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Strategic Networking Among Small High Technology Firms: Evidence from the Western Australian ICT Sector

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ABSTRACT

Strategic networks are a potentially valuable source of competitive advantage for firms, offering access to resources that might not be otherwise available within the organization. Such networks have also been found to enhance the flow of ideas between firms and thereby increase the level of innovation within industry. Small firms can fill resource gaps and leverage market opportunities through collaboration. This paper examines the strategic networking behaviour of small firms in the information and communications technology (ICT) sector of Western Australia. It highlights the importance of developing strong alliances with lead customers and key suppliers, as well as resource network partners. The need for inter-personal communication and social relationships as a means of driving innovation diffusion is highlighted.

Keywords: *Strategic Networks, Small Firms, Innovation, and Information Technology.*

THE NATURE OF STRATEGIC NETWORKS

Throughout the past century the two dominant organisational forms have been vertical integration and sub-contracting (Jarillo 1993). During the first half of the Twentieth Century many firms adopted vertical integration seeking to control all resources within their balance sheets. By the end of the century there was a shift toward downsizing of corporations with outsourcing becoming a popular means of increasing efficiency and reducing cost (Quinn and Hilmer 1994). However, while vertical integration proved uncompetitive, outsourcing has provided only a temporary solution, creating firms that were little more than hollowed-out shells with only a superficial impression of success (Haapanieni 1996). Faced with these two extremes a third organizational form emerged; that of the strategic network (Jarillo 1988).

A strategic network emerges where firms within an industry or industries do not have the ability or desire to secure ownership over key resources, and are also willing to adopt strong cooperative relationships for mutual benefit. Such relationships may involve sharing or leveraging resources within the network. The key to the development of a strategic network is the willingness and ability of participants to seek mutually supporting and beneficial outcomes (Jarillo 1993). While conventional sub-contracting involves suppliers being treated as being outside the customer firm's organizational boundaries, within a strategic network these organizational boundaries become fuzzy. Of importance is not the individual firm, but the overall business activity system. This comprises all the various activities that take place throughout the production and distribution of the product (the value chain). Each activity offers different levels of value adding and different returns on investment by firms.

There are six main elements that comprise a strategic network. The first of these are the *actors*, usually in the form of firms that are the basic participants in the network. Second are the *activities* that these actors undertake. Each actor has particular competencies that make it able to specialize in certain

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activities while leaving other activities to other actors. The third element within the network is the *resources* or competencies of each actor that determine what strategic options it has in relation to what activities it undertakes. Coupled with this are the *routines*, a fourth element comprising the operating procedures that each actor conducts in their activities. The fifth element are the *relations* that take place between the various actors in the network, and the sixth element are the *fitness functions* or strategic decisions about how each actor decides to configure their activities, resources, routines and relations within the network (Mathews 2001).

Three Layers of Network Relationships

Strategic network relationships operate on three broad levels or layers (Holmlund and Tornroos 1997). The first of these is that of the *production network layer*, which consists of the vertical supply-chain relationships flowing through a particular business activity system. Critical to this are the *key suppliers* and *lead customers* that make up the production network in which the firm operates. Key suppliers are those firms that offer critical inputs to the firm and who would degrade the firm's competitiveness if they allowed their own quality or efficiency to degrade. Lead customers are typically dominant in their own industries and have above average levels of competitiveness. They assist the firm to benchmark its quality to the highest levels, and consistently drive up performance standards. Due to the dominance they have in their own industry, lead customers offer firms access to new markets and increased sales. Lead customers also serve as a source of new ideas and often collaborate with their suppliers to foster innovation (AMC 1994).

