed a barrier to sharing and exchange of knowledge. Similarly, in the VCCU case, there was apparent lack of feedback to mentors and social activities for mentoring groups which could have diminished the motivational levels required in virtual networks. Nevertheless the initiatives of these two networks in Australia have accomplished some benefits to SMEs to insulate themselves from the pervasive effects of competition, technology advancement and dynamic environments. This study provides insight concerning network-based activities and strategies required to pursue capability development in SME firms; and provide significant propositions for entrepreneurs who are pursuing innovative organisations. It creates opportunities for SMEs in both the VCCU and TIFA networks to ameliorate their quest for entrepreneurship, enhanced learning and successful innovation.

## REFERENCE


Amit, R. and Schoemaker, P. (1993). Strategic assets and organisational rent. *Strategic Management Journal,* Vol. 41, No. 1, pp. 33-46.

Bahrami, H (1992). The emerging flexible organization: perspectives from silicon valley, *California Management Review*, Summer, pp. 33-52.

Barney, J. (2001). Is the resource-based view a useful perspective for strategic management research? Yes. *Academy of Management Review,* Vol. 26, No. 1, pp. 41-56.

Beckett, R.C. (2006). Building Operational effectiveness in a virtual organisation. *Proceedings of Australian and New Zealand Academy of Management; Operations Management Symposium. Wellington, New Zealand, 6-7 June. (CD Rom)*

Bryman, A. (1988). *Doing Research in Organisations.* London: Routledge.

Cohen, W.M and Levinthal, D.A. (1990) Adsorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, vol.35, pp. 128-152.

Daghfous, A 2004, Absorptive capacity and the implementation of knowledge- intensive best practices *S.A.M. Advance Management Journal* , Vol. 69, no. 2, pp. 21-27.

Debowski, S. (2005). *Knowledge Management*, Wiley, Sydney.

Dodge, H.R. and Robbins, J.E. (1992). Empiricial investigation of the organisational life cycle. *Journal of Small Business Management,* Vol. 30 No. 1, pp. 27-38.

Emory, C., and Cooper, D. (1991). *Business Research Methods.* Homewood, IL: Richard D. Irwin.

Fitzpatrick, W. and Bruke, D. (2000). From, functions and financial performance realities for the virtual organization, SAM *Advanced Management Journal*, vol.65, no.3, pp.13-22.

Fransman, M. (1998). *Information, knowledge, vision and theories of the firm. Technology, organization and Competitiveness* , Oxford University Press, New York.

Grabowski, M. and Roberts, K. (1999). Risk mitigation in virtual organizations, O*rganization Science,* vol.10, pp. 704-21.

Greis, N. and Kasarda, J. (1997). Enterprise logistics in the information era, *California Management Review*, vol. 39, no. 3, pp.55-78.

Hughes, J.A., O'Brien, D.R., Rouncefield, M. and Tolmie, P. (2001). Some 'real' problems of virtual organisations, *New Technology, Work and Employment,* Vol. 16, No. 1, pp.49-64.

Hunt, J. (2000). The virtual challenge, *The Financial Times*, 24 November, pp.17-21.

Hyland, P., Soosay, C., and Sloan, T. (2003). Continuous Improvement and Learning in Distribution Centres. *International Journal of Physical Distribution and Logistics Management 33(4). 316-335.*

Jantunen, A. (2005). Knowledge processing capabilities and innovative performance: an emprirical study. *European Journal of Innovation Management,* Vol. 8, No. 3, pp. 336-349.

Kavan, C. (1999). Virtual@virtual in Stoak Saunders, *Business Horizons*, vol. 42, no.5, pp.73-83.

Kervin, J.B. (1992). *Methods for business research.* New York: Harper Collins.

Lipnack, J and Stamps, J. (2000). *Virtual teams-people working across boundaries with technology,* John Wiley & Sons, New York

Lofland, J. (1971). *Analysing social settings: A guide to qualitative observation and analysis.* Wordsworth, CA.

Magretta, J. (1998). Fast global, and entrepreneurial; supply chain management, Hong Kong Style, *Harvard Business Review*, vol. 76 no. 5, pp. 102-14.

Mahon, R.G.P. (2001). Growth and performance of manufacturing SMEs: the influence of financial management characteristics. *International Small Business Journal,* Vol. 19 No. 3, pp. 10-29.

Maijoor, S. and Witteloostuijn, A.V. (1996) An empirical test of the resource based theory: Strategic regulation in the Dutch audit industry. *Strategic Management Journal,* Vol. 17 No. 7. pp. 549-570.

Marshall, C., and Rossman, G.B. (1995). *Designing qualitative research.* 2nd edition. Thousand Oaks, CA: Sage.

Mays, N., and Pope, C. (1995). Rigour in qualitative research. *British Medical Journal,* Vol. 311, pp. 109-112.

Miles, M.B., and Huberman, A.M. (1984). *Qualitative data analysis. A sourcebook of new methods.* USA: Sage.

Park, D. and Krishnan, H.A. (2001). Supplier selection practices among small firms in the United States: testing three models. *Journal of Small Business Management,* pp. 846-864.

Poirier, C. and Reiter, S. (1996). *Supply chain optimization: building the strongest total business network*, Berrett-Koehler, San Francisco.

Song, L. and Nagi, R. (1997). Design and implementation of a virtual information system for agile manufacturing. *(Special Issue of Design & Manufacturing on Agile Manufacturing), IIE Transactions*, Vol. 29, No. 10, pp. 839-857.

Soosay, C., and Hyland, P. (2004) Driving Innovation in Logistics: Case Studies in Distribution Centres. *Creativity and Innovation Management*, Vol. 13 No. 1, pp. 41-51.

Stojanovic, L., Stojanovic, N., Gonzalez, J.and Studer, R. (2003), Ontomanager – a system for the usage-based ontology management, *Proceedings from ODBASE 2003 Conference, Catania, Sicily, 3-7 November*

Tsai, W. (2001). Knowledge transfer in intraorganisational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Journal,* Vol. 44 No. 5, pp. 996-1004.

von Hippel, E. (1988). *The sources of innovation,* Oxford University Press, New York.

Willey, D. (1993). 2020 foresight. (management in the year 2020), *Journal of Business Strategy*, Vol. 14, No. 3, pp. 26-27.

Wognum, P.M. and Faber, E.C.C. (2002). Infrastructures for collaboration in virtual organisations, *International Journal of Networking and Virtual Organisations*, Vol. 1, No. 1, pp.32–54.

Yin, R (2003) *Case Study Research: Design and Methods*. 3rd ed. Thousand Oaks, CA: Sage Publications

Zhou, M, Zheng, J, Williams, A and Alexander, B (2001) "A Web-based Bidding Workbench for Global Manufacturing" in Mo, J.P.T and Nemes, L (Eds) Global engineering, manufacturing and enterprise networks" Kluwer Academic Publishers, Massachusetts. pp 206-211