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**ABSORPTIVE CAPACITY AND
INTERNATIONALIZATION OF NEW ZEALAND HIGH-
TECH SMEs IN THE AGRO-TECHNOLOGY SECTOR**

A Thesis

submitted in fulfilment

of the requirements for the Degree

of

Doctor of Philosophy

at

The University of Waikato

by

VESNA SEDOGLAVICH

The University of Waikato

2008

Abstract

This study investigates the relationships between firm's technology, absorptive capacity and the internationalization process in the high-tech SMEs. The research identifies the most influential factors that affect the international activities and expansion decisions of New Zealand high-tech SMEs with core capabilities in agro-technology.

Mixed methods, qualitative and quantitative elements in the data collection and analysis, were employed in this research for a reason that a deeper understanding of the research subject and the analysis of complex issues such as the internationalization process and absorptive capacity required methodological variety. The use of qualitative and quantitative methods took place in parallel. Both methods were used to study the same subject but they had specific objective related purposes and they offered the possibility of developing rich empirical data as well as a more comprehensive understanding of the subject under the study.

The findings show that it is absorptive capacity that explains internationalization process, not internationalization process that explains absorptive capacity. The practice of internationalizing is as much a reflection of a firm's absorptive capacity as it is its determinant. The research identifies that high-tech SMEs possess technological and non-core absorptive capacity which in a different way influence firms' strategies. The research suggests that firm's technological capabilities and the advantage of specialized knowledge along with their limited non-core absorptive capacity act as constraints to the development of the future international strategy in high-tech SMEs.

The study expands the existing literature on internationalization by developing variables for evaluating absorptive capacity in firms. This helped develop an absorptive capacity model which can be used as a valuable tool for self-assessment by firms to facilitate gaining insight towards further growth and development. The research suggested that if firms were able to *measure* its absorptive capacity this may result in improved business activities and enhanced presence in the world market.

The results of this study should encourage firms to identify, capture and articulate knowledge achieved by their ventures. Managers must develop and nurture skills that ensure effective integration of learning as their firms expand, particularly internationally. These findings and absorptive capacity model offered as a tool should encourage managers to explore when, where, and how to best use firm's resources in the business operations. This is particularly important in regards to the research context (high-tech SMEs) where scientists are managers as well.

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1 Chapter Introduction

This chapter sets the scene for the thesis. In this chapter, a brief introduction of the thesis is provided. Section 1.2 addresses the nature of the topic, while Sections 1.3 and 1.4 explain technology transfer and absorptive capacity respectively. This is followed by a problem discussion in Section 1.5, while Section 1.6 deals with the research context, which leads to the research objectives and the central research question in Section 1.7. This is followed by a brief methodology in Section 1.8 and main intended contributions of the thesis in Section 1.9. Section 1.10 presents the structure of the thesis, while Section 1.11 concludes the chapter.

1.1 Introduction

The rapid globalization of business and the intensification of competition on a global scale have encouraged a number of firms seeking opportunities in international markets to develop strategies to enter into markets outside their home locations. Competition on a global scale is increasingly knowledge-based as firms strive to learn and to develop capabilities faster than their rivals (Teece and Pisano, 1994). Further, an essential requirement for survival and further growth of any business is successful adaptation to the environment (Watts, Cope and Hulme, 1998). In contrast, failure in business is more likely to be the result of inability to learn about the changes in the environment and ultimately to adapt to them. Yet the time between the identification of a problem and its arrival may not allow firms to internally develop the knowledge and capabilities needed to respond effectively (Dierickx and Cool, 1989).

The literature suggests that knowledge is the key source of firm-specific advantage, particularly as it applies to high-tech companies. The firm goes abroad to earn revenue derived from its store of knowledge; the creation and exploitation of that knowledge is the main reason for the success and growth of the firm over time (Caves, 1996). Accordingly, the primary advantage a company brings to

foreign markets is its possession of ‘superior’ knowledge, i.e. its most important proprietary asset is its technology and knowledge¹.

However, the following questions emerge: *What kind of knowledge do firms need to facilitate an understanding of their environments and how do firms co-evolve with their environments?* A firm’s existing accumulated knowledge is certainly the important element of a whole process. This study hopes to facilitate better understanding and to answer these questions.

The purpose of this chapter is to provide an introduction to the topic – the relationships between technology transfer and knowledge creation on one hand and the internationalization process on the other hand of the New Zealand high-tech SMEs with core capabilities in agro-technology.

1.2 The Nature of the Topic

A central issue in the theory of foreign direct investment has been the nature of firm specific advantages and their transfer across borders. Protecting the knowledge advantages of the company from opportunistic behavior by competitors is a key to ensuring the long run competitive advantage of the firm.

A firm’s knowledge as part of firm’s competitive advantage includes both easily communicated knowledge and tacit knowledge. Tacit knowledge exists in the shared norms or routines of the firm’s employees (Nelson and Winter, 1982); this is the ability of employees to reconfigure the routines to produce novel knowledge. As such, the development of tacit knowledge is viewed as a function of the evolutionary development of the firm (Nelson and Winter, 1982; Kogut and Zander, 1995) and is acquired through “learning-by-doing” (Stiglitz, 1987) or “learning-by-using” (Rosenberg, 1982). It is acquired only by “experientially and transferred by demonstration, by personal instruction and by the provision of expert services” (McFetridge, 1995, p. 413). Moreover, technological

¹ Following Dunning (1988, p.287) we define technology as the “output of technological and organizational capacity, which determines the way in which tangible and intangible resources may be converted into goods and services”.

competence² is unique to each firm. It is tacit knowledge and largely incomprehensible to competitors.

When a firm's capabilities are built on tacit knowledge and are rare, imperfectly tradable, and costly to imitate, they are the basis for superior performance (Spender, 1996). However, their strategic value to a firm can weaken over time as substitutes appear and new competitive situations emerge requiring to develop the methods for learning new external knowledge.

The growth and international expansion of technological capabilities in the firm is closely associated with accumulating international experience and increasing commitments to foreign markets (Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1990). This is not to suggest that technological capabilities across all firms are internationalized uniformly. While the general path of expansion is determined by product characteristics or industry affiliation, the development of foreign technological capabilities depends on market conditions at the critical time of foreign expansion and firm-specific events like unexpected merger and acquisition opportunities (Zander, 1998a). Additional influencing factors include management attitudes towards internationalization, strategy and dispersion of technological capabilities (Patel and Pavitt, 1997), as well as the amount of operational freedom granted to foreign affiliates (Behrman and Fischer, 1979).

While most of the existing frameworks for international market entry have been developed from the perspective of manufacturing firms, overseas expansion in the high-tech industries may be more complex. Although their entry mode selection choices may not differ substantially from those for manufacturing, high-tech firms face different challenges. They may be restricted to entry modes such as contractual relationships, licensing, franchising and foreign direct investment in order to protect the knowledge advantages of the company. Erramilli (1990) proposes that because information-intensive high-tech industries involve wide-

² Cantwell (1991, p. 50) suggests that "technological competence ... because it consists of those elements of a firm's technology which are distinctive, is never itself transferred through trade or copied exactly through spillovers to other firms."

ranging customization, the necessary tighter control dictates the use of foreign entry modes such as wholly owned subsidiaries or joint ventures. Such high-involvement entry modes require considerable resource and managerial commitment and do not give the firm full benefit from the experience accumulated during a more gradual approach to internationalization (Carman and Langeard, 1980). These limitations are aggravated for smaller firms, which may lack the necessary resources and/or managerial capabilities. McDougall, Oviatt and Shrader (2003) suggest that networks and knowledge are important factors for small technology-intensive firms' internationalization process.

This research suggests that the assumptions regarding the limited options for investment in a foreign country by the high-tech industries may be extremely simplistic because the nature of the high-tech industry affects the way in which firms in the industry produce and deliver their products. This creates a more complex environment than has been considered in much of the extant literature.

1.2.1 The Role of Knowledge in the Creation of Competitive Advantage

Bower and Hilgard (1981) suggest that an individual's learning is greatest when the new knowledge to be assimilated is related to the individual's existing knowledge structure. Extending these insights to the organizational level, Cohen and Levinthal (1990) suggest that a firm's prior knowledge must meet two criteria in order for it to be relevant enough to facilitate understanding and valuing new external knowledge. First, it must possess some amount of prior knowledge which permits the firm to understand the assumptions to the new emerging knowledge. Second, the next challenge the firm faces is how to internalize this knowledge. Cohen and Levinthal (1990, pp. 132-134) noted that "the assimilation process is influenced by a firm's tacit, firm-specific knowledge regarding its established systems for processing knowledge," and "a firm's knowledge is embedded in the organization's established knowledge-processing systems". Teece and Pisano (1994) suggest it is the embeddedness of valuable, firm-specific knowledge that is

the basis of a firm's capabilities and the ultimate source of sustainable competitive advantage (Spender, 1996).

In recent years knowledge creation in firms has been linked to the 'absorptive capacity' concept. It has been used by researchers to understand and explain various and complex organizational phenomena. The significance of absorptive capacity has been noticed in fields such as strategic management (Lane and Lubatkin, 1998), technology management (Schilling, 1998) and international business (Kedia and Bhagat, 1988). Cohen and Levinthal (1990) define absorptive capacity as the ability to value, assimilate and apply new knowledge. Mowery, Oxley and Silverman (1996) add that absorptive capacity comprises a broad array of skills, reflecting the need to deal with the tacit components of knowledge, as well as the frequent need to modify these skills. Zahra and George (2002) define absorptive capacity as a set of organizational routines and processes, by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability. While these studies have made substantial contributions to the existing body of knowledge, the empirical literature on how the firm's absorptive capacity influences the internationalization process, specifically as it applies to high-tech SMEs is quite limited.

Moreover, researchers have used absorptive capacity in their analysis of diverse and complex organizational phenomena. Despite the growing use of the absorptive capacity construct, its understanding remains challenging. To advance our understanding of absorptive capacity, this study raised the following question initially posed by Van den Bosch, Volberda and de Boer (1999): *"How can a firm's absorptive capacity be understood as a joint outcome of managerial actions and developments in the knowledge environment?"* In addressing the question the research argues that besides understanding the absorptive capacity phenomenon, absorptive capacity measurements also need to be considered.

The purpose of this study is to lay a foundation for future research that utilizes the absorptive capacity construct. To accomplish this, the study critically reviews the most cited literature on absorptive capacity to identify the imprecision in their definitions and its application of the term and to show that absorptive capacity can

and has to be measured. A reason for utilizing the absorptive capacity measurement is to help firms to better understand the international environment in order to achieve competitive advantage and to enhance their presence in the world market. By doing so this research intends to extend the two most-cited absorptive capacity definitions in the international business literature: Cohen and Levinthal (1990) and Zahra and George (2002). Both studies established capabilities of a firm and components of absorptive capacity as a concept but not as measurements. However, in order to achieve and sustain a competitive advantage in the world market a firm needs to be able to measure its absorptive capacities to improve its competitive positioning. The confusion about the absorptive capacity concept may come from the lack of clarity and the vagueness of prior definitions which increases concerns about the sphere of influence and measurement of absorptive capacity.

The primary proposition advanced in this thesis is that absorptive capacity might assist companies respond to the imperfect markets with intangible assets, such as technology. A number of different types of imperfect markets for intangible assets have been identified. However, markets for technology are identified to be one of the strongest cases (Buckley and Casson, 1976; Teece, 1986).

While the theories of internationalization have made substantial contributions to the existing body of knowledge and help to explain motivations to commence international expansion, choice of entry and the strategy process in foreign markets, the empirical literature on how the firm's technology and absorptive capacity influence the internationalization process, specifically as it applies to high-tech SMEs is quite limited. To date there is no well integrated approach that considers impact of both technology transfer and absorptive capacity on firms' foreign strategy. Since the strategy decision heavily influences the firm's internationalization process, this study hopes to make a contribution and provide some new observations on the nature of business activities undertaken by firms outside their home base.

The present study concerns the impact of technology transfer and absorptive capacity on the internationalization process of the New Zealand high-tech SMEs

with core-competencies in agro-technology. The following question has initiated this study: *“What kind of knowledge should New Zealand high-tech SMEs possess in order to develop the ability to successfully adapt in a new business context?”*

1.3 Technology and the Internationalization Process

Technology is one of the most fundamental of the core capabilities of a firm. Technology consists of many dimensions such as hardware (Woodward, 1965), search procedures (Perrow, 1967) or skill and knowledge (Rousseau and Cooke, 1984). Its diversity of forms ranges from a simple technical process to a very complex electronic or computer system. Stewart and Nihei (1987) regard technology as an innovation which is associated with new and better ways of achieving economic growth and development. Technology is also defined in terms of knowledge and skills necessary for a specific task, such as utilizing a production technique or making a specific product. Technology is therefore a whole range of knowledge, skills, ideas, routines, equipment and facilities that organizations need to produce goods and services. It is a body of knowledge embodied in human capital and machines, and in software and standard operating procedures of the organization. As such, it is inevitable that technology will become one of the central factors in deciding the firm's strategy. How strategy and technology interact with each other is one of the basic themes of this research.

Technology transfer, knowledge and experience necessary for the planning, establishment and operation of production in a foreign market is increasingly becoming a fundamental element of a strategy of a firm. Generally speaking, technology is a whole range of knowledge, skills, ideas, equipment and facilities that organizations need to produce goods and services.

The literature on the internationalization of business suggests a number of different reasons for undertaking technological activities outside the home country. For example, Vernon (1966, 1979) argued that having established a new product or a new production process in the home market, firms would

subsequently export and/or locate production facilities in foreign locations. This process would certainly involve some foreign R&D activity mainly concerned with adapting the products and the production processes to suit the local market conditions. Therefore, the main purpose of foreign technological activities would be to support foreign production and to service the foreign market. In such a scenario, companies would be mainly exploiting technological advantage created within the home country.

However, Cantwell (1992, 1995), Pearce and Singh (1992) and Dunning and Narula (1995) suggest that two other factors have become increasingly important: the need to monitor new technological developments and the ability to generate entirely new technologies and products from foreign locations. Both of these have been attributed to a complexity of technology and the increasing rise in the cost of R&D. In the former case, the need to monitor new technological developments, a company would be active abroad in technologies where there is complementarity between the strength of the host country and its own domestic strength. In the latter case a company is simply interested in exploiting the technological advantage of the host country in order to lessen technological weakness at home. Since the research context in the present study is New Zealand high-tech SMEs with core capabilities in agro-technology (explained in more detail in Section 1.6 and in Chapter 3), the following question has helped in developing the study: *“What kind of knowledge should New Zealand high-tech SMEs possess in order to be able to successfully monitor new technological developments?”*

The geographical dispersion of technological capabilities is becoming an important addition to the overall internationalization of the companies. The expansion of technological activities involves the emergence of increasingly advanced technological capabilities outside the country of origin, which are associated with enhanced flexibility and the formation of new innovation processes within the company. More specifically, traditional routines for innovation are being accompanied by an increasing amount of globally integrated innovation projects.

The growth and international expansion of technological capabilities in the company is closely associated with accumulating international experience and increasing commitments to foreign markets (Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1990). This is reinforced by the centrifugal forces which over time enhance technological activity among foreign units of the established company (Cantwell, 1992; Granstrand, Hakanson, and Sjolander, 1992; Forsgren, Holm, and Johanson, 1995). This is not to suggest uniform internationalization of technological capabilities across all firms. Underneath the general path of expansion determined by product characteristics or industry affiliation, the development of foreign technological capabilities depends on market conditions at the critical time of foreign expansion and firm-specific events like unexpected merger and acquisition opportunities (Zander, 1998a). Additional influencing factors include management attitudes towards internationalization, strategy and dispersion of technological capabilities (Patel and Pavitt, 1997), as well as the amount of operational and technological freedom granted to foreign affiliates (Behrman and Fischer, 1979).

Technology transfer among multinational organizations has been the subject of much research (i.e., Buckley, 1997; Kogut and Zander, 1995; Dunning, 1988). In general, this body of research has led to the conclusion that organizations engage in the transfer of technology in order to profit directly from the transfer (as in licensing agreements), profit indirectly from the dissemination of the product or process (e.g. establishing industry standards), or in order to enable foreign affiliates to utilize organization-specific technologies in their operations. Further, technology transfer from MNEs to host countries is the primary mechanism by which developing countries receive technology (Caves, 1996; Dunning, 1993a).

The mode by which technology is transferred is influenced by the characteristics of the advantage that motivates the growth of the firm across borders. Maignan and Lukas (1997) and Woodcock, Beamish and Makino (1994) argue that entry modes (and foreign strategies) may be differentiated according to three characteristics: quantity of resource commitment required, amount of control and level of technology risk.

The first, resource commitments are the involved assets that cannot be employed for other uses without incurring costs. Resources may be intangible, such as managerial skills, or tangible, such as machines and money. The amount of required resources varies dramatically with the entry mode, from almost none in the case of indirect exporting, or the minimal training costs associated with licensing, to extensive investments in facilities and human resources in wholly-owned subsidiaries.

Second, control is the ability and willingness of a firm to influence decisions, systems, and methods in foreign markets. In a franchise type of licensing agreement, control over the operations is granted to the franchisee in exchange for some type of payment and for the promise to abide by the terms of the contract. In a joint venture, control is shared formally according to level of ownership, as when equity ownership over 50 percent gives one of the partners the largest number of directors on the board. However, informal control mechanisms may also be exerted as when one partner possesses and uses knowledge and information that the other lacks. Wholly-owned subsidiaries are attractive to many companies because this mode enables the multinational company to exert the most control in decision-making.