In addition to the production layer, the strategic network also consists of the *resource network layer* and the *social network layer* (Holmlund and Tornroos 1997). The first of these comprises those actors that control various resources necessary for the production process to take place. Typical actors within a resource network are financial institutions (e.g. banks, venture capital firms), insurance providers, transport, storage and communications industries, education and training institutions. It can also include research centres or even firms in other industries that can provide complimentary goods and services or transfers of technology (e.g. packaging technology). The third layer is that of the social interaction that takes place between personnel from the firms within the network. Social interaction can be both formal and informal in nature and has been found to be an important source of innovation due to the sharing of knowledge that takes place (Hogberg and Edvinsson 1998).

Interpersonal communication between individuals within the social network layer, particularly at an informal level, has been identified as a major source of innovation (Senker and Faulkner 1996). It is important for individuals to move away from their traditional circles *homophilous* groupings, where relationships are usually strong but knowledge exchange is *isomorphic* (similar), into new circles *heterophilous* groupings (Steward and Conway 1996). Within these latter groupings social relationships

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are not as strong, but new ideas and tacit knowledge can be exchanged via social interaction (Nonaka and Takeuchi 1995). Individuals seek to enter into new knowledge exchange relationships by choice and by doing so reshape their perceptions and develop new mental models frequently resulting in innovation (March and Olsen 1988). From the firm's perspective the development of knowledge networks, both within the organizational boundaries and across the strategic network via the social layer, is one of the most important long-term challenges for management (Seufert, von Krogh and Bach 1999).

STRATEGIC NETWORKING AMONG SMALL FIRMS

Vertical integration is generally not an option for small firms (e.g. those with less than 100 employees) due to their limited resources. Small, independently owner-managed firms exist within a network of actors consisting of customers, suppliers, financial institutions, government agencies, local authorities, employees, other firms and stakeholders (Jennings and Beaver 1997). The owner-managers of small firms can leverage such networks to secure resources that they do not possess within their own organization with resulting competitive advantages (Ostgaard and Birley 1994).

The strategic alliances that form the basis of the networks within which small firms operate can range from loose affiliations with limited commitments and relatively little allocation of resources, to tight associations market by amalgamation. Such alliances can take place across both the production network and resource network layers and are driven by the strategic intent of the owner-manager (Jarrett 1998). Independently owner-operated small firms are usually dependent on the managerial competencies of their owner-managers for success, and their networking behaviour is frequently the result of a process of formal or informal social interaction between the owner and others (Donckels and Lambrecht 1997). Key factors influencing network formation among small firms are the owner-manager's propensity to engage in social networking, the strength of ties that are formed in such networks and the social prestige attached to membership of the network. Such things as the age and education of the owner-manager, the size of their firm and the industry within which they operate can influence these primary motivation factors. What network does (its purpose) may be more important than how large it is (BarNir and Smith 2002).

Small firms that enter into networks are likely to do so as a result of their owner-manager's perception that they offer one or all of three key functions. The first of these is their capacity to create new value for the firm by assisting in the development of new products or markets, accessing new technologies or enhancing quality. Second, they may help to build existing business capability by accessing financial resources, knowledge and skills, or sourcing physical capital or information. Finally, the network may serve to help the firm defend its market position though joint promotion, the establishment of barriers to new market entrants or protection against substitutes (Jarrett 1998).

Previous research into the development of alliances and networks among small firms in Australia suggests that owner-managers view networks as source of sharing ideas and resources, but understand the

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concept poorly. Networking also appears to be more prevalent among service firms than manufacturers. Major barriers to the formation of networks are the perception by the owner-manager that they would lose their independence or suffer a leakage of commercially valuable ideas. The owners of newer, less established firms were more likely to hold such concerns than older, more established companies (Dean, Holmes and Smith 1997).

Alliances within networks for small firms can be both formal and informal and can take place across both the production and resource network layers. Given the importance of the owner-manager in the decision to form an alliance, it is within the social network layer that attention needs to be given in seeking to understand the networking of small firms. A personal network – whether formal or informal in nature – is a valuable source of knowledge and ideas for the owner-manager and can assist them in making strategic decisions (Hogberg and Edvinsson 1998).

Common causes of network failure include the attempt by a large focal firm to appropriate the resources of other network partners, or attempt to interfere too much in the operations of their suppliers or distributors. A lack of trust or poor communication between network members can also lead to fatal damage to the alliance. Finally, if the network actors become overly specialized and narrow in their focus, they can lose their ability to innovate and the alliance may see its competitiveness reduced over the long-term (Miles and Snow 1992).

METHODOLOGY

This study examined the strategic networking behaviour of firms in the information and communications technology (ICT) industry in Western Australia. Of interest were the collaborative relationships that took place between these firms across the production, resource and social network layers, and whether such alliances enhanced competitiveness and innovation. A further aim of the study was to identify the existence of strong networks that might be identified as potential industrial clusters (Baptista 1998).

Case Studies

The study commenced with the identification of several sub-sectors in the local ICT industry and the selection of five for further analysis. These were the sub-sectors engaged in mining software, wireless communications, e-business services, defence technologies, and the technology incubator precinct within a science park. A series of firms were selected from each of these sub-sectors and case studies prepared involving in-depth interviews with their senior managers and follow up interviews with suppliers and customers where possible. Common interview protocols were used in each case study with the unit of analysis the strategic network behaviour of the firm and its senior managers. Attention was given to examining networking along the production, resource and social network layers. Replication logic was

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followed in the analysis of the findings from what resulted in 28 case studies (Yin 1989). It is not possible to provide details of all these cases in this paper, but all were identified as successful within their respective sub-sectors.

Survey

In addition to the case studies, a survey was conducted via mail, of 400 firms listed within the state government database as being engaged in the ICT sector. The questionnaire used in this survey was constructed using a range of items originally used by the Australian Manufacturing Council (AMC 1994) that examined the role strategic alliances play in enhancing competitiveness and innovation, as well as other studies that measured innovation within Australian firms (Soutar and McNeil 1993). Dillman's (1978) *Total Design Method* was employed in the conduct of the survey. Prior to the mail out of the final survey the questionnaire was pilot tested and several items removed or re-worded. The target of the mail out was the CEO of the firm and a covering letter was provided along with the questionnaire that explained the purpose of the study. Two mailings were used to collect the final sample. The first mailing returned 46 responses (11.5 percent) of which 44 were usable. The second mailing returned 30 responses producing a total usable sample of 73 questionnaires and an overall response rate of 19 percent.

Sampling

The final sample drawn for this survey comprised firms that had been in operation for approximately 12 years, with an average employee base of 33 full time and 3 part time staff, and an annual turn over of between \$1 million and \$5 million. Locally based equity holders privately owned 71 percent of these firms. Fifty-two percent of the firms reported being engaged in exporting although the majority of their sales revenues over the previous three years had been sourced within the local market. Innovation intensity was high, with an average of 20 percent of their annual turnover being spent on research and development. Forty-four percent of the firms reported having a formal commercialisation process; with 55 percent of these indicating that they thought it was either effective or very effective.

Although a relatively small final sample, comparisons with earlier, larger, surveys undertaken in the same sector over the previous five years indicated that the structure of the sample was consistent in terms of these demographic measures (TIAC 1999; Boche Group 2000). Further, the level of export activity and investment in R&D among these firms was found to be significantly higher than that of firms in Australia (AMC 1994) and Europe (Evangelista, Sandven, Sirilli and Smith 1998).

FINDINGS

The findings of this study were extensive and can only be summarised in the space available. Full details have been separately reported (Mazzarol 2003). The following sections outline the key findings from the study as they relate to the strategic networking of the firms across the production, resource and social network layers.