Technology risk is a third parameter of modal forms and decision-making. According to the resource-based view of the firm a firm's competitive advantage is rooted in its own resources and those that it can acquire. One key resource is the firm's knowledge, more specifically, its codified knowledge (i.e., knowledge that can be easily identified, structured, and communicated) and its tacit knowledge (i.e., knowledge that is rooted in the firm's culture, routines and processes) (Kogut and Zander, 1992; Madhok, 1997). This concept can be defined as the potential for a firm's applied knowledge (tangible or intangible) to be unintentionally transferred to a local firm. In a licensing agreement, the risk of the licensee reproducing and using the licensor's technology in the future may be high. Joint venture partners may also learn and acquire unspecified elements of the other firm's technology in the context of their partnership. Technology risk is probably lowest in a wholly-owned subsidiary, since the operations are under the control of only one firm.

The choice of foreign market entry mode depends on the mode's ability to transfer the company's competitive advantages and/or knowledge. However, the literature suggests that protection of knowledge from the threat of opportunism posed by business partners is a primary driver of the choice of mode. Woodcock et al. (1994) claim that resource commitment, control, and technology risk are highly correlated. For example, increased control leads to lower technology risk. Yet, control also requires increased resource commitment. Some researchers have argued that the entry mode decision consists mainly of determining the levels of resource commitment, control, and technology risk that the international entrant desires or can accept (Maignan and Lukes, 1997; Woodcock et al., 1994).

Taking into account the New Zealand high-tech firms' ability to create novel knowledge and constraints posed by the country's remoteness and firms' size (explained in more details in Chapter 3), the question is: "*How do New Zealand high-tech SMEs balance required resource commitment, amount of control and level of technology risk when choosing a foreign market? What kind of knowledge should the New Zealand high-tech firms possess in order to be able to successfully transfer their technology to foreign markets?*"

The following section briefly explains the issues related to the lack of market knowledge and introduces the absorptive capacity concept.

1.4 Absorptive capacity

1.4.1 Market Knowledge

Lack of market knowledge in undertaking international assignments makes the international expansion of a firm a complicated task. Researchers have placed great importance on lack of market knowledge and incorporate it as an important element in studies and the development of more theoretical models (Barkema, Bell and Pennings, 1996; Inkpen and Beamish, 1997; Johanson and Vahlne, 1977; Li, 1995). Lack of market knowledge is linked to modes of establishments so that

those incorporating more resource commitments also acquire deeper local market knowledge (Inkpen and Beamish, 1997). It has also been shown that lack of market knowledge implies lower performance (Li, 1995) and difficulties in overcoming obstacles associated with cultural distance (Barkema, et al., 1996). According to the Uppsala internationalization process model, the lack of foreign market knowledge is reduced as a firm increases its market commitment (Johanson and Vahlne, 1977).

A firm's lack of knowledge relates to a wide variety of issues handled in international business. These issues are the transferability of knowledge (Kogut and Zander, 1993), institutional conditions (North, 1990) and organizational structure of the firms engaged in international business exchange (Bartlett and Ghoshal, 1989), which has been found to take place within the frame of international business relationships (Blankenburg Holm, Eriksson and Johanson, 1996). Consequently, one approach to capture the firm's lack of knowledge is to study its lack of knowledge about international business relationships. Such relationships have been found to be interdependent with other relationships in networks (Blankenburg Holm, et al., 1996; Coviello and Munro, 1997). Lack of foreign market knowledge can, therefore, be considered as lack of knowledge on networks of business relationships that are connected to each other (Johanson and Vahlne, 1990). Through their networks, firms obtain general knowledge such as marketing, technological, cultural and competitive information that increases the success rate of a firm. Knowledge of specific relationships in a network is learned by doing is tacit and hard to transfer. This can be illustrated by the fact that conducting international business relies on experiential learning, which emerges from accumulated experiences of specific relationships (Barkema and Vermeulen, 1998; Delios and Beamish, 1999).

Foreign market knowledge is often acquired by firms through collaboration with others who have this knowledge (Bell, 1995; Chetty and Blankenburg Holm, 2000). By collaborating with other firms, they gain access to various sources of information thus offering more opportunities to learn rather than relying on knowledge from within the firm (Grabher, 1993). The new information that the firm is exposed to in these relationships enable it to improve its understanding of

its business partners in foreign markets and to learn how to collaborate with them. The more experience the firm has to collaborate and to acquire information from these relationships, the more capability it will have to identify the value of this new information, and the extent to which it lacks foreign market knowledge.

According to the ‘internationalization process approach’ on business networks and internationalization, the internationalization of firms should be seen as a ‘set of connected learning processes’ (Axelsson and Johanson, 1992). These processes involve other actors in the network: competitors, suppliers, customers, and government. The firm’s relationships with these various actors are its most important assets (Sharma and Johanson, 1987) and an important source of acquiring foreign market knowledge. Being part of a business network is of strategic importance as the firms are exposed to external information and opportunities in new markets (Axelsson and Johanson, 1992; Coviello and Munro, 1997). Coviello (2006) suggests that if the early mobilization of international new ventures is facilitated by network relationships, it is reasonable to assume that such ties emerge from pre-internationalization. This builds on Wiedersheim-Paul, Olson and Welch (1978) observation that the “likelihood of acquiring a fortuitous order will in many cases be dependent upon the pre-export activity of the firm” (p. 53). Further, Shane’s (2000) research shows that the development of a new organization may be imprinted through ties and knowledge generated pre-founding. In response to McDougall and Oviatt (2003) call for research in this area, Coviello (2006) addresses a need to understand international new venture networks at not only internationalization and pre-internationalization but also pre-founding.

The firm combines its existing knowledge with that of other partners to create new knowledge. It is through these relationships that the firm learns how to do business in foreign markets, and obtain the information to identify what type of foreign market knowledge it lacks. In addition, the knowledge and information acquired through its relationships enables the firm to identify the type of foreign market knowledge it lacks and the obstacles this will create in an ongoing business activity. Accordingly the following question has been raised: “*What is*

the role of networks in acquiring market knowledge in the New Zealand high-tech firms' foreign activities?"

The next section discusses the relationship between the lack of market knowledge and the absorptive capacity concept.

1.4.2 Absorptive Capacity and the Internationalization Process

In recent years, researchers have used absorptive capacity in their analysis of diverse, significant and complex organizational phenomena. The importance of absorptive capacity has been noted across the fields of strategic management (Lane and Lubatkin, 1998), technology management (Schilling, 1998), international business (Kedia and Bhagat, 1988) and organizational economics (Glass and Saggi, 1998).

The absorptive capacity concept evolved out of prior research on internal firm performance, for example, the role of R&D on firm performance and organizational learning (Fiol and Lyles, 1985; Levitt and March, 1988). Van Den Bosch, Van Wijk and Volberda (2003) suggest that the term 'absorptive capacity' was originally used by Kedia and Bhagat (1988) in the context of technology transfers across nations.

A firm's ability to use its experiences to identify new information and to integrate this information to create useful knowledge in an ongoing business is referred to as a firm's absorptive capacity (Cohen and Levinthal, 1990). A firm may decide not to exploit new information even though this information could be important (Cohen and Levinthal, 1990). The reason may be that the capacity to absorb knowledge is cumulative and if the firm has no prior experiences with, for example, customers in foreign markets, it finds that it lacks the capabilities to learn from this new information.

A firm's experiences provide it with the prior related knowledge to collaborate with others and the ability to handle new situations. Prior experience with collaboration promotes absorptive capacity that helps the firm benefit from future co-operations as they have developed routines for gathering, interpreting and transferring information (Simonin, 1999). Since prior related knowledge facilitates the development of new knowledge in an ongoing business, it can also be argued that a lack of foreign market knowledge is dependent on the prior related knowledge of business networks in foreign markets (Eriksson and Chetty, 2003). In particular, the more experience the firm has of acquiring foreign market knowledge in past assignments, the more absorptive capacity it will develop.

A firm operating in diverse foreign markets could be accumulating a wide range of knowledge, which provides it with the absorptive capacity to recognize which new opportunities to exploit (Miller and Chen, 1996). The firm has to know how to integrate its knowledge by recognizing what it has learnt in the diverse markets and how it can use this knowledge in an ongoing business (Zahra, Ireland and Hitt, 2000). The firm's involvement in multiple markets gives it access to relationships that enhance learning and innovations. These new ideas and new practices encourage innovations and thus enhance the firm's capabilities (Miller and Chen, 1994; Miller and Chen, 1996; Abrahamson and Fombrun, 1994). When a firm becomes involved in more diverse markets, however, it needs to increase investment to acquire the capability to conduct business in each of these foreign markets. In addition, a firm needs to have the capability to successfully integrate this knowledge from diverse markets in an ongoing business as involvement in a diversity of markets can impede the speed of the firm's learning (Zahra, et al., 2000).

Previous experiences determine the routines which are fundamental to the firm's future actions and these routines have to be relevant to those needed in a particular market (Madhok, 1977). Next in importance are the gains associated with learning from previous expansion in other countries, which are from the same cultural bloc. Of least importance is the learning from earlier expansions in countries that are culturally more close to the home country. However, Barkema, Bell and Pennings (1996) argue that the significance of previous experience in the same

country supports the view that ‘experiential’ knowledge (Johanson and Vahlne, 1977; Penrose, 1959) from a country is important and that it increases the success rate of additional assignments within the same country.

Moreover, as firms increase the share of their operations abroad, thus increasing their degree of internationalization, they experience exposure to new environments and if successful, they build more absorptive capacity (Miller and Chen, 1996). The previous literature often implicitly assumes that internationalization is the “cause” of firm’s absorptive capacity – that is, by increasing international activities it has a direct impact on firm’s absorptive capacity. Although it is true that, in part, the causality may move from internationalization to absorptive capacity, the above mentioned assumption ignores an important fact that firms go abroad to exploit and/or acquire firm-specific advantages. That is, firms develop techniques and products that give them some competitive advantage in domestic markets; these firms then move abroad to exploit the firm-specific advantages. The firms that are doing well domestically are most likely to move abroad.

However, the effect of domestic operations on knowledge accumulation in internationalizing firms is unclear. Accumulating knowledge in domestic markets may have a negative effect on a firm’s accumulation of foreign business knowledge. This may happen, as going abroad implies operations in a new environment and this may require *unlearning* of some old knowledge and practices developed in the domestic market. The knowledge accumulated in domestic markets may over develop as a barrier to internationalizing. The longer a firm operates in the domestic market the more difficult it is to unlearn such knowledge and practice.

If it is believed that internationalization somehow improves firm absorptive capacity, then it should be accepted that expanding abroad will lead to improvements in firm’s knowledge. On the other hand, to the extent that firm knowledge is high because of firm-specific advantages, internationalization might be a reflection of underlying firm-specific advantages. This study suggests that if firms decide to move abroad and improve absorptive capacity, and the decision is

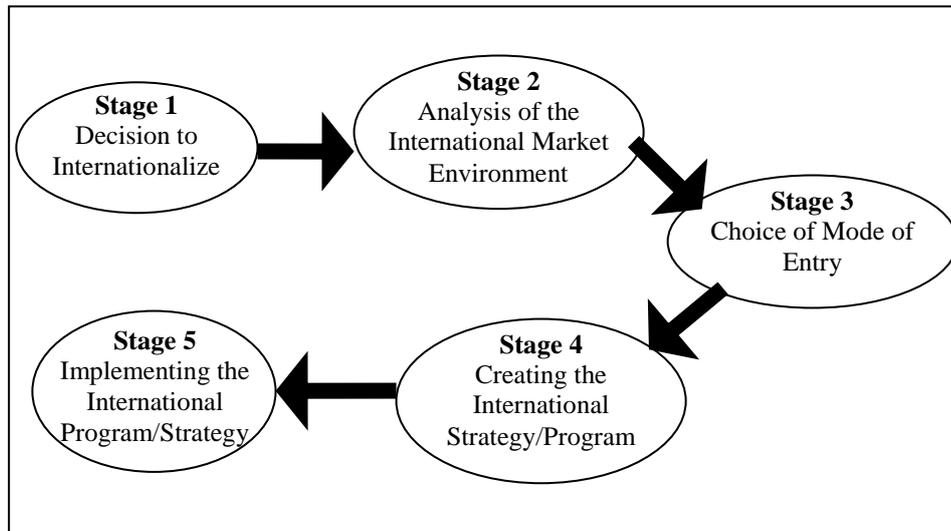
solely based on the belief that there is a positive relationship between the internationalization and absorptive capacity, then such a strategy may not result in improved firm performance.

This research suggests that if a firm is able to *measure* its absorptive capacity, this may result in improved business activities and performance. A reason for absorptive capacity measurement suggested by this research is to help firms to better understand international environment, to achieve competitive advantage and to enhance their presence in the world market. By doing so the research intends to extend the two most-cited absorptive capacity definitions in the international business literature: Cohen and Levinthal (1990) and Zahra and George (2002). Both studies established capabilities of a firm and components of absorptive capacity which are not measurable in nature. However, in order to achieve and sustain a competitive advantage in the world market, these concepts must be readily translated into operational measures of absorptive capacity.

1.5 Research Problem Discussion

Increasingly, a number of firms are seeking opportunities in international markets. This imperative is being driven by the rapid globalization of business and the intensification of competition on a global scale. Firms deciding to enter a foreign market face a critical decision in developing strategies and choosing the most appropriate market entry mode based on an evaluation of firm's own strengths and weaknesses along with an assessment of the external environment in which it intends to operate. The strategy decision heavily influences the firm's internationalization process. When companies are planning their internationalization, they go through a number of phases that eventually leads to establishment in the foreign country. It is therefore helpful to study a model that describes this process (see Figure 1.1), (Bradley, 1995).

Figure 1.1: Five-stage Process Model of Internationalization



Source: Adapted from Bradley (1995)

The first stage in the internationalization process includes the motives behind the decision to go international. In stage two, the marketing environments have to be scanned, examined and evaluated, with the intention of finding a market that is suitable for the company's operations. In stage three, the company has to select an appropriate mode of entry. When the mode of entry has been decided upon, the firm has to design an international strategy/program in stage four. The fifth stage involves implementing the international strategy/program in the selected country (Bradley, 1995). This model of internationalization can be utilized when describing how most companies design their market entry strategy, and this leads us to the purpose of this research.

In addition, the subject of internationalization of technology has received increasing attention among academics (Dunning, 1992; Pearce and Singh, 1992; Cantwell, 1992; Cantwell, 1995; Florida, 1997; Kumar and Subramaniam, 1997). However, as Granstrand et al., (1992) put it:

“...internationalization of R&D and technology is a phenomenon with many dimensions but with – after all – few available observations so far, leaving ample room for uncertainty and speculation.” (p. 133).

This thesis is an attempt to address the growth and international expansion of technological capabilities in the firm. The aim of this thesis is to distinguish between different patterns of foreign technological activities at the firm level by examining the internationalization process of high-tech SMEs³. More specifically, this thesis explores how a firm's technology and absorptive capacity influence the foreign strategy of a firm from a New Zealand perspective. Due to the increased competition on the domestic and global scale and challenges faced by local SME's in the highly competitive environment in New Zealand, SME's "in search of a wider customer base and scarce resources often need to internationalize much earlier than SME's with access to larger markets" (Akoorie and Scott-Kennel, 2005, p. 90). Since the majority of firms in New Zealand can be classified as SMEs⁴ this is an appropriate location to examine this phenomenon. In addition, the New Zealand economy is still heavily reliant on foreign exchange earnings derived from agricultural production, even though the technology to produce agricultural outputs such as dairy products have historically been embedded in the products exported. More recently outputs from the agro-technology industries which have been used to develop efficiency and innovation in farm systems, generics and 'spin-off' industries are now being used to generate earnings through technology transfer. The research question underpinning the research problem discussion is: "*What is the impact of firm's technology on its internationalization strategy in New Zealand high-tech SMEs?*"

1.6 The Research Context

This section begins with a short overview of the New Zealand economy with a particular emphasis on the agritech industry. The section continues with a brief description of the CEECs. Along with the New Zealand economy CEECs were chosen to be a research context because the region represents both a large market

³ Differences in measurement and use of terminology means that caution must be used when comparing indicators of firm dynamics and business demography across countries (Akoorie & Scott-Kennel, 2005, pp. 92). In the US the definition of SMEs is industry-specific, while the OECD defines SMEs as firms with fewer than 500 employees (OECD, 2002)

⁴ The Ministry of Economic Development in New Zealand categorizes the small enterprises as those employing 0-5 full-time employees, and at the same time as medium enterprises are those employing 6-19 full-time employees (Akoorie & Scott-Kennel, 2005, p. 92). Ninety-six per cent of firms in New Zealand employ 19 or fewer full-time employees.

for agricultural and food products, and an important region for agricultural production and trade. The region is characterized with a sizeable productivity gap compared to the OECD countries. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector. At the same time, the changes in the region suggest an ever increasing need for further growth, which offers real potential for expansion of New Zealand's agrotechnology exporters. The more detailed discussion of both the New Zealand economy and the CEECs is given in Chapter 3 of this thesis.

1.6.1 The New Zealand Economy

New Zealand has a mixed economy with manufacturing and service sectors complementing an export-oriented agricultural sector (New Zealand Treasury, 2000). New Zealand is an open economy dependent on trade. External trade is of fundamental importance to New Zealand. The country has been reliant in exports of commodity-based products as a main source of export receipts and relies on imports of raw materials and capital equipment for industry, making New Zealand strongly trade oriented.