Production Network Layer

The survey highlighted the importance of lead customers and key suppliers to these firms, with the majority having such customers located within their home state, rather than inter-state or abroad. Seventy percent of firms had lead customers that were locally based, although many of these firms also reported having such customers overseas or elsewhere in the country. Sixty percent had locally based key suppliers, but also drew equally from national suppliers, with around 35 percent sourcing from overseas. The nature of these alliances ranged from informal to formal with most firms having either only a few (1 or 2) formal agreements, or many (e.g. >6). An examination of the relationship between size of firm and number of formal agreements was undertaken using chi-square tests but found no significant relationship at the 0.05 levels. This was contrary to earlier studies conducted into the Australian manufacturing sector that found a positive relationship between firm size and number of formal agreements (BIE 1995).

Respondents were asked to indicate whether they considered that their relationships with customers or suppliers had strengthened over the previous three years, moving from 'arms length' toward a more 'partnership like' relationship. The majority of firms reported that they felt their relationships with their lead customers and key suppliers had strengthened significantly over this time period. When asked about the role customers and suppliers played in raising performance levels, the role of locally based customers was noticeably important. The majority (76.5 percent) of firms reported that customers from their own state were important to enhancing their performance over the past five years, as compared to only 51 percent of national customers and 51 percent overseas customers. The main role such lead customers played was driving performance by demanding high quality and service levels. Such customers also served as market opinion leaders and helped to gain credibility for the product.

Resource Network Layer

Compared to the production network layer, the strength and density of alliances across the resource network layer were substantially less. Most firms (70 percent) reported having no joint initiatives or alliances with other firms, either locally, nationally or internationally, and around 80 percent reported similar findings in relation to process R&D. In terms of direct financial value 89 percent of firms considered their linkages to lead customers to be valuable, and 63 percent viewed key suppliers in a

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similar manner. Lead customers were viewed as important sources of new technology by 39 percent of respondent firms, and key customers by 49 percent. Thirty-eight percent of firms considered other companies in their industry to be an important source of new technologies. By comparison universities and the Commonwealth Scientific and Industrial Research Organization (CSIRO) were viewed as being of much less importance in terms of technology transfer with around 75 percent of firms considering universities (either local or international) to be of little importance, and 89 percent viewing the CSIRO to be similarly unimportant in accessing key technologies. Firms were also pessimistic about their ability to access venture capital financing, with 60 percent considering there was insufficient venture capital funding in their local market. However, only 15 percent of firms indicated that they had established alliances so as to secure venture capital either within the local market or overseas.

A variety of potential constraints to the development of joint initiatives and alliances were examined. Key constraints perceived by the respondents were the potential to lose control of a business advantage, set up costs, difficulties locating suitable partners, a lack of skills required to set up and manage a partnership and difficulties in managing offshore alliances. Responses to these constraints were evenly spread with about 40 percent of firms seeing such issues as either important or not important. The only exception was the issue of fear of losing control.

Social Network Layer

Communication with lead customers and key suppliers took place frequently within most firms. Face to face contact between the firm's senior managers and those of lead customers occurred at least monthly within 54 percent of firms and weekly within 11 percent. A similar pattern was found for marketing and sales staff, with 43 percent of technical staff meeting their equivalents in lead customer firms at least monthly. Email and telephone contacts were exchanged with lead customers on a daily or weekly basis by 86 percent and 79 percent of firms respectively. This direct communication, whether by email, telephone or face-to-face, was considered significantly more important than contacts via mail, newsletters or at trade shows. Informal contacts via personal networks were considered by 52 percent of respondents to be important sources of information about new ideas and technology, even more important than formal research and conferences. Innovation within the firms was most frequently sourced to the top management with 75 percent of firms indicating that this was the case. Lead customers were the next main source of ideas according to 58 percent of firms.