New Zealand's \$3 billion agritech industry (Market New Zealand, 2007), which has evolved over 150 years to meet the demands of New Zealand's pasture-based farm system. Today its products and systems are in demand around the globe, with annual exports of about \$700 million (Market New Zealand, 2007). The majority of New Zealand's agritech companies are focused on improving farmers yields and productivity through information technology and animal and plant-based biotechnologies, such as livestock farming, improved genetics, products for pasture management, animal health etc. The following firms are just several examples: Tru-Test's world-leading electronic milk meters; Dexcel's sustainable resource planning software Smartplan, which enables water quality, resource management compliance and animal welfare issues to be planned dynamically at the farm level; Sensortec's technology platforms for on-line measurement of biological components in animal fluids, targeting components in milk capable of

providing information on animal health, milk quality, reproduction and nutrition (Market New Zealand, 2007).

A tradition of large animal farming has led to the development of many effective and innovative animal health solutions. A range of companies are concentrating on the research and development of products that boost animal immune systems and technologies for better disease diagnostics and drug delivery systems for animals. Further, New Zealand's strong tradition in plant science research is being applied to crop improvement. Innovations include techniques to modify crops that will improve food production and decrease costs.

The focus of agritech companies has been on improving the profitability of farmers, who in New Zealand have been operating without subsidies for some 20 years (Market New Zealand, 2007). Another characteristic of the agritech industry in New Zealand is the willingness of its firms to work together. By collaborating the companies are able to succeed in export markets.

New Zealand has a strong tradition in agricultural export industries. Past economic success of the country can be attributed to combining practical knowledge with technical innovation, research and development, and the benefits of an ideal environment and climate. Currently enjoying a 70% share of the domestic market but only a 1% share of the global market (Market New Zealand, 2007), New Zealand-based companies have huge potential for export growth.

Agricultural technology exports are increasing rapidly (see Table 1.1) for New Zealand companies as they adapt their innovative solutions discovered in New Zealand for practical, on-farm problems, to countries around the world. Growth in the agro-tech sector over recent years has been significant, with foreign exchange earnings more than doubling since 1994 to reach NZ\$628 million for the year ending June 2002 and being NZ\$700 million in 2006 (Market New Zealand, 2007). During each of the last four years the sector has grown significantly, a trend expected to continue over next years. The agritech sector has successfully supported agricultural farming in New Zealand and now has exports of about \$700 million annually.

Table 1.1: New Zealand agritech exports from 1994 - 2006

Year	Value (million NZ\$)	Increase on previous year - %
2006	\$700	110.94
2004	\$631	106.05
2003	\$595	94.75
2002	\$628	103.45
2001	\$607	202.33
1994	\$300	-

Source: www.marketnewzealand.com

New Zealand agritech companies are active in many countries. Most interest is coming from countries where farmers are seeking to implement more cost-effective farming systems. Major export markets are Australia, the USA, the UK, Europe, South America and South Africa and potential, emerging markets are Central/Eastern Europe, China and Asia (Market New Zealand, 2007).

New Zealand has developed a specialization for innovative niche production in engineering and manufacturing across many sectors, including plant and equipment, food processing, agricultural machinery. For example, the need to support and add maximum value to primary sector produce and overcome the difficulties presented by the country's geographic isolation has seen New Zealand develop expertise in food processing technology. The flexibility to design and customize solutions sets New Zealand companies apart from many of their global competitors.

Table 1.2: Royalties and License Fees from the Balance of Payments

	Exports \$(000)	Imports \$(000)	Difference Export-Import \$(000)
June 2000	96,491	633,231	-536,740
June 2001	138,041	772,158	-634,117
June 2002	126,433	742,952	-616,519
June 2003	234,596	723,361	-488,765
June 2004	196,048	746,866	-550,818
June 2005	140,611	807,374	-666,763
June 2006	169,045	755,591	-586,546

Source: www.stats.govt.nz

Table 1.2 shows royalties and license fees from the New Zealand balance of payments from 2000 to 2006. Persistent deficits have outweighed the outstanding results in technological development in New Zealand, which reflect New Zealand's status as a net debtor to the rest of the world.

Innovative and state-of-the-art solutions that have been found for primary producers looking to add value to primary produce with lower unit costs, consistent quality and products which can give premium pricing and positioning, originated primarily in response to the needs of New Zealand's primary sector. New Zealand engineering companies operating within the agricultural sector design and build plants, customize modification to existing plant and make specialized equipment including robots, automated sorting and packaging equipment to name a few. Even though the producers of these systems, plants and equipment, and agricultural machinery have seen the export potential of their developments, their innovative solutions are primarily embedded in the products.

1.6.2 Central and Eastern European Countries

Changes in the political and economic arrangements in the post-communist countries following the fall of the Berlin Wall in 1989 attracted the attention of the international community. Governments in more than 20 post-communist countries are currently involved in programs directed at transforming their

economies from the socialist planned-economy system to the market system. The pre-1989 socialist countries of Central and Eastern Europe were largely characterized by a deliberate isolation from other parts of the world economy. All segments of their international economic cooperation, including trade, investment and technology flows, were predominantly occupied with intra-Soviet bloc transactions while economic ties with countries outside the region were rather weak. The change of political regime and beginning of the transition process from a centrally-planned to market economy was a starting point on the region's path towards global economic integration.

Most Central and Eastern European countries (CEECs)⁵ introduced policy reform packages from 1989-1990. Reform policies of the 1990s were aimed at completing the dismantling of the bureaucratic-oriented economy and introducing new policies to support a market economy, both at the macroeconomic and sectoral levels, on one hand, and getting ready for EU accession. Current EU member states are: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.

After successfully growing from 6 to 27 members, the EU is now preparing for the next enlargement. Candidate countries and stability process countries are: Turkey, Croatia, Macedonia, Serbia, Bosnia-Herzegovina and Albania. In 2007, 50 years after signing of the Treaty of Rome and the beginning of European integration, European Union has a population of almost 500 million.

Further, the agrarian economies of CEEC continue to undergo systemic change and transformation. The agricultural sector in CEECs countries is confronted by two huge problems simultaneously: transition processes and sustainability. With the introduction of reforms the role of agriculture, although still important, has

⁵ It is now common to refer to Central and Eastern Europe as one region. This region is generally considered to consist of Poland, Hungary, the Czech Republic, Slovakia and the Balkan States of Romania, Bulgaria, Albania and the former Yugoslavia comprising Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro and Macedonia.

changed. The emphasis now in most CEECs is to develop an efficient, productive, and sustainable export oriented agriculture based on comparative advantage.

The relative inefficiency of agriculture is one of the most important challenges facing the countries of the CEEC. Creating viable private farming based on private ownership of land, and allowing market signals to determine levels and types of production have been some of the most difficult tasks of the transition period (Csaki and Zuschlang, 2003).

During the 1990s, the agro-food sector in all Central and Eastern European countries faced enormous difficulties arising from the transition process and inherited problems from the previous communist period. These included the initial cost-price squeeze, the slow pace of privatization, over-capacity in the downstream sector, lack of mobility of agricultural assets and inefficient and underdeveloped market structure and mechanisms. Additional problems have also been a shortage of finance for modernization and restructuring, tough competition on third country markets, insufficient development of human capital, and the lack of a long-term strategy for the development of agriculture.

During the latter part of the 1990s, the main policy focus shifted to deeper restructuring and productivity improvement in agriculture, as well as integrating agriculture within the broader context of rural development. Further, rural development policies are becoming a high priority in the CEECs due to the growing domestic economic disparities between different regions. Within the framework of the EU pre-accession program to assist in the preparation of agriculture for full participation in the EU internal market, a large range of projects for developing agriculture and rural areas are developed, including help financing farm development and improvement of infrastructure in rural areas.

With a population of over 100 million people, the CEECs represent both a large market for agricultural and food products, and an important region for agricultural production and trade. With greater economic stability in all countries in the region accompanied by progress in farm restructuring and modernization of the food processing industry, agricultural exports are likely to grow in the medium term.

However, there is still a sizeable productivity gap between most CEECs and those in the OECD, although in the most advanced reformers in the region, this gap is diminishing quickly. The level of agricultural labor productivity in CEECs was between 3 and 73 per cent of that of EU countries in 1998 (OECD, 2000). Only three countries show labor productivity of more than 50 per cent to that of the EU (the Czech Republic, Hungary and Slovenia), and productivity for Central and Eastern Europe as a whole was only 15 per cent of the EU's level. This productivity gap also means that agricultural producers of CEECs are performing at a level that is far below the region's technological potential. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector, and further efforts are needed to overcome management inertia. The future trend in agricultural output will not only depend on the prospects for commodity prices, but also on improvements in productivity and competitiveness in the agro-food chain.

Changes in the region suggest an ever increasing need for further growth, which is in accordance to the EU accession conditions. There is also a commitment to the so-called Lisbon strategy that aims to transform the EU (including the CEECs) into the world's most competitive knowledge-based economy by 2010 (Economic Survey of Europe, 2005). CEEC's industries have high demands for various kind of products (equipment, machinery, software solutions etc.), which suggests that there is a potential for New Zealand high-tech firms to improve their international performance. This offers a real potential for expansion of New Zealand's exporters. However, in order to successfully exploit potential of new emerging markets, the following questions need to be answered:

“How do New Zealand high-tech SMEs organize the internationalization process? How do firms select new foreign markets?”

1.7 Research Objectives

The focus of the research is on eight New Zealand high-tech SMEs with core capabilities in agro-technology and on their process of internationalization. This research identifies the most influential factors that affect the international activities and expansion decisions of New Zealand high-tech firms, with a particular emphasis on the new emerging markets, gaining a deeper understanding of the strategy used by firms having outstanding technology. Further, the thesis is aimed at evaluating how particular New Zealand companies do or do not exploit the window of opportunities that the Central and Eastern European countries offer.

Further, there is limited empirical research on the role and influence of both technology transfer and absorptive capacity of the firm in the internationalization process. Similarly, research of the impact of technology transfer and absorptive capacity on strategy, international activities and market development is lacking, despite extensive literature on the internationalization process of a firm (see Chapter 2). This gap may be partially attributed to research emphasis on understanding the internationalization process from the perspectives of *foreign market entry mode* and the sequence of stages rather than *the managerial perspective* in terms of management foreign experience, functions and activities.

The purpose of this thesis is, therefore, to develop and examine a model of how absorptive capacity, its depth and diversity of experience and firm's technology affect the internationalization process. This includes a detailed study of how absorptive capacity affects the manner in which a lack of foreign market knowledge is perceived as an obstacle to carrying out the ongoing business and how the firm organizes technology transfer and knowledge management.

This thesis has three main objectives:

The first objective is to explore and describe the nature of technological activities undertaken by firms outside their home base and to understand the process of internationalization of high-tech companies with the core capabilities in agro-

technology and their development activities (from the perspective of technology transfer, knowledge management and absorptive capacity).

The second objective is to develop a conceptual model that seeks to describe the underlying determinants of the strategy choice and dynamic interaction between strategy and technology, on one hand, and absorptive capacity and strategy, on the other hand, and to answer the question of ‘how a firm’s superior technology and absorptive capacity may affect the way the international business is conducted’.

The third objective is to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate development of absorptive capacity in firms.

Further, for practical reasons, the research provides a framework that may help to evaluate the strategic decisions to entering new emerging markets such as CEEC. This region⁶ is selected since it represents an area that agro-technology companies in New Zealand may consider as a target for their operations given the need to modernize the former communist countries in the decades to come

The thesis explores the process of internationalization of high-tech SMEs and identifies the most influential factors that affect the expansion decisions of New Zealand firms into new emerging markets.

The findings of this study would provide potentially helpful information about factors affecting past decisions and could inform and improve future firm decision-making process. Knowing the factors that were central considerations in the strategy choices made by other companies can improve the firms’ strategies and decision-making process generally. Subsequently, understanding why particular factors are associated with the particular strategy choice in a particular market can be useful in helping develop international strategies for New Zealand firms. This would be of great significance to both business practitioners and scholars because choosing the means of entering a foreign market is a vital

⁶ In this thesis the following CEECs will be examined: Poland, Hungary, the Czech Republic, Slovakia and Slovenia.

strategic decision, especially where technology transfer is concerned. This has a crucial impact on the competitive advantage of multinational companies, not to mention the opportunities that have emerged in CEECs. Besides having significant implications for practice, the framework should have implications for international business research, technology transfer and absorptive capacity.

To achieve the research objectives, the following central research question guiding the empirical investigation is proposed:

“What is the impact of firm’s technology and absorptive capacity on the internationalization process?”

1.8 Methodology

To solve the complex research objectives, this thesis had to go beyond standard mathematical techniques and/or pure interpretation of data. Instead, there was a need for complementary research approaches and methods. Two different research methods were adopted in the thesis. The research objectives and research questions required employment of mixed methods with both qualitative and quantitative approaches applied in the study.

Reflection on the research objectives #1 and #2 and associated questions (explained in Section 1.7), suggested the use of a *qualitative* research approach. Within the philosophical range of ideographic methodologies, *phenomenology* was considered to be the most suitable to investigate the research question in its specific context which is explained in more details in Section 4.3.

Within the methodology of phenomenology the research strategy of case study provided the practical framework for the execution of the study using a multiple-case study design. The study was pre-structured, using the research model as a framework and a case study protocol to ensure the consistency of instrumentation across cases. New Zealand high-tech firms with core capabilities in agro-technology provided the dynamic context that pursuit of the research question

required. The firm was selected as the unit of analysis and evidence was principally collected using interviews with managers in case firms.

To facilitate meeting the objective #3 requirements, which was to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate development of absorptive capacity in firms, this research adopted a *positivist* ontological paradigm (explained in Section 4.4). Within epistemology, the empirical, *objectivist* epistemological paradigm was adopted (see Table 4.1), which required using a *quantitative* methodology.

The use of mixed methods was based on the belief that the analysis of complex issues such as the internationalization process and particularly absorptive capacity requires methodological variety in order to show the complexity of the phenomenon as completely as possible and to add to the existing knowledge. The methodology, research strategy and research instruments used in this study are discussed in detail in Chapter 4 of the thesis.

1.9 Main Intended Contributions

The findings of this study have several implications for managers in general and for international business literature. Although this study focused on the agrotechnology high-tech firms, most of the findings can, with proper caution, be generalized to other industries.

This thesis intended to identify the most influential factors that affect the expansion decisions of New Zealand firms into new emerging markets. Knowing the factors that are central considerations in the strategy choices made by companies could improve firms' strategic and decision-making process generally, helping New Zealand firms in developing international strategies and building competitive advantage in foreign markets.

The research has implications for international business research, technology transfer, and absorptive capacity. This thesis intends to make several contributions

to knowledge: to identify the relationships between the internationalization process, technology transfer and absorptive capacity; to develop a conceptual model, which includes both technology transfer and absorptive capacity at the same time, and the internationalization process; to generate measurements to measure absorptive capacity; to develop the absorptive capacity model.

As previously suggested, the reason for absorptive capacity measurement is to help firms better understand the international environment and to achieve competitive advantage in the world market. This study extends the two most-cited absorptive capacity definitions in the international business literature, Cohen and Levinthal (1990) and Zahra and George (2002) for the reason that both studies established capabilities/components of absorptive capacity which are not inherently measurable. Further, to date there has been little attempt to more systematically measure this concept. However, in order to achieve and sustain a competitive advantage in the world market, firms need to measure absorptive capacity. This research intends to demonstrate a model to measure absorptive capacity.

1.10 Structure of the Thesis

The subsequent parts of the thesis will be structured as follows:

- Chapter Two presents an overview of the literature and the relevant theories concerning the area of study, based on the above research questions. Further, the conceptual framework used in this study is presented. First, the research question that the study sought to address is proposed. Building on the research question, the conceptualization of the relationship between the internationalization process and technology transfer, on one hand, and the internationalization and absorptive capacity, on the other hand, that provided a framework for the research process is presented as a schematic model and discussed. The theoretical grounding for the research questions and the research model are explained and discussed.

- Chapter Three puts the distinctive course of the thesis into the research context. To facilitate a deeper understanding of the nature and implications of transition in the CEECs, this chapter begins with a short background of the CEECs in transition and agricultural reforms. The emphasis is placed on technology transfer and CEECs. Later, information on the New Zealand business environment is presented. It begins with a short presentation of New Zealand economic reforms and the role of government. The chapter continues with a discussion of intellectual property issues in New Zealand.
- Chapter Four describes the methodology and the method used when obtaining the data needed for analysis. It begins with the purpose of the research, continues with the research approach, research strategy, data collection method, sample selection, the analysis of the data and finishes with the quality standards followed.
- Chapter Five presents and analyses the results of the empirical research conducted for the study. The chapter introduces the firms involved in the study and then presents the findings of case analysis within each firm. Firm characteristics are presented to set the context for the study while informant characteristics confirm their position in that context.
- Chapter Six includes the interpretation of the collected data in the previous chapter. The analysis examines the data from the field research in relation to the literature, the three major research areas, namely, internationalization process, absorptive capacity and technology transfer, and initial propositions put forward in Chapter 2. Intensity of understanding of the common characteristics across cases was developed to the point where a conceptual model of the internationalization process across case firms was postulated.
- Chapter Seven presents the findings from the analysis in chapter seven, and the drawn conclusions based on the research questions. Through the process of analysis, the conceptual model presented in its preliminary form in Chapter 2 is further developed and refined, to explain the underlying nature and impact of the firm's superior technology and absorptive capacity on its foreign strategy. The conclusions are derived from the experiences and perceptions of the case firms.

- Chapter Eight concludes the thesis with implications for management, theory, and future research within this area.

1.11 Conclusions

The objective of this chapter was to introduce the thesis. The background for the study was outlined to place the work in a wider context. The research problem, research question and research model that provided the basis and framework for the research study were described and explained. The reasons for conducting the study were introduced and the methodology and research approach employed was briefly described and explained. The contextual and theoretical limitations of the study were presented and the layout of the thesis was described. This material provides a basis of a detailed description of the study that follows.

2 Chapter Literature Review

The previous chapter introduced the research area and concluded with research question related to the purpose of this thesis. This chapter provides a brief review of the literature on the internationalization research in general and illustrates the importance of the absorptive capacity concept and the transfer of technology for firms faced with the new knowledge environments. This discussion will serve as the theoretical starting point for defining the frame of reference for the empirical study of the internationalization process of the New Zealand high-tech companies with the core competence in agro-technology. Section 2.2 looks at the theories of internationalization and compares subsequent models. Section 2.3 deals with knowledge in the firm and technology transfer, while Section 2.4 discusses the effects of absorptive capacity on the international activities. A conceptual framework as a schematic model along with the preliminary propositions are presented and discussed in Section 2.5 while Section 2.6 concludes the chapter.

2.1 Introduction

The purpose of this study is to assess the relationships between the internationalization process, technology transfer and absorptive capacity. This thesis intends to identify the most influential factors that affect the expansion decisions of New Zealand high-tech SMEs into new emerging markets. This research builds on an idea that knowledge creation and absorptive capacity are fundamental to the strategy formation and international activities of firms. The literature suggests that knowledge is the key source of firm-specific advantage. Accordingly, the primary advantage a company brings to foreign markets is its possession of knowledge and its most important proprietary asset, its technology.

The research proceeds by reviewing the theories of internationalization and incorporating insights from literature that deals with technology transfer and absorptive capacity.

2.2 Theories of Internationalization

The body of international business research produced over the last decades is characterized by considerable intellectual diversity drawing on a wide range of disciplines. The purpose of this section is to review the research on the internationalization process.

2.2.1 Perspectives of the Internationalization Process

The internationalization process of companies has been the subject of extensive research (Leonidou and Katsikeas, 1996). The literature shows that there are three broad theoretical perspectives (Li, Li, and Dalgic, 2004) regarding the internationalization process of firms: 1. *Experiential learning* (Johanson and Vahlne, 1977; Lam and White, 1999; Cavusgil, 1980; Cavusgil and Zou, 1994), 2. *Systematic planning* (Root, 1987, 1994; Miller, 1993; Yip, et al, 2000) and 3. *Contingency perspective* (Welch and Welch, 1995; Coviello and Munro, 1997). The three perspectives of the internationalization process and the corresponding models are summarized in Table 2.1.

Table 2.1: Comparisons of Internationalization Process Models

	Experiential Learning		Systematic Planning	Contingency Perspective
	Uppsala Model	Innovation-Related Models		
Internationalization Process	The cycle of four self-reinforcing components: market knowledge, commitment decisions, current activities and market commitment. Incremental learning and market commitment	A sequence of stages of adopting new technologies Internationalization decision considered as an innovation for a firm.	The internationalization process is a systematic step by step planning process.	Accelerated internationalization process with no predictable order. Internationalization process depends on various internal and external factors.
Time of Emergence	Early and mid 70's	Late 70's and early 80's	Late 80's and early 90's	Mid and late 90's
Theoretical Foundation	Behavior theory of the firm: Bounded rationality and uncertainty Internationalization is embodied in a process of organization learning and adaptation		Classic economic theory of perfect rationality. Assume perfect information availability and a firm can evaluate all the opportunities to pursue maximum utility.	Contingency theory Combination of economic rationality and managerial behavior.
Representative Studies	1.Johanson & Wiedersheim-Paul (1975), 2.Johanson & Vahlne (1977)	1.Bilkey & Tesar (1977), 2.Czinkota (1982),3. Cavusgil (1980, 1984), 4.Cavusgil & Sikora (1987), 5. Cavusgil & Zou (1994), 6.Reid (1981)	1.Root (1987, 1994), 2.Miller (1993), 3.Yip et al. (2000)	1.Welch & Welch (1995),2.Coviello & Munro (1997)
Sampling and Type of Research	1.Observations of four Swedish companies in a few industries (steel, pulp and paper, pharmacy and engineering)	Diversity of samples including small and medium-sized firms in manufacturing industries 1. 423 Wisconsin (US) firms - Empirical, longitudinal; behavioral approach	Diversity of samples including medium-sized firms in various industries: 1. Discussion; 2.	1.European and New Zealand small and medium-sized firms in various industries: 2. four New Zealand-based software firms – historical/longitudinal research)

	Empirical, longitudinal 2. Discussion based on 1975 Johanson & Weidersheim-Paul data on Swedish firms	2. 237 Ohio firms – Empirical; behavioral approach. 3. Discussion 6. Discussion	Discussion 3. 68 US SMEs; interview/mail survey	
Generalizability	Firms of any size Initial stage of internationalization Some research has pointed out that Uppsala model may not be applicable to international entrepreneurship	Firms of large and small sizes. Eriksson et al. (1997) pointed out that models in this category may be more suitable for SMEs.	Firms of any size, but less viable for SMEs. Less applicable to turbulent and volatile environment.	Small and medium-sized firms.
Managerial Implications	Experiential learning and adaptation are particularly important in an international market of high uncertainty. SMEs may follow the leaders and/or partners to reduce the cost of “muddling through”.	Innovation adoption is essential to the internationalization of the export driven firms. Exporters need to make different adaptations at different stages of international expansion.	Systematic strategic planning may be viable for well established firms. Limited applicability to SMEs.	Contextual factors (e.g., initial resources, networking condition with stakeholders, marketing strategies, industry characteristics) affect a firm’s internationalization process. Firms ignore these factors at their own peril. For SMEs, contingency perspective is appropriate due to their resource constraints and a large variety of motivations.

Source: Adapted from Li, Li, and Dalgic (2004)

2.2.2 Internationalization Process Models

Two parallel schools of thought have become the established theories of internationalization, the 'behavioral school' and the 'economic school' (Almor, Hashai and Hirsch, 2006).

The '*behavioral school*' focuses on a firm and sees internationalization as an evolutionary process. During that process, firms increase their international involvement as a result of increasing knowledge and market commitment (Aharoni, 1966; Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1977, 1990; Welch and Luostarinen, 1988). This approach is also referred to as the Uppsala model, perhaps the most influential study on internationalization processes. The research was conducted by Johanson and Vahlne (1977) who drew upon the behavioral theory of the firm (Cyert and March, 1963), the theory of the growth of the firm (Penrose, 1959) and the study of the foreign investment decision process by Aharoni (1966).

Several studies of international business have indicated that internationalization of firms is a process in which firms gradually increase their international involvement. The characteristics of this process influence the pattern and pace of internationalization (Johanson and Vahlne, 1977). The process comprises both changed perspectives and changed positions (Welch and Luostarinen, 1988). Internationalization is a major dimension of the ongoing strategy (Welch and Luostainen, 1988), and the strategy process determines ongoing development and change in terms of scope, business idea, action orientation, nature of managerial work, and dominating values.

The '*economic school*' views the internationalization process as a commitment in cross border activities motivated by reasonable economic considerations (e.g., Buckley and Casson, 1976, 1998; Dunning, 1977, 1988; Rugman, 1981). A decision is based upon evaluating economic costs and selecting the mode that minimizes overall costs.

Almor et al. (2006) suggest that the 'behavioral school' offers a dynamic view of internationalization which is based on behavior and learning concepts (Forsgren, 2002), while the more static 'economic school' (Melin, 1992) builds on economic reasoning to explain the choice between foreign market modes. Almor et al. (2006) further claim that "the 'economic school' treats the firm as a 'black box' and does not differentiate between the motivations to internationalize different functions of the firm" (p. 511).

Firms seeking to increase their market presence internationally have a number of potential market entry strategies at their disposal, ranging from a variety of forms of exporting to direct operations in the foreign market. Many theoretical market entry frameworks assume that firms tend to intensify their market involvement incrementally (Johanson and Vahlne, 1977, 1990; Loustarinen, 1980; and Cavusgil, 1980). They progress toward modes requiring greater involvement and resources when the opportunities present themselves, when the investment is economically justified, and/or once the suitable level of managerial skills has been developed (Johanson and Vahlne, 1990; Oystein and Servais, 2002) generating knowledge about the market at the same time (Johanson and Vahlne, 1977). However, not all firms exhibit such behavior (McDougall, Shane and Oviatt, 1994) and firms may 'leapfrog' successive modes (Newbould, Buckley and Thurwell, 1978). Though subject to criticism related to the theoretical assumptions and its methodological foundation (Akoorie and Scott-Kennel, 2005), the incremental expansion model is still one of prevailing theoretical perspectives on how firms begin overseas expansion.

Further, three main paths of internationalization of small firms are offered by the existing literature. First is the 'traditional' path when a company moves in incremental stages from domestic markets into international markets. The objective of 'traditional' firms "appears to be survival by increasing sales volume, greater market share, or extending product life cycles" (Bell, McNaughton, Young and Crick, 2003, p.348). Their actions are usually due to unfavorable conditions in the domestic market (Bell et al, 2003). The second path of internationalization is 'born global', as many small firms internationalize quickly and with a global focus from the beginning (Bell et al, 2003). They view the

global market place as one market (Oviatt and McDougall, 1994). The key objective of 'born global' firms is to "gain 'first mover' advantage and achieve rapid penetration of global niches or segments" (Bell et al, 2003, p.348). The third path of internationalization identified by Bell et al (2003) is 'the born again global'. Bell et al (2003, p. 348) suggest that "the 'born again global' firm's change of focus from a domestic to an international direction is triggered by an infusion of new human and/or financial resources, access to new networks in overseas markets, acquisition of new product/market knowledge, or some other critical incident". The main goal is to exploit the new networks and/or resources that they now get access to.

Since Welch and Luostarinen's (1988) comprehensive analysis of the internationalization concept, a number of useful reviews have assessed and synthesized the general internationalization process literature (Johanson and Vahlne, 1990, 1992; Melin, 1992; Andersen, 1997; Forsgren 2002). Each of these reviews agree that efforts to summarize the internationalization concept in a definitive manner have been inadequate. Even though the internationalization process has been analyzed from various angles and seen through different lenses, to date, most of our understanding of the internationalization process reported in the literature relates to initial foreign market entry and/or activities post-internationalization.

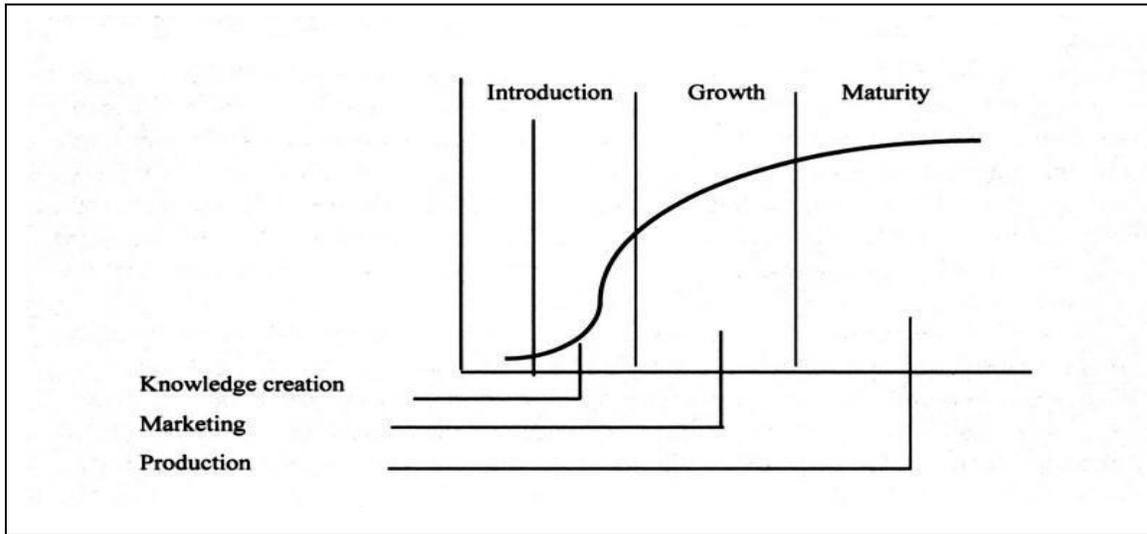
Significant models in the field of international business describe the internationalization process as a gradual learning development taking place in distinct stages and over a relatively long period of time (Melin, 1992). Since this research builds on the idea that knowledge creation and knowledge acquisition are fundamental to the strategy formation and international activities of firms, the following models will be briefly discussed here: the Expanded Product Cycle Model (Almor, Hashai and Hirsch, 2006); the Uppsala internationalization process model (Johanson and Vahlne, 1977, 1990); network approaches to internationalization (Coviello and Munro, 1995, 1997); and the Model of a Systematic Internationalization Process (Yip Biscarri, and Monti, 2000).

The Expanded Product Life Cycle Model

Almor et al. (2006) claim that “existing models do not explicitly deal with the interface between knowledge intensity and the sequence in which firms internationalize their value adding functions” (p. 509). They used an expanded version of the product cycle framework developed by Vernon (1966, 1979) to illustrate how the role of R&D, production and marketing activities, as a salient determinant of competitive advantage, evolves along the product cycle. The authors developed a framework, which predicts the relationship between firm-specific knowledge intensity and the internationalization of firms functions.

The model posits that the internationalization of specific value adding functions is triggered by the knowledge intensity of firms offering products belonging to the different phases of the product cycle. Almor et al.’s (2006) findings show a relationship between the knowledge-intensity of firms and their internationalization modes. What is noticeable from their findings is that some firms behave as if mature products dominate their product portfolio, while some firms behave as if their portfolio is dominated by products in the introductory and growth phases of the product cycle. The authors suggest that the relative importance of R&D, production and marketing in determining competitive advantage, varies across the three phases of the cycle: introduction, growth and maturity (Figure 2.1)

Figure: 2.1 The Phases of the Product Cycle and the Determinants of Competitive Advantage



Source: Adapted from Almor et al. (2006)

During the introductory phase, when investment in R&D reaches the highest point, technological superiority has a major impact on competitive advantage, and may even grant innovating firms a monopolistic position (Almor et al., 2006). Production and marketing are of secondary importance in shaping the competitive position during this phase. During the growth phase, as technology is gradually diffused, the first mover advantage of innovating firms is eroded. At this stage, the firm's competitive position depends more and more on its ability to provide pre- and post-sales services efficiently. For this reason the marketing function becomes the major determinant of the firm's competitive position (Almor et al., 2006).

Production takes over as the prime determinant of competitive advantage when maturity is reached, growth decreases slightly and unit production costs account for a growing percentage of total costs (Klepper, 1996). When a product is standardized, production cost considerations, rather than technological superiority or improved servicing, become the major determinants of competitive advantage (Almor, et al., 2006).

As products become less knowledge-intensive and more standardized, the complexity and frequency of information and knowledge flows decline (Melin, 1992; Vernon, 1979). Further, distance premium diminishes over the product cycle (Almor et al., 2006). “Distance premium diminishes over the cycle because of its close association with service intensity, which peaks at the early phase of the cycle, and declines over the following phases” Almor et al. 2006, p. 523). In conclusion, Almor et al.’s (2006) framework identifies knowledge intensity as the major trigger of internationalization, challenging that proprietary knowledge dissipates with product maturity, as the relevant information spreads and ceases being proprietary.

The Uppsala Internationalization Model

The Uppsala internationalization process model is most associated with the research of Johanson and Wiedersheim-Paul and Johanson and Vahlne. The model deals with knowledge acquisition. How the organizations learn and how their learning affects their investment behavior are the key issues for the model (Johanson and Vahlne, 1977, 1990). A basic assumption of the Uppsala Model is that lack of knowledge about foreign markets is a major obstacle to international operations, but such knowledge can be acquired (Johanson and Vahlne, 1977).

In the light of the work on learning in organizations Forsgren (2002) argues that the model applies a narrow interpretation of learning, which limits the ability of the model to explain certain forms of behavior in the internationalization process. Forsgren (2002) states that organizational learning contains several dimensions, of which the Uppsala Model primarily deals with one – learning through the firm’s experience. For example, making foreign acquisitions with the intention of learning more about a certain market, learning through imitation of other organization or following the ‘herd’ when invest abroad, are not included in consideration.

In addition, Almor et al. (2006) suggest that “triggers” of the stages model approach are the accumulated experience and knowledge of doing business abroad, and associated with

this, the reduction of risk. The double triggers of accumulated experience and risk reduction lower the barriers, which prevent the firm from internationalizing its functions in the first place. Almor et al. (2006) claim that the stages model does not explain why internationalization of production is “inherently superior to other modes of internationalization” (p. 524). Neither does it explain the shift between different modes of foreign market servicing (Andersen, 1993, 1997).

However, the basic learning assumptions underlying the Uppsala model remain valid because the model managed to present reasonable explanations for the firms’ internationalization processes of a significant number of firms (Forsgren, 2002). This study is theoretically anchored in the Uppsala model as an explicit process oriented theory of international expansion. The model provides a suitable point of departure for research on internationalization because it deals with experience accumulation and knowledge acquisition.

Network Approaches to Experiential Knowledge and Internationalization

The potential influence of network relationships on the internationalization process is highlighted in a growing body of literature. The experience gained from the foreign marketplace is transformed into knowledge that can be used to resolve problems or select alternative options relating to international operations (Brockmann and Anthony, 1998). Hadley and Wilson (2003) suggest that internationalization knowledge is significantly related to the firm’s market diversity leading to the conclusions that a firm’s exposure to culturally dissimilar markets facilitates its ability to conduct international operations, and that market diversity is a key asset for the firm. The involvement in a range of psychically distant market results in the adaptation of the firm’s resources and capabilities to its international environment.

However, the problem is how a firm that has no international operations can acquire relevant knowledge. This is where the contacts of other international companies can be invaluable, if the inexperienced firm can learn from the lessons of others (Bonaccorsi,

1992). Learning about foreign markets often occurs through collaboration with other firms who have this knowledge. Knowledge of specific relationships in a network is learned by doing and is tacit and hard to transfer. Accordingly, conducting international business relies on experiential learning, which emerges from accumulated experiences of specific relationships (Delios and Beamish, 1999).

In the research focused on small high technology knowledge-based and service-intensive firms, Coviello and Munro (1995) found that successful New Zealand-based software firms are actively involved with international networks and outsource many market development activities to network partners. Along with Bell (1995), Coviello and Munro (1995) research provides a contrasting view to much of the internationalization literature which focuses on traditional manufacturing organizations.

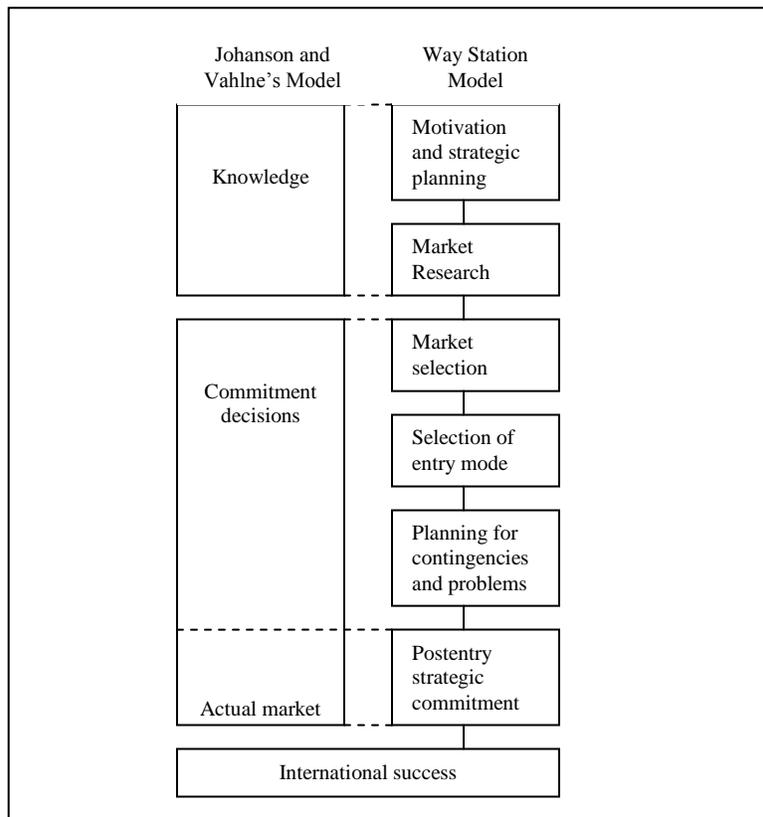
Lecocq and Yami (2002) state that inter-organizational relationships and networks are increasingly important sources of new resources. Moreover, some subsidiaries develop their own competencies via collaboration in the local business context (Holm and Pedersen, 2000; Moore, 2001). Relationships with external partners are equally important to internal relationships within the MNC network for the development of competencies (Furu, 2000). Further, through the industry network members acquire ideas, influences, or information that would otherwise be unobtainable (Larson, 1992). In addition, Shane's (2000) research shows that the development of a new organization may be imprinted through ties and knowledge generated pre-founding. Coviello (2006) stresses the need to understand international new venture networks at the internationalization and pre-internationalization levels as well as pre-founding. The author's results support Welch and Welch's (1996) and Johanson and Vahlne's (2003) observations that "the way in which network relationships provide the basis for future growth is more important than the actual path of internationalization" (p. 727).

The network perspective literature suggests that a firm's strategy emerges as a pattern of behavior influenced by network relationships. As such, these external contacts or relationships may drive, facilitate, or inhibit a firm's international market development.

Model of a Systematic Internationalization Process

Newly internationalizing companies face various difficulties because of the complexity of the international environment. They are usually inexperienced (Yip et al., 2000) and they are typically smaller companies that lack the resources and capabilities. Van Hoorn (1979) claims that smaller companies have informal structures, insufficiently developed administrative procedures and unsystematic decision-making process. However, Baird, Lyles, and Orris (1994) notice that small firms that are internationally oriented have more-formal planning systems. Yip et al. (2000) proposed and tested a model of a systematic internationalization process of the internationalization, which is compared, among others to the Johanson and Vahlne’s model shown in Figure 2.2.

Figure 2.2: The Way Station Model in the Context of Johanson and Vahlne’s (1977) Theory



Source: Adapted from Yip, et al. (2000)

Yip et al. (2000) divide the knowledge/commitment stages into six different way stations that come in a logical sequence shaping the path to be taken: motivation and strategic planning, market research, market selection, selection of entry mode, planning of contingencies, and post entry strategic commitment. Motivation and strategic planning, and market research deal with acquiring knowledge, which correspond to Johanson and Vahlne's process. Further, knowledge is used to define strategies and allocate resources. Yip et al. (2000) add three new way stations to capture the first decisions that companies must take: market selection, selection of entry mode, and planning for contingencies.

The Model of a Systematic Internationalization Process puts the stress on the thoroughness of the planning steps (first five way stations) and on the actual degree of commitment to the foreign market (the sixth way stations). Yip et al. (2000) state that "the process of internationalization will be successful if the first five steps are carried out thoroughly and the company commits strongly to the foreign market" (p. 16). After testing the model Yip et al. (2000) suggest that there are inherent capabilities in companies that help explain their superior performance, which matter particularly in international markets.

In summary, there is limited empirical research on the management role in the internationalization process. This gap may be partially attributed to research emphasis on understanding the internationalization process from the perspectives of *foreign market entry mode* and *the sequence of stages* rather than *the managerial perspective* in terms of management knowledge, foreign experience, functions and activities.

Given that this thesis explores the process of internationalization of high-tech SMEs and factors that influence the expansion decisions of New Zealand firms into new emerging markets, overseas expansion in the high-tech industries seems to be somehow neglected in the internationalization process literature. This research is interested in establishing: "*How do New Zealand high-tech SMEs organize the internationalization process?*" Since knowledge is at the essence of firm's growth and development, the next sections

address knowledge and competitive advantage of the firm particularly in relation to the technology transfer.

2.3 Knowledge of the Firm and Technology Transfer

2.3.1 Knowledge and Competitive Advantage

Firms compete based on the superiority of their know-how and their abilities to develop new knowledge by experiential learning. The limiting factor on growth is not only the competitiveness of other firms and the demand of the market, but also the extent to which their competitive advantage can be replicated to different environments more quickly than through copying by competitors. When firms grow in their ability to create new knowledge to expand their market, their advantage lies in being able to understand and carry out the transfer of their capabilities more effectively than other firms.

Knowledge-based competition is an area of increased interest to both strategic management scholars and practitioners. Researchers investigating this topic often link their work to the resource-based view of the firm, which argues that distinct knowledge should give the firm a competitive advantage (Barney, 1991). The resource-based view emphasizes barriers to imitation, such as the tacitness or complexity of knowledge as the basis for sustained competitive advantage (Kogut and Zander, 2003). However, there is debate in the literature on whether it is knowledge itself or rather knowledge management which is the source of a firm's competitive advantage.

In order to clarify relationships between knowledge and competitive advantage, this research is interested in how knowledge acquisition and accumulation, knowledge protection and leverage impact on building a firm's competitive advantage and sustained growth. Assuming that a firm has already accumulated distinctive knowledge, protecting and extending that knowledge is the first step in finding sustained competitive advantage (Kogut and Zander, 2003). But no knowledge base can be unique forever. Firms will seek to acquire new knowledge in order to remain competitive in the market. The cycle is

repeated again when the firm seeks to accumulate new knowledge. Sustaining profitable growth requires continuous relations between these three knowledge management activities of accumulate, protect and leverage (Chakravarthy, 1996, 1997).

Two broad types of knowledge often underlie a firm's competitive advantage: resource conversion and market positioning (Chakravarthy, McEvily, Doz, and Rau, 2003). Resource conversion knowledge refers to the ability of a firm to use the resources which are also available to its competitors and still be able to create distinctive products and services from these through product and process innovation. The patents, copyrights and trade secrets that a firm owns are the most evidential of its resource conversion knowledge (Friedman, Landes, and Posner, 1991).

The knowledge gained from resource conversion is a likely source of superior performance. However, resource conversion knowledge alone is not enough for competitive success. The ability of a firm to *recognize opportunities* in its environment and avoid threats is also a form of knowledge. The firm may not have access to any special information over its competitors and yet may be able to see patterns in this new emerging information that others are not able to.

Further, protection includes activities to maintain the proprietary nature of a firm's knowledge stocks. This includes seeking legal protection, such as patents and non-compete agreements, designing policies and educating employees about the types of knowledge they should not share with their peers in other organizations. For a new product, particularly if a result of R&D is to be of value to a company, comprehensive protection through the patent system is almost essential. Certainly, the lack of global patent law complicates such issues because inventors could face problems in maintaining ownership to intellectual property, especially when ideas and inventions could be copied by other individuals or companies in other countries.

Three characteristics of knowledge have been linked to the level of imitation barriers: tacitness, complexity and specificity (Reed and DeFillippi, 1990; Doz, Santos and

Williamson, 2001; McEvily and Chakravarthy, 2002). These attributes increase “stickiness” – the costs to transfer knowledge across organizational boundaries and the degree to which it resists identification and ultimately imitation (Zander and Kogut, 1995). There are a numerous ways that firms can manage these knowledge attributes. Firms might maintain the tacitness of their knowledge, for example, by emphasizing learning by doing, overlapping problem solving and job rotation to transfer lessons gained through experience. This shared knowledge then becomes the basis for future learning and the accumulation of new tacit knowledge. When knowledge is embedded in the complex interaction of many people it is firm specific and for that reason difficult to copy.

Furthermore, leveraging is the use of existing knowledge for commercial ends (Chakravarthy, 1996, 1997). When knowledge is applied to existing ends, the size and durability of a firm’s competitive advantage will be defined by how well protected its knowledge is. Leveraging a firm’s knowledge across a wide range of its businesses has advantages for the firm. First, it maximizes the return on that knowledge. Second, it can also accelerate the knowledge articulation process, by providing more application opportunities.

Marquardt (1996) views transfer as a key process in managing corporate knowledge, in addition to acquisition, creation, utilization and storage of knowledge. Free knowledge flow has also been identified as one of the key elements of successful knowledge management (Marquardt, 1996). In order to support a free flow of knowledge the company has to develop a certain organizational architecture, i.e. cross-functional, flexible structure (Nevis, DiBella, and Gould, 1995), open communication (Argyris, 1994) and a learning culture (Slater and Narver, 1995). The actual knowledge transfer process is extremely complex and difficult to capture, since it has both, inter-personal and inter-organizational dimensions.

Gold, Malhotra, and Segars (2001) found that the knowledge management infrastructure of the company has to be highly developed in order to maximize the exploitation of

resources that are embedded within, available through, and derived from a network of units. Technical infrastructure within the field of a company's knowledge management includes business intelligence (knowledge regarding competition and broader economic environment), collaboration of individuals within the company and distributed learning, knowledge discovery (discover internal and/or external knowledge), knowledge mapping (track sources of knowledge), opportunity generation and security (prevent inappropriate use (Gold, et al., 2001).

Following Nonaka and Takeuchi's (1995) knowledge spiral, four modes can be identified in the knowledge transfer practices: socialization (from individual tacit knowledge to group tacit knowledge), externalization (from tacit knowledge to explicit knowledge), internalization (from explicit knowledge to tacit knowledge), and combination (from separate explicit to systemic explicit knowledge). As these modes cover the possibilities of knowledge conversion between individual and organizational knowledge they could equally be applied to knowledge transfer between organizational units.

Sharing information and adequate managing the flow of it across the firm is of critical importance to firm's growth. In the same manner, this study addresses the question: *"How do firms acquire new information and how is the flow of newly acquired information managed across the high-tech firms?"*

2.3.2 International Strategy and Technology

Technology, as defined in Section 1.3 (p. 7), is one of the most fundamental of the core capabilities of a firm. It is a body of knowledge about how natural and artificial things function and interact (Itami and Numagami, 1992). Technology may be in the form of know-how, machinery or tools, technical assistance, processes, organization or products. As such, it is inevitable that technology becomes one of the central factors in deciding the firm's strategy.

Strategy, as a term used in this thesis, means a dynamic design of activities for the entire firm. *How international strategy and technology interact with each other* is one of the basic themes of this research. It is usually argued that the strategy that the firm wants to pursue is controlled by the technologically feasible set of actions, or the firm should invest in broadening that feasible set if it wants to take a strategy which requires the broadened technological capability (Porter, 1983, 1985).

The growth and international expansion of technological capabilities in the company is closely associated with accumulating international experience and increasing commitments to foreign markets (Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1990). This is not to suggest a uniform internationalization of technological capabilities across all firms. Underneath the general path of expansion determined by product characteristics or industry affiliation, the development of foreign technological capabilities depends on market conditions at the critical time of foreign expansion and firm-specific events like unexpected merger and acquisition opportunities (Zander, 1998). Additional influencing factors include management attitudes towards internationalization, strategy and dispersion of technological capabilities (Patel and Pavitt, 1997), as well as the amount of operational and technological freedom granted to foreign affiliates (Behrman and Fischer, 1979). As a result, the international dispersion of technological capabilities may involve significant variation even across firms engaged in similar lines of business.

The literature on multinational enterprises suggests that knowledge is the key source of ownership or firm-specific advantage, particularly as it applies to high-tech companies. The firm goes abroad to earn revenue derived from its store of knowledge, and the creation and exploitation of that knowledge is the main reason for the success and growth of the firm over time (Caves, 1996). Accordingly, it is critical in utilizing knowledge/technological capability in a foreign country. The traditional view of firm specific advantages suggests that the primary advantage a company brings to foreign markets is its possession of superior knowledge, i.e. its most important proprietary asset is technology or knowledge. Given this focus on knowledge, three perspectives

describing how knowledge determines the expansion tendencies of a company have emerged: 1) the public goods perspective, 2) the internalization perspective, 3) the technological competence perspective (Eden, Levitas and Martinez, 1997).

According to *the public goods perspective*, knowledge is conceptualized as a public good¹ owned by the firm which can be transferred at zero marginal cost to various units within the MNE (Johnson, 1970). As a result, the firm that is responsible for its creation faces the difficulty of appropriating a return to its use. Given the ease of transfer, a critical concern for the company is the potential for expropriation of that knowledge by competitors. As such, the public goods perspective suggests that company will internalize transaction when a significant risk of knowledge appropriation would dissipate the company's knowledge-based specific advantage. Such cases are likely where property rights to the knowledge have not been assigned or are not effective (e.g. countries without patent protection).

The internalization perspective suggests that the decision by the company to organize outside of its home country lies in the costs of transferring knowledge to those distant locations. While this perspective recognizes the public good aspect of knowledge, the focus is, as Hennart (1991) stated, more on the weight of bureaucratic costs (costs of hierarchical organization) relative to transaction costs in determining expansion. The company will internalize divisions in host countries at that point where the costs of increased bureaucratization are just outweighed by the transaction costs associated with market contracting (Hennart, 1991). Whereas the focus of the public goods perspective is on the MNE's possession of unique knowledge, the internalization perspective is distinct in its concentration on the factors affecting the transfer of that knowledge (Rugman, 1981).

Technological competence is unique to each firm. Cantwell (1991, p. 50) suggests that "technological competence ... because it consists of those elements of a firm's

¹ By public good it is meant that one party may enjoy the use of a common good without diminishing its availability to the other.

technology which are distinctive, is never itself transferred through trade or copied exactly through spillovers to other firms.” It is tacit, and largely incomprehensible to competitors. Tacit or intangible knowledge exists in the shared norms or routines of the firm’s employees (Nelson and Winter, 1982) and the ability of the employees to reconfigure those routines to produce novel knowledge. The development of tacit knowledge is viewed as a function of the evolutionary development of the firm (Nelson and Winter, 1982; Kogut and Zander, 1995). As such, tacit knowledge is acquired through “learning-by-doing” (Stiglitz, 1987) or “learning-by-using” (Rosenberg, 1982). It is acquired only by “experientially and transferred by demonstration, by personal instruction, and by the provision of expert services” (McFetridge, 1995, p. 413).

The technological competence perspective also attaches dominance to knowledge in determining the expansion activities of MNEs (Cantwell, 1989). This perspective is different from the other two in that the importance of technological competence in determining and MNEs competitive advantage is stressed over knowledge transfer costs. In this framework, the MNE is not simply a mechanism through which costs are reduced but, rather, a vehicle through which knowledge is recombined to produce and subsequently exploit new and valuable innovations (Kogut and Zander, 1993, 1995).

Further, protecting the knowledge advantages of the company from opportunistic behavior by competitors is a key to ensuring the long run competitive advantage of the firm. As a result, the firm will choose to transfer technology primarily through wholly-owned subsidiaries rather than use external methods. The internal mobility of knowledge within the MNE, together with the need to prevent its dissipation to outsiders, implies that production and transfer of this type of technology will take place primarily within firm.

2.3.3 Technology Transfer

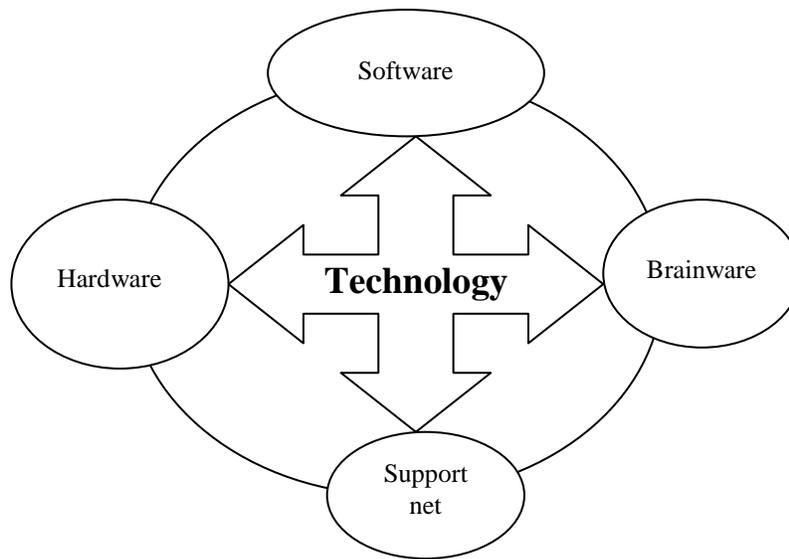
Technology transfer as a separate field in international management literature has emerged as the result of increasing awareness of the key role of technology in economic

development. Technology transfer has been described as a process based on a movement of technology from one place to another which can be either from one organization to another or from one country to another (Schon, 1967; Solo and Rogers, 1972).

Technology transfer among multinational organizations has been the subject of much research (Buckley, 1997; Dunning, 1988; Kogut and Zander, 1995, McFetridge, 1994). This body of research has led to the conclusion that organizations engage in the transfer of technology in order to profit directly from the transfer (in licensing agreements), profit indirectly from the dissemination of the product/process (e.g. establishing industry standards) or to enable foreign affiliates to utilize firm-specific technologies in their operations. However, most royalties, license and management fees – forms of payment for technology – are in-house payments, flowing from MNE subsidiaries to their parent firms and difficult to estimate by tax authorities.

Mansfield (1968) distinguishes three types of transfer that can be associated with the main elements of technology as shown in Figure 2.3. The first one consists of the transfer of materials, final products, components, equipment and even turnkey and/or product-in-hand plants. The second form of transfer involves the movement of designs, blueprints, and the know-how. It provides the basic information, data and guidelines needed to create a desired capability. The objective to the third form of transfer is to provide know-how and software needed to adapt existing technology and innovate.

Figure 2.3: The Main Components of Technology



Source: Adapted from Stewart and Nihei (1987)

Mansfield (1983) found that foreign subsidiaries were the principal channel of transfer during the first five years after commercialization. For the second five-year period after commercialization, licensing became more important. Coughlin (1984) examines the technology-transfer complications of foreign ownership restrictions. His argument relies on the assumption that the incentives to internalize the transfer (via setting up wholly owned foreign subsidiaries) are greater for product technology than for process technology.

Maignan and Lukas (1997) and Woodcock, Beamish and Makino (1994) argue that entry modes (and foreign strategies) may be differentiated according to three characteristics: quantity of resource commitment required, amount of control, and level of technology risk. *Resource commitments* are related to intangible assets such as managerial skills, or tangible, such as machines and money. The amount of required resources varies dramatically with the entry mode, ranging from almost none in the case of indirect exporting, or the minimal training costs associated with licensing, to extensive investments in facilities and human resources in wholly-owned subsidiaries. *Control* is the ability of a firm to influence decisions in foreign markets. In a franchise type of licensing agreement, control over the operations is granted to the franchisee in exchange

for some type of payment. In a joint venture, control is shared formally according to level of ownership, while wholly-owned subsidiaries are attractive to many companies because this mode enables the multinational company to exert the most control in decision-making. *Technology risk* is a third parameter of modal forms. According to the resource-based view, a firm's competitive advantage is rooted in its own resources and those that it can acquire. To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile (Barney, 1991, p. 105-106). This translates into valuable resources that are neither perfectly imitable nor substitutable without great effort (Hoopes, 2003, p. 891; Barney, 1991, p.117).

Woodcock et al. (1994) claim that resource commitment, control, and technology risk are highly correlated. For example, increased control leads to lower technology risk. Some researchers argue that the entry mode decision consists mainly of determining the levels of resource commitment, control, and technology risk that the international entrant desires or can accept (Maignan and Lukes, 1997; Woodcock et al., 1994). However, the choice of foreign market entry mode depends on the mode's ability to transfer the company's competitive advantages.

Erramilli (1990) proposes the necessary tighter control over entry modes because information-intensive high-tech industries involve wide-ranging customization. Such high-involvement entry modes require considerable resource and managerial commitment and do not give the firm full benefit from the experience accumulated during a more gradual approach to internationalization (Carman and Langeard, 1980). These limitations are aggravated for smaller firms which may lack the necessary resources and/or managerial capabilities. McDougall, Oviatt and Shrader (2003), Coviello and Munro (1995) and Coviello (2006) suggest that networks and knowledge are important factors for small technology-intensive firms' internationalization process.

Technology transfer involves several types of costs for the producer. The first cost type is the transfer costs of making a market in an uncertain world (Casson, 1982), such as costs

of search, negotiating a contract, monitoring and enforcing the contract. Internalization theory argues that transfer costs are higher for external transfers than for transfers through the hierarchy (Rugman, 1981; Hamel, 1991). The second category of costs is the risks and costs of opportunistic behavior. The third category is provision costs identified by Teece (1977) and Kogut and Zander (1993) referring to the costs of providing knowledge or technology to other entities, such as subsidiaries, affiliates, or external organizations. The last category is dissipation costs, i.e. the risk of loss of the MNEs firm-specific advantage; technology spillovers to competing firms can reduce the rents from knowledge production. Dissipation costs are linked with opportunistic costs as uncertainty increases, the risk of opportunism and of dissipation increase.

The mode by which technology is transferred is influenced by the characteristics of the advantage that motivates the growth of the firm across borders. Buckley and Casson (1976) indicate that the character of knowledge (being easily transferred and hard to protect), lies at the core of their theory of internationalization. They write:

“There is a special reason for believing that internationalization of the knowledge market will generate a high degree of multinationality among firms. Because knowledge is a public good which is easily transmitted across national boundaries, its exploitation is logically an international operation; thus unless comparative advantage or other factors restrict production to a single country, internationalization of knowledge will require each firm to operate a network of plants on a worldwide basis.” (p. 45).

Further, Teece (1977) argues that the costs of technology transfer decline with each subsequent transfer and with the experience of the recipient of the technology. These costs are derived from the efforts of codifying and teaching complex knowledge to recipients. Teece (1977) claims that more efforts must be expended, the less capable the user is. Hill, Hwang and Kim (1990) find that transferring technology to a less competent licensee results in lost revenues which they link to transactions costs:

“The licensee may lack the tacit know-how and informal routines that are required to turn a technological blueprint into a successful product... Thus, by establishing a wholly owned subsidiary, the MNC can economize on the transaction costs of arm’s-length contracting and earn greater rents from its technology.” (pp. 117-28)

One of the most persistent findings in work on technology transfer is the importance of prior experience. Pavitt (1971) notes that the cumulative experience with a technology is a critical factor determining the learning capability of the recipient, as well as that of the firm possessing the technology. Therefore, experience with the technology points to the important *relationship between the current state of knowledge and learning capabilities* of the adopter.

One key resource is the firm’s knowledge, more specifically, its codified knowledge (i.e., knowledge that can be easily identified, structured, and communicated) and its tacit knowledge (i.e., knowledge that is rooted in the firm’s culture, routines and processes) (Kogut and Zander, 1992; Madhok, 1997). Kogut and Zander (1993) argue that the choice of transfer mode is explained by the degree of tacitness of technology [knowledge]; the more tacit the technology, the more likely technology will be transferred within the firm hierarchy.

There are indications that the costs of transfer are related to the accumulation of experience and learning. Firms that specialize in the transfer of knowledge that is difficult to understand and codify are able to transfer these technologies at a lower cost to wholly owned subsidiaries than to third parties (Kogut and Zander, 1993). On the other hand, there is another interpretation that technologies that are difficult to codify also represent platforms for expansion into future markets. Because they are not well understood, they are resistant to rapid imitation. Due to both the qualities of novelty and difficulty of imitation, knowledge that is tacit can be expected to embody the advantage of the firm to grow and expand in the future (Kogut and Zander, 1992). One challenge that may exist in using tacit knowledge for achieving competitive advantage in technology transfer is to be able to better assess the tacitness of this knowledge and to quantitatively measure it.

In summary, while most of the existing frameworks for international market entry have been developed from the perspective of large manufacturing firms, overseas expansion in the high-tech industries may be more complex. Although, the entry mode selection choices may not differ substantially from those for manufacturing firms, high-tech SMEs face different challenges. They may be restricted to entry modes that facilitate the protection of knowledge advantages of a company. This research is interested in determining: *“What is the impact of firm’s knowledge/technology in determining international strategy?”*

2.4 The Effects of Absorptive Capacity on the International Activities

This section illustrates the importance of the absorptive capacity concept for firms faced with new knowledge environments. Based on a review of the literature, three factors (prior knowledge, R&D intensity and organizational structure) are emphasized as organizational determinants of absorptive capacity. Second, these organizational determinants will be assessed with regard to their influence on the level of a firm’s absorptive capacity.

2.4.1 Absorptive Capacity Concept

Cohen and Levinthal (1990) introduced the concept of absorptive capacity to the field of strategy. The concept comes from economic theories (primarily Schumpeterian) that examine the role of R&D in economic performance. In the first-half of the 20th century, Schumpeter (1942) argued that economic growth is rooted in technological innovation and processes.

The concept of absorptive capacity evolved from prior research on organizational learning, for example, regarding the role of R&D in firm performance and organizational

learning (Levitt and March, 1988). Another example is Kedia and Bhagat (1988) who already used the term “absorptive capacity” in the context of technology transfers across nations. Cohen and Levinthal (1989, p. 569) introduced the absorptive capacity construct as follows: ‘the firm’s ability to identify, assimilate and exploit knowledge from the environment’. Even though they defined a firm’s absorptive capacity as the ability to recognize the value of new information, assimilate it and apply it to commercial ends, they put an emphasis on new information.

Past research points to the role and outcomes of absorptive capacity as a set of firm abilities to manage knowledge. Further, the analysis of past research reveals three definitions that have dominated the literature on absorptive capacity. These definitions are similar to some extent but also differ in major ways and highlight different dimensions, as Zahra and George (2002) summarized in Table 2.2.

Table 2.2: Absorptive Capacity Definitions

Definitions	Dimensions	Illustrative Studies
The ability to value, assimilate, and apply new knowledge (Cohen & Levinthal, 1990)	<p>Ability to value knowledge through past experience and investment</p> <p>Ability to assimilate</p> <ul style="list-style-type: none"> • Based on knowledge characteristics • Based on organizational or alliance dyad characteristics • Based on technological overlap <p>Ability to apply</p> <ul style="list-style-type: none"> • Based on technological opportunity (amount of external relevant knowledge) • Based on appropriability (ability to protect innovation) 	<p>Boynton, Zmud & Jacobs (1994); Cohen & Levinthal (1989, 1990); Cockburn & Henderson (1998); Lane & Lubatkin (1998); Mowery, Oxley & Silverman (1996), Szulanski (1996)</p>
A broad array of skills, reflecting the need to deal with the tacit components of transferred technology, as well as the frequent need to modify a foreign-sourced technology for domestic applications (Mowery & Oxley, 1995)	<p>Human capital</p> <ul style="list-style-type: none"> • Skill level of personnel • Trained R&D personnel as percent of population • Trained engineering graduates • R&D spending 	<p>Glass & Saggi (1998); Keller (1996); Kim & Dahlman (1992); Liu & White (1997); Mowery & Oxley (1995); Veugelers (1997)</p>
Absorptive capacity requires learning capability and develops problem-solving skills; learning capability is the capacity to assimilate knowledge – for imitation – and problem-solving skills to create new knowledge – for innovation (Kim, 1998)	<p>Prior knowledge base; intensity of effort</p>	<p>Kim (1995, 1997a,b); Matusik & Heeley (2001); Van Wijk, Van den Bosch & Volberda (2001)</p>

Source: Adapted from Zahra and George (2002)

Cohen and Levinthal (1990) have offered the most widely cited definition of absorptive capacity, viewing it as the firm’s ability to value, assimilate, and apply new knowledge, while Mowery and Oxley (1995) propose a second definition of absorptive capacity as a broad set of skills needed to deal with the tacit component of transferred knowledge and the need to modify this imported knowledge. Kim (1998) proposes a third definition of

absorptive capacity as the capacity to learn and solve problems. There is an agreement that absorptive capacity is a multidimensional construct involving the ability to value, assimilate, and apply knowledge (Cohen and Levinthal, 1990) and is a combination of effort and knowledge bases (Kim, 1998; Mowery and Oxley, 1995).

Zahra and George (2002, p. 186) define “absorptive capacity as a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability”. These four capabilities/dimensions of absorptive capacity play different but complementary roles in explaining how absorptive capacity can influence the organizational outcomes. In Table 2.3 Zahra and George (2002) relate each of the four dimensions that comprise absorptive capacity to its respective components, roles, and importance.

Table 2.3: Dimensions of Absorptive Capacity: Re-Conceptualization of Components and Corresponding Roles

Dimensions/Capabilities	Components	Role and Importance	Citations
Acquisition	Prior investments Prior knowledge Intensity Speed Direction	Scope of search Perceptual schema New connections Speed of learning Quality of learning	Boynton, Zmud & Jacobs (1994); Cohen & Levinthal 1990); Keller (1996); Kim (1998); Lyles & Schwenk (1992); Mowery, Oxley & Silverman (1996); Van Wijk, Van den Bosch & Volberda (2001); Veugelers (1997)
Assimilation	Understanding	Interpretation Comprehension Learning	Dodgson (1993); Fichman & Kemerer (1999); Kim (1998); Lane & Lubatkin (1998); Szulanski (1996)
Transformation	Internalization Conversion	Synergy Recodification Bisociation	Fichman & Kemerer (1999); Koestler (1966); Kim (1997b, 1998)
Exploitation	Use Implementation	Core competencies Harvesting resources	Cohen & Levinthal (1990); Dodgson (1993); Kim (1998); Lane & Lubatkin (1998); Szulanski (1996); Van den Bosch, Volberda & de Boer (1999); Van Wijk, Van den Bosch & Volberda (2001)

Source: Adapted from Zahra and George (2002)

Acquisition refers to a firm's capability to identify and acquire externally generated knowledge that is critical to its operations. Assimilation refers to the firm's routines and processes that allow it to analyze, interpret, and understand the information obtained from external sources (Kim, 1997). Transformation indicates a firm's capability to develop and refine the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge. Exploitation as an organizational capability is based on the

routines that allow firms to refine, extend, and leverage existing competencies or to create new ones by incorporating acquired and transformed knowledge into its operations. Exploitation reflects a firm's ability to harvest and incorporate knowledge into its operations (Van den Bosch et al., 1999). However, in order to use absorptive capacity to its fullest extent, knowledge that has already been created, learnt and internalized for use, needs to be retrieved.

Cohen and Levinthal (1989, p. 569) associated a firm's "learning" to label the capabilities of the firm to innovate and proposed to consider prior related knowledge as a key antecedent. Most commonly, it is Cohen and Levinthal's (1989, p. 569-570) definition of absorptive capacity that is used as "the firm's ability to identify, assimilate and exploit knowledge from the environment". Cohen and Levinthal (1990, p. 128) further clarify absorptive capacity as "an ability to recognize the value of new information, assimilate it, and apply it to commercial ends." This definition establishes three capabilities of a firm which have been categorized as components of absorptive capacity: recognizing the value, assimilating and applying new external knowledge to commercial ends.

Zahra and George (2002) re-conceptualized the absorptive capacity concept and raised important issues about its components, antecedents, contingencies and outcomes. They incorporated the significant amount of research on learning and innovation accumulated since Cohen and Levinthal's seminal articles (1989, 1990) and presented a new absorptive capacity model. Zahra and George (2002) define four components of absorptive capacity (acquisition, assimilation, transformation and exploration) and combine them into two subsets with different value-creating potentials, namely potential and realized absorptive capacity.

In relation to the technology development, absorptive capacity is different from pure technology development because absorptive capacity involves learning and acting on the discoveries occurring outside the boundaries of the firm. The information gathered from outside the firm is then used to redirect activities within the firm. If R&D activities are seen as investments, then superior absorptive capacity would result in more effective

R&D expenditures (Cohen and Levinthal, 1994). Basically, absorptive capacity enhances a firm's ability to judge the likelihood of successfully turning a basic research into a profitable product. Firms with greater absorptive capacity are more likely to pursue projects with a higher probability of success due to their superior knowledge.

2.4.2 Antecedents of a Firm's Absorptive Capacity

Based on seminal contributions of Cohen and Levinthal (1989, 1990) a brief overview of the various conceptual attributes of this construct is provided here, such as the definition, antecedents and consequences and levels of analysis involved.

Cohen and Levinthal (1990) distinguished the key antecedents which influence absorptive capacity as both prior related knowledge (basic skills and learning experience) and organizational factors, such as the structure of communication and distribution of knowledge. The authors introduce three capabilities of absorptive capacity: 1. recognizing the value; 2. assimilating; and 3. applying new external knowledge to commercial ends. These three capabilities have been labeled as components or dimensions of absorptive capacity. Cohen and Levinthal (1990, p. 131) pointed out two important issues: first, the level of analysis, and second, the impact of the organizational context on absorptive capacity by emphasizing that "an organization's absorptive capacity will depend on the absorptive capacity of its individual members". However, a firm's absorptive capacity is not simply the sum of the absorptive capacity of its employees. It is useful to consider what aspects of absorptive capacity are distinctly organizational. Cohen and Levinthal (1990, p. 130) suggest that "the prior possession of relevant knowledge and skills is what gives rise to creativity..." and that these processes require time and an effort. Simply adding the absorptive capacity of the organizational members, however, will not give rise to the absorptive capacity at organizational level without including the organizational context.

Cohen and Levinthal (1990) describe prior related knowledge as various related knowledge domains, basic skills and problem-solving methods, prior learning experience

and learning skills, and a shared language, and they call it a cluster of antecedents of a firm’s absorptive capacity. “Internal mechanisms that influence the organization’s absorptive capacity” (Cohen and Levinthal, 1990, p. 135) represents a second cluster of antecedents (see Table 2.4).

Table 2.4: Two Key Clusters of Antecedents of a Firm’s Absorptive Capacity

Prior related knowledge as the first cluster of antecedents	Internal mechanisms influencing a firm’s absorptive capacity as the second cluster of antecedents
<p>Examples:</p> <ul style="list-style-type: none"> ▪ General knowledge of related domains ▪ Basic skills and problem-solving methods ▪ Prior learning experience ▪ Shared language 	<ul style="list-style-type: none"> ▪ Structure of Communication (both intra- and inter-organizational) Examples: centralized versus decentralized interface functions, shared internal language etc. ▪ Character and distribution of expertise and knowledge within organization Examples: cross-function interfaces, internal and external networks etc.

Source: Based on Cohen and Levinthal (1990).

Cohen and Levinthal (1990) suggest that absorptive capacity affects expectation formation “...permitting the firm to predict more accurately the nature and commercial potential of technological advances” (p. 136). Related to expectation formation is the impact that the level of absorptive capacity may have on a firm’s aspiration level as organizational outcome. In this connection Cohen and Levinthal (1990, p. 137) suggest that the higher the level of absorptive capacity, the more likely a firm will be proactive in “exploiting opportunities present in the environment, independent of current performance.” Obviously, this type of organizational outcome is of great importance in, among others, strategy research.

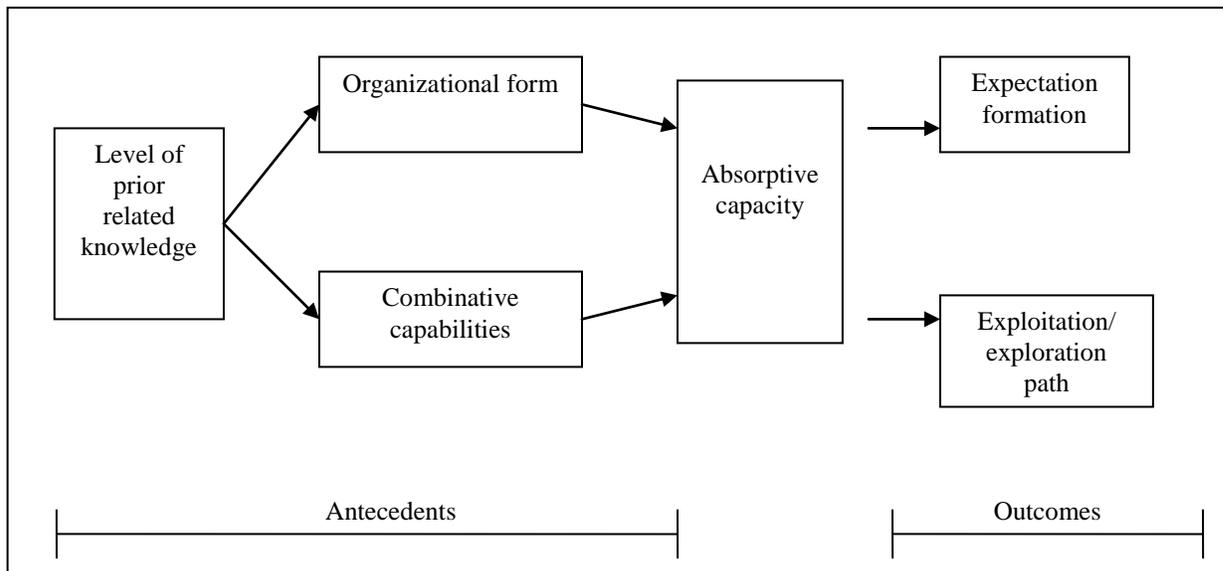
The link between absorptive capacity and the organizational learning and innovation literature can be illustrated by referring, for example, to the dual role of R&D. R&D generates not only innovations and new knowledge, but also enhances learning. This

phenomenon is illustrated by the title of Cohen and Levinthal (1989) paper: “Innovation and learning: the two faces of R&D.” Cockburn and Henderson (1998) too pointed out that firms have to invest in absorptive capacity in the form of in-house basic research to be able to access and learn from upstream research.

An example of a link between the organizational learning literatures is provided by Dijksterhuis, Van Den Bosch and Volberda (1999) who emphasize that a change in shared managerial schemas or multiple management logic being shared among a firm’s key decision makers influences a firm’s absorptive capacity. Further, Cohen and Levinthal (1990) deal with cooperative research ventures or strategic alliances, and stress the importance of absorptive capacity of the partners involved in inter-organizational relations.

The following model addresses antecedents and organizational outcomes of absorptive capacity by focusing on different subsets of antecedents and on particular outcomes.

Figure 2.4: A Model of a Firm’s Absorptive Capacity: Antecedents and Outcomes



Source: Adapted from Van Den Bosch, Volberda and De Boer (1999)

Figure 2.4 portrays the absorptive capacity model emphasizing major antecedents and outcomes that are closely related to the ones distinguished by Cohen and Levinthal (1990). The model illustrates how absorptive capacity is largely a function of prior related knowledge and how two complementary antecedents reflect, as well as how internal mechanisms influence a firm's absorptive capacity. The model portrays how these two internal mechanisms moderate prior related knowledge; it can be considered as a kind of distributed organizational knowledge system (Tsoukas, 1996), while the two internal mechanisms enable the connection and integration of the various parts, areas and skills of prior related knowledge. These two internal mechanisms emphasize the fundamentally organizational character of a firm's knowledge. This model suggests that prior related knowledge and a change in organizational form have an influence on the level of absorptive capacity. The third antecedent refers to *combinative capabilities*. Kogut and Zander (1993) suggest that a firm's combinative capabilities synthesize and apply current and acquired knowledge. This construct is used in the model to investigate the capabilities associated with the internal mechanisms influencing a firm's absorptive capacity.

Van Den Bosch, et al. (1999) build on these contributions by distinguishing between three types of combinative capabilities a firm has at its disposal: systems capabilities (procedures and manuals often used to integrate explicit knowledge), coordination capabilities (enhance knowledge absorption through relations between members of a firm) and socialization capabilities (shared ideology and collective interpretation of the reality). The three capabilities influence the structure of communication and the ways in which the distribution of expertise facilitate knowledge absorption. The organizational form and combinative capabilities interact over time and their combined effect is on the level of absorptive capacity. Organizational form and combinative capabilities (system, coordination and socialization capabilities) with their moderating characteristics toward prior knowledge have helped guide the investigative enquiry of this thesis.

2.4.3 Conceptualization of the Absorptive Capacity Construct

Researchers have used the absorptive capacity construct to explain organizational phenomena that cover multiple levels of analysis by referring to the organizational learning (Huber, 1991; Kim, 1998), industrial economics (Cockburn and Henderson, 1998), resource-based (Lane and Lubatkin, 1998) and dynamic capabilities (Mowery, Oxley and Silverman, 1996) perspectives. This section reviews the literature of representative empirical studies (see Table 2.5) to identify key dimensions of absorptive capacity and to offer a conceptualization of the concept. In Table 2.5, the acronym ACAP means absorptive capacity.

Table 2.5: Absorptive Capacity: Conceptualization

Unit of Analysis	Study	Sample/Data	Theoretical Lens	Treatment/Modeling	Measurement	Outcome/Effects
Country	Mowery & Oxley (1995)	Conceptual (illustrated with statistical data)	Comparison of inward technology transfer channels and national innovation systems	National ACAP as moderator of inward technology transfer and national innovation systems	Investments in scientific and technical training and economic policies that enforce competition	National innovation and productivity are greater for countries that invest in building their ACAP
	Keller (1995)	Conceptual/economic modeling	Transitional dynamics and sustainable long-run growth dependent upon rate of human capital development	ACAP allows exploitation of technology	1. Engineering students as percentage of total postsecondary educated population; 2. Scientists and engineers per million of population; 3. Scientists and engineers in R&D per million of population	Switch in government policy toward an outward orientation (policy liberalism) gives a country only the information part of technology; implementation, however, requires ACAP (or skilled human capital)
	Liu & White (1997)	145 firms from 29 manufacturing industries in China	Innovation in developing economies	ACAP as predictor of innovative output	Investments in R&D personnel	Innovation is driven by synergy between investments in ACAP and investment in sources of new knowledge (foreign technology imports)
Interorganization	Lane & Lubatkin (1998)	69 R&D nonequity alliances between 48 pharmaceutical and 22 biotechnology firms	Organizational learning theory; resource-based theory	ACAP as predictor of organizational learning in an alliance dyad	8 total measure based on valuing new knowledge (2); assimilating new knowledge (5); and commercializing new knowledge (1)	ACAP best measured at the dyadic unit of analysis; relative similarities between two firms' knowledge and knowledge-processing systems are more important than one firm's knowledge base
Organization	Cohen & Levinthal (1990)	1,719 business units from 318 firms in 131 lines of business in U.S. manufacturing sector	Organizational learning; economic theory	ACAP is used as predictor of innovative activity	R&D intensity; responsiveness of R&D to learning incentives (relevance, ease, and appropriability)	R&D creates a capacity to assimilate and exploit new knowledge
	Boynton, Zmud & Jacobs (1994)	132 units with similar information technology (IT) mainframe systems	Organizational learning	ACAP as a predictor of the extent of managerial IT use	(1) Managerial IT knowledge of business processes and the value of information technology; (2) Managerial IT process effectiveness	Managerial IT knowledge was found to influence an organization's extent of IT use; IT management process effectiveness did not influence extent of use, also, higher levels of IT management climate positively influenced both dimensions of ACAP
	Szulanski (1996)	271 respondents comment on 122 transfers of 38 practices/technologies	Organizational learning/strategic management	ACAP as predictor of effective transfer of best practices within the firm	9 measures that capture the internal stickiness of knowledge	Lack of ACAP of the recipient is a major source of "stickiness", defined as difficulties in imitating best practices within a firm
	Veugelers (1997)	290 Flemish firms with active R&D units	Organizational learning/innovation	ACAP is a moderator of level of innovative activity	ACAP as (1) R&D department fully staffed; (2) R&D departments with doctorates; (3) R&D departments engaged in fundamental research	When ACAP is present, external sources of R&D (e.g. from alliance partner) stimulate internal R&D spending; there is no similar effect when capacity is not present
	Cockburn & Henderson (1998)	68,186 publications in scientific journals	Industrial/organization economics	ACAP as predictor of research productivity	Not a direct operationalization of ACAP but is reflected by number of scientific publications	Developing ACAP is not adequate; connectedness to scientific community is a key factor in driving a firm's ability to recognize and use upstream research and findings
	Kim (1998)	Case study of a manufacturing firm (Hyundai Motor Co.)	Organizational learning theory; organizations as learning systems	Organizational learning theory; organizations as learning systems	Organizational learning is a function of ACAP; it is the capacity to assimilate knowledge (for imitation) and create new knowledge (for innovation)	Changes in firm orientation toward use of assimilated technology; transition from technology assimilation to imitate to development of internal R&D functions to innovate

Source: Adapted from Zahra and George (2002)

Note: The studies listed are representative rather than exhaustive.

Table 2.5 summarizes representative empirical studies of absorptive capacity, showing that researchers have studied the effects of absorptive capacity at different levels of analysis, while adopting various measures of the construct. For example, Lane and Lubatkin (1998) examined relative absorptive capacity in the context of R&D capability transfers using survey methods. Cohen and Levinthal (1990) used survey methods to measure R&D intensity and responsiveness of R&D to learning incentives, while Kim (1998) utilized the case study method. Szulanski (1996) developed nine measures to capture the internal stickiness of knowledge transfer; the author analyzed internal stickiness of knowledge transfer and tested the resulting model by canonical correlation analysis of a data set consisting of 271 observations of 122 best-practice transfers in eight companies.

Prior literature uses either qualitative or quantitative methods to examine the absorptive capacity from different angles and offers diversity of analysis and findings leading to the ambiguity of absorptive capacity concept and its definition. Both the quantitative and qualitative approaches are valid ways of doing research. However, to solve the complexity of the absorptive capacity concept and to capture as complete picture of the subject as possible, different approach which offers innovative methodological solutions is required. Having its foundation in prior literature, this research is concerned with the knowledge necessary to develop to facilitate understanding of new emerging information. It has to go beyond standard mathematical techniques or pure interpretation of data to achieve the research objectives.

2.4.4 Absorptive Capacity Concept - Issues

Cohen and Levinthal (1990) propose that *recognizing* the value is the first component of absorptive capacity. They suggest that without prior knowledge firms are not able to evaluate the new information and, therefore, fail to absorb it (Todorova and Durisin, 2006). As Todorova and Durisin (2006, p. 774) pointed out, absorptive capacity depends on the knowledge source and prior knowledge; it is conditioned on the appropriability regimes, and it influences the innovative performance of the firm.”

Ocasio (1997) supports Cohen and Levinthal (1990) emphasizing the constraints in firms in detecting new external knowledge and the importance of recognizing and acting on identified constraints. Research on learning and innovation provides evidence for the critical role of recognizing the value of new external knowledge for the survival of firms in dynamic competitive environments. Henderson and Clark (1990) illustrate how new external knowledge is screened out by information filters and communication channels that embody obsolete architectural knowledge. Iansiti and Clark (1994) too investigate how external and internal integration capabilities appraise external information sources and stimulate the communication between subunits.

Cognitive and structural embeddedness bias firms' capabilities in favour of incremental learning and strong ties (Hansen, 1999). Firms are hampered by their embedded knowledge base, rigid capabilities and path-dependent managerial perceptions (Gavetti and Levinthal, 2000; Tripsas and Gavetti, 2000). For this reason they often fail to identify and absorb valuable external information. The capability to recognize the value of new external knowledge is a critical component of absorptive capacity because "the valuing is not automatic, it is biased, and it needs to be fostered to allow the absorption to begin at all" (Todorova and Durisin, 2006, p. 777).

Todorova and Durisin (2006) suggest that the constraints on the ability to judge the significance of the new knowledge usually come "from the use of the values of key stakeholders as evaluation criteria" (p.777). Christensen and Bower (1996) investigate the problems of managers in properly assessing the value of new knowledge when it is not relevant for the current demands of key customers and found that the exploitation of new knowledge did not lead to an increase in the value of the firm because managers did not *invest* in its absorption.

Accordingly, the ability to absorb external knowledge depend a great extent on the ability to value and understand the new information. The importance of *recognizing* the potential value of the new knowledge requires researchers and practitioners to understand and

accept absorptive capacity as a *building block* of the dynamic capability of a firm in the increasingly competitive environment.

This confusion about the absorptive capacity concept may come from the lack of clarity and the vagueness of prior definitions and its tacitness which increases concerns about the sphere of influence and the ability to evaluate absorptive capacity.

2.4.5 Absorptive Capacity in the International Context

With increasing globalization and worldwide trade liberalization, research on learning and internationalization has become an important issue in the international business literature. As firms increase their international involvement by conducting business in countries that have different business customs, business institutions and infrastructure they have to widen their internationalization knowledge. One perspective on learning is that firms that have previous experience have an advantage as they can learn from these experiences and add their new knowledge to these accumulated experiences (Mahdok, 1997; Cohen and Levinthal, 1990; Eriksson, Johanson, Majkgard and Sharma, 1997). As a firm internationalizes it acquires, evaluates, assimilates, integrates and diffuses knowledge, which Madhok (1997) refers to as ‘capability accumulation’.

Lane and Lubatkin (1998) have found that internationalization is a cumulative process, and can be viewed as a process of learning and knowledge accumulation, where prior experiences form the base for an ongoing business. In this process firm’s ability to evaluate this external information is determined by its prior related knowledge. A firm’s prior related knowledge can be increased when it operates in diverse foreign markets, as it is exposed to different ideas and experiences (Abrahamson and Fombrun, 1994; Barkema and Vermeulen, 1998; Eriksson, Johanson, Majkgard and Sharma, 2000; Miller and Chen, 1994, 1996).

Cohen and Levinthal’s (1990) concept of absorptive capacity highlights the importance of previous knowledge for learning new tasks. As a firm accumulates absorptive capacity

in one task, it becomes more experienced in accumulating it in subsequent tasks. In the context of internationalization this means that as a firm learns in one international market, its learning and performance in another market will be influenced by this previous experience and the chances of successful performance will be improved.

Experientially based market specific knowledge guides the identification of market opportunities to which a firm decides to commit resources. In turn, market interaction leads to reduced uncertainty and risk perception in foreign markets. It can, therefore, be expected that market knowledge developed in the past affects how a lack of foreign market knowledge is perceived as an obstacle to carrying out the ongoing foreign business activities. A firm's prior related knowledge can be increased when it operates in diverse foreign markets, as it is exposed to different ideas and experiences (Abrahamson and Fombrun, 1994; Barkema and Vermeulen, 1998; Eriksson et al., 2000; Miller and Chen, 1994; Miller and Chen, 1996).

A significant amount of research using the concept of experiential knowledge on the internationalization process and the choice of mode for entering foreign markets has been accumulated covering the topic from different perspectives (Barkema, et al., 1996; Beamish, 1990; Erramilli, 1990; Erramilli and Rao, 1993; Kogut and Singh, 1988; O'Grady and Lane, 1996; Reid, 1981; Root, 1987; Sharma and Johanson, 1987). This section identifies the literature that examines how absorptive capacity affects the way the international business is conducted focusing on experiential knowledge², which is viewed as a driving force in the internationalization process (Johanson and Vahlne, 1977).

Firms that expand internationally gain experiential knowledge about foreign markets, foreign cultures, foreign institutions and other market specific knowledge (Barkema et al., 1996). Denis and Depelteau (1985) found that firms place a greater emphasis on acquiring knowledge through interacting with the market environment compared with information obtained through public or private information services.

² Experiential knowledge offers such advantages as direct knowing, immediate understanding, learning without the conscious use of reasoning, or making a choice without formal analysis.

A critical consideration in internationalization is the compatibility between a firm's existing resources and those needed in a particular foreign market. Knowledge is required both about the market and the firm (Johanson and Vahlne, 1977; Madhok, 1997). With increasing experiential knowledge of the market and the demand situation, firms become more able to perceive opportunities in foreign markets reducing uncertainty (Kogut and Singh, 1988).

Despite the clear focus on experiential knowledge in the process of internationalization, there is an absence of studies empirically investigating the concept of experiential knowledge as it relates to internationalization. A notable exception to this is the work of Eriksson et al. (1997) concerning experiential knowledge and the perceived cost of internationalization. The authors find a strong relationship between the lack of foreign business and foreign institutional knowledge and the perceived cost of internationalization. In turn, foreign business knowledge and foreign institutional knowledge are found to be dependent on internationalization knowledge. Through the development and testing of these three experiential knowledge constructs, Eriksson et al. (1997) reinforce the view that experiential knowledge reduces perception of difficulty concerning internationalization, given that it 'captures a firm's ability to apply and to develop its accumulated unique knowledge as it gains foreign business experience in a way that supports further internationalization' (Eriksson, et al., 2000, p. 40).

Through an adaptation of the Uppsala model (Johanson and Vahlne, 1977, 1990), Eriksson et al. (1997) modeled the effect of lack of experiential knowledge on the cost of incremental commitments in the internationalization process of firms. They argued that firms develop routines and structures to manage operations in their home market, but such routines and processes are not "sensitive" to stimuli originating from overseas. In contrast to technology, other skills in firms may have a limited geographical application because of differences between the host and home countries (Buckley and Casson, 1976). As firms operate abroad, failure and success are achieved, firms learn and their routines and structure are amended.

Building upon the research summarized in Table 2.5 and on the literature on learning, and on dimension of absorptive capacity in Table 2.3, this section analyzes the literature related to the effect of variation on the accumulation of knowledge in firms in the internationalization process. The model by Eriksson et al. (1997) is the point of departure. This section further discusses R&D intensity and organizational structure in the firm as significant factor that influence firm's absorptive capacity.

Prior Experiential Knowledge in the Internationalization Process

Eriksson et al. (1997) identified 'foreign business knowledge', 'foreign institutional knowledge' and 'internationalization knowledge', aspects of prior knowledge, which play an important role in conducting an international assignment. These three types of experiential knowledge will be used as points of reference for this study.

Foreign business knowledge is defined as 'experiential knowledge of clients, the market, and competitors' (Eriksson et al., 1997, p. 343). The lack of this knowledge is a disadvantage for the firm. A firm can acquire this knowledge by working closely with its customers to gain knowledge about the market and how local businesses operate. When firms conduct business with foreign counterparts they acquire knowledge from each other (Hamel, 1991). A large amount of internationalization activity is associated with networking as it involves building relationships with foreign intermediaries, customers, suppliers and alliance partners.

Eriksson et al. (1997, p. 343) define *foreign institutional knowledge* as 'experiential knowledge of government, institutional framework, rules, norms, and values'. The authors maintain that, if a firm lacks experiential institutional knowledge, it has difficulty understanding the technical and commercial laws in a particular market. A lack of knowledge of social, political and economic conditions of a particular market is a disadvantage to the firm (Beamish, 1984).

Eriksson et al. (1997, p. 345) maintain that *internationalization knowledge* stems from “a firm’s experience of organizing internationalization’ and ‘knowing what knowledge is required in different situations and different settings connected with internationalization, and where to seek this knowledge”. As a firm internationalizes it accumulates knowledge, which becomes part of the organization’s knowledge and routines (Eriksson et al., 1997). A firm operating in diverse foreign markets accumulates a wide range of knowledge that provides it with the capabilities to recognize which new opportunities to exploit (Cohen and Levinthal, 1990). Internationalization knowledge reveals a firm’s capability and resources to engage in international operations.

The three interrelated components of knowledge are critical to internationalization (Eriksson et al., 1997). Ultimately, a lack of internationalization knowledge influences lack of business knowledge and institutional knowledge about foreign markets. The number of countries in which a firm is operating abroad, as well as the length of operations abroad, affects the knowledge accumulation in internationalizing firms (Eriksson et al., 2000). The internationalization process of firms implies accumulating new knowledge and making sense of an unknown and unfamiliar situation.

Knowledge is embedded in the organizational routines, administrative structure or theory-in-use (Argyris and Schon, 1978) developed to manage operations of firms. New information is filtered and adjusted to the firm’s own information-processing capacity. The current theory-in-use influences the sense-making process. In the context of the internationalization of firms, domestic operations influence sense-making process. The existing theory-in-use restricts what new knowledge firms can accumulate. Learning is dynamic and involves making sense out of past histories; it is linked to current and past knowledge (Argyris and Schon, 1978). When going abroad, firms base their activities on the *domestically accumulated knowledge*. In the context of going abroad, internationalization knowledge forms the theory-in-use in firms, with regard to their international business strategy.

In theories such as the product life-cycle (Vernon, 1966) and Uppsala model (Johanson and Vahlne, 1977, 1990) a precondition for successful internationalization of firms is a firm-specific advantage and the importance of domestic operations for the internationalization process of firms. However, in a study on manufacturing firms, Brush (1992) found that longer domestic operations prior to initiating foreign sales did not positively affect foreign sales. O'Grady and Lane (1996) found that prior experience in the domestic market actually inhibited firms from learning about the differences between domestic and foreign markets. Further, Brush (1992), McDougall, Shane, and Oviatt (1994) and Oviatt and McDougall (1994) show that many firms entered overseas markets early in their life-time and served the world market from the very start.

The conclusion is that some firms have the necessary mental models and organizational routines to combine resources from the different national markets. Similarly, Bell (1995) found a number of firms that did not establish domestic sales before going international, more important factors being relationships, both foreign and domestic, industry-specific factors and the nature of the niche in the target market. Reid (1981) states that, in newer, smaller firms, the competence and experience of top management is more likely to influence internationalization.

The effect of domestic operations on knowledge accumulation in internationalizing firms is still unclear. Accumulating knowledge in domestic markets may have a negative effect on a firm's accumulation of foreign business knowledge. This may happen, as going abroad implies operations in a new environment and this may require *unlearning* some old knowledge and practices developed in the domestic market. The knowledge accumulated in domestic markets may over develop as a barrier to internationalizing.

Cohen and Levinthal (1990) show that existing theory-in-use and the associated routines are the determining effects on future accumulation of knowledge in internationalizing firms. In the context of internationalization, this implies that the theory-in-use in firms that is based on their domestic operations may inhibit an internationalizing firm from picking up and interpreting cues from abroad. This in turn may slow down accumulation

of knowledge on foreign markets. Buckley (1997) argues that firms may become dependent on national traits and these may be non-transferable to foreign markets. This inhibits adaptation to foreign markets and the ability to learn.

Further, firms exposed to limited variation (e.g., single product, single client, and single technology) must deal with a limited number of customers, competitors, and other business and institutional actors (Erramilli, 1991). For this reason, these firms accumulate limited knowledge. There is also likely to be less innovation, since such firms experience only a limited set of problems and of technical and market-related solutions. This narrows and restricts the questioning of current theory-in-use, product profile, marketing practices, and strategies toward consumers, competitors, and other institutions. Thus, Erramilli (1991) states that firms exposed to limited variation abroad accumulate limited knowledge of the institutions that exist in a country and of the principles by which they operate. These firms may have to acquire knowledge and develop new routines and structures if they are to operate successfully in a new market.

Level of the Firm's Investment in R&D

The development of absorptive capacity and, in turn, innovative performance are history- or path-dependent; lack of investment in an area of expertise early on may eliminate the future development of a technical capability in that area (Cohen and Levinthal, 1990). Outside sources of knowledge are often critical to the innovation process. The ability to exploit external knowledge is a critical component of innovative capabilities. The ability to evaluate and utilize outside knowledge is largely a function of the level of prior related knowledge. Firms that conduct their own R&D are better able to use externally available information (Tilton, 1971). This implies that absorptive capacity may be created as a byproduct of a firm's R&D investment or/and a firm's manufacturing operations.

This idea that prior knowledge underlies absorptive capacity has important implications for the development of absorptive capacity over time and, in turn, the innovative performance of companies. Accumulating absorptive capacity in one period will permit

its more efficient accumulation in the next; by having already developed some absorptive capacity in a particular area, a firm may more readily accumulate what additional knowledge it needs in the later periods in order to exploit any critical external knowledge that may become available (Cohen and Levinthal, 1989). The possession of related expertise permits the firm to better understand and evaluate new technological advances. In an uncertain environment absorptive capacity gives an opportunity to the firm to anticipate more accurately the nature and commercial potential of technological advances, which, in turn, form the incentive to invest in absorptive capacity subsequently.

The greater the organization's expertise and associated absorptive capacity, the more sensitive it is likely to be to emerging technological opportunities. Thus, organizations with higher levels of absorptive capacity will tend to be more proactive, exploiting opportunities present in the environment. Alternatively, organizations that have a modest absorptive capacity will tend to be reactive, searching for new alternatives in response to failure on some performance criterion.

Since technical change within an industry (Rosenberg and Steinmueller, 1988) is often closely related to a firm's ongoing R&D activity, a firm's ability to exploit external knowledge is often generated as a byproduct of its R&D. Therefore, it may be considered a firm's R&D as satisfying two functions (Cohen and Levinthal, 1990): R&D not only generates new knowledge but also contributes to the firm's absorptive capacity. If absorptive capacity is important and R&D contributes to it, then whatever conditions the firm's incentives to learn should also influence R&D spending. The empirical challenge then is to understand the impact of the characteristics of the learning environment on R&D spending.

The relative amount of expenditure on R&D has traditionally been used as an indicator of a firm's innovative activities in many industries (Scherer, 1980). R&D intensity is not only used as a measure of internal learning but also as a requirement for external learning as firms need to develop a certain level of internal knowledge to understand and apply external knowledge (Cohen and Levinthal, 1990).

Internal R&D contributes to technical output because it builds the prior knowledge that is needed in order to identify, assimilate and exploit technological spill-overs from the firm's external environment (Cohen and Levinthal, 1990). Internal R&D produces a firm-specific knowledge, which enables the firm to absorb external knowledge. The greater the level of investment in internal R&D, the greater the technical output of the firm and subsequently understanding the firm's external environment. It is not to say that a firm that invests more will have more output. What is important to emphasize here is that internal R&D also impacts the firm's ability to more efficiently screen, access, and assimilate outside knowledge. In other words, internal R&D tend to build the absorptive capacity of the firm.

Organizational Structure and Communication

The development of an organization's absorptive capacity builds on prior investment in the development of its individuals' absorptive capacity. However, a firm's absorptive capacity is not simply the sum of the absorptive capacity of its employees. Absorptive capacity refers not only to the acquisition or assimilation of information by an organization but also to the organization's ability to exploit it (see Table 2.3). It also depends on transfer of knowledge across and within subunits in the firm and on the structure of communication between the external environment and the organization, as well as on the character and distribution of expertise within the organization (see Figure 2.4). The firm's absorptive capacity depends on the individuals who stand at the interface of both the firm and the external environment or at the interface between subunits within the firm (Cohen and Levinthal, 1990).

Beyond diverse knowledge structures, the sort of knowledge that individuals should possess to enhance organizational absorptive capacity is also important. This knowledge can be knowledge of who know what, who can help with what problem, or who can exploit new information. Individuals' awareness of others' capabilities and knowledge is strengthened. As a result, individual absorptive capacity is leveraged even more, and the

organization's absorptive capacity is strengthened; i.e., practice of rotating their R&D personnel through marketing and manufacturing operations enhances the diversity of background of their personnel.

However, researchers have focused less attention on the fact that knowledge stocks within the firm may differ across organizational subunits. In their original paper, Cohen and Levinthal (1990) emphasize that absorptive capacity "depends on the transfer of knowledge across and within subunits that might be quite removed from the original point of entry" (Cohen and Levinthal, 1990, p. 131).

Cohen and Levinthal (1990) suggest that "accumulating absorptive capacity in one period permits its more efficient accumulation in the next" (p. 129). Besides prior related knowledge as a determinant of absorptive capacity the distribution of knowledge within the organization and the organization's ability to transfer this knowledge internally is critical to absorptive capacity (Cohen and Levinthal, 1990). However, it is useful to consider what aspects of absorptive capacity are "distinctly organizational" (Cohen and Levinthal, 1990, p. 131). Examples of these "internal mechanisms that influence the organization's absorptive capacity" (Cohen and Levinthal, 1990, p. 135) are the transfer of knowledge across and within subunits; the structure of communication between the external environment and the firm, a broad and active network of internal and external relationships; and cross-function interfaces (Cohen and Levinthal, 1990).

On the basis of Lane and Lubatkin's (1998) empirical findings, a firm's knowledge-processing system plays a key role in absorbing knowledge. The organization form is an important determinant of absorptive capacity because a firm's organization form is strongly related to its knowledge-processing activities. Besides organizational forms, combinative capabilities are an important organizational determinant of absorptive capacity (Kogut and Zander, 1992). This is in line with Cohen and Levinthal's (1994, p. 227) statement that absorptive capacity is "... comprised of the set of closely related abilities" to evaluate, assimilate, and apply external knowledge; these abilities "... collectively constitutes what we have termed a firm's absorptive capacity."

The existing organization form influences how a firm processes knowledge. In this respect, an organization form could be viewed as a type of infrastructure (Van Den Bosch, Volberda and De Boer, 1999) which enables the process of evaluating, assimilating, integrating, and utilizing knowledge in a specific way.

In an effort to understand the sources of absorptive capacity, Cohen and Levinthal (1990) recognized that the problem of designing communication structures (i.e. systems through which information is to flow) could not be separated from the distribution of expertise within and between units and argued that the firm's absorptive capacity is largely dependent on the individuals who stand at the interface between subunits within the firm or between the firm and its environment. They suggested that the interactions across individuals who possess diverse knowledge structure is likely to lead to technological innovation.

For example, original technological innovation often requires insights from a number of specialists. These specialists may be affiliated with different units in the organization (e.g. marketing, manufacturing, R&D) or with different organizations (e.g. two or more strategic alliance partners). These individuals can be expected to bring to the technological innovation process very different socially constructed understandings of reality. These sometimes diverse systems of meaning, knowledge structures and mental models may limit specialists' ability to interact and combine their shared expertise, thus hindering original technological innovation.

Competencies associated with successful management of units coordination may reside in a group of individuals (e.g. team managers within a firm), collaborative mechanisms established by the firm, or a combination of the two. Because original technologically innovative efforts often depend on the management and coordination, and some firms have distinctive competencies that make them more successful in managing these types of relationships than other firms, it can be argued that firms with such above average

managerial capabilities should have a competitive advantage when seeking to innovate technologically.

Organizational cooperative capabilities are embedded in firm routines, which are a product of the organization as an entire system (Barney, 1992; Teece, Pisano and Shuen, 1997). Further, the construct often labeled 'organization culture' is an excellent example of how a number of organizational cooperative capabilities can become embedded in firm routines and provide a firm with a competitive advantage that is not easily competed away. A path-dependent, ambiguous, and socially complex organizational culture, that serves as the context for organizational routines, systems and processes, and encourages and supports cooperative interaction and learning, should enhance original technological innovation and