Interviews with senior managers from the 28 case study firms confirmed the importance of the social network layer as a source of innovation and business development. For example, according to the CEO of one of the case study firms, engaged in the wireless technologies sub-sector, the majority of managers and engineers from the firm maintained a personal network of contacts within the industry. Senior managers from the firm allocated around 60 to 70 percent of their time maintaining social-

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professional networks with a range of groups including financial institutions, venture capital sources, university researchers, government agencies and sources of new technology. These networks were maintained both locally, nationally and internationally through telephone, email and direct contact. The CEO of a second firm, engaged in the Defence Technologies sub-sector, reported similar findings, explaining how his staff were active members of various associations and sporting clubs through which they maintained contacts with lead customers and both military and government officials. The value of 'the old school tie' was considered most important and the firm had recruited many former military personnel because of their ability to leverage former relationships. Most of the case study firms reported similar findings and considered that social networking was important not just for the senior management of the company, but all employees.

For firms engaged in exporting, there was a need for senior managers to travel frequently overseas to maintain contact with customers and this could place severe burdens on already overstretched managerial resources. Another important means of innovation diffusion found within the ICT sector was the movement of people from one firm to another through recruitment and selection. The case studies illustrated several examples of links being strengthened between firms due to the transfer of key technical staff. This was particularly the case among firms in the mining software sub-sector engaged in the development of milling-processing applications. This work was highly specialized and knowledge transfer was found to take place through firms recruiting staff that had worked elsewhere in the local sector and had accumulated experience from past projects. Links with universities, where they were found, frequently occurred as a result of students or academic staff moving from the university to industry and maintaining social contact with research centres in the institutions.

DISCUSSION AND CONCLUSIONS

The findings from this study highlight the importance of lead customers and key suppliers to small firms and illustrate the role that such alliances can play in the enhancement of performance, and expansion of market opportunities. Despite the high proportion of firms engaging in exporting, the importance of local contacts for both sales and the sourcing of new technologies and ideas should be noted. This illustrates the role spatial proximity appears to play in enhancing the growth and development of industry networks (Baptista 1998). The need for close, personal and frequent contact with others within the network makes locally based customers, suppliers or resource providers significant.

Of some concern is the relatively weak relationship found to exist within the resource network layer, particularly between the firms and research centres and universities. It was common to find within the case studies firms that had not considered developing links to such network support partners due to a perception that such alliances were either impossible or unprofitable. While it is likely to be more difficult for small firms to access universities or the CSIRO, they can still benefit from such linkages.

Paper presented at the ANZAM Conference 2003, 2-5 December, Fremantle WA.

The study suggests that small firms recognize the importance of alliances within the production network and devote substantial time maintaining and strengthening such relationships. It is also the role of the CEO (usually the owner of the firm) and other senior managers to lead such relationships, and seek to leverage them for enhanced product or market development. Innovation appears to be strengthened via such social interaction, and informal relationships can be as important as formal ones to this process. However, the weakness of the linkages across the resource network indicate a need for government policy makers and universities to recognise the special difficulties faced by small high-technology firms in seeking to access publicly funded research centres. Such firms lack time and resources to engage in long-term research projects, and are usually focused on incremental operational R&D, rather than fundamental research.

Western Australia's economy has developed around a core of highly successful and globally competitive industries within the mining, resources and agriculture sector. Diversification of the economy is required for long-term economic and social sustainability. The ICT sector has been viewed as offering an opportunity for such diversification (TIAC 1999). This study suggests that the WA ICT sector lacks sufficient strength within the resource network layer to possibly impede its competitive development. Although internationally focused and innovation intensive, the sector appears to lack concentration, and has relatively limited collaboration between firms at the local level. Government policy should be directed at enhancing the level of local collaboration within the sector through the creation of mechanisms designed to encourage greater networking, particularly across the resource network layer. This might include the creation of *institutes of collaboration*, non-profit organizations that bring together industry participants, research centres and government agencies to foster *communities of interest* aimed at undertaking commercial projects requiring such cooperation. Universities and the CSIRO also need to review their commercialisation policies so as to facilitate technology transfer to smaller firms.

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Paper presented at the ANZAM Conference 2003, 2-5 December, Fremantle WA.

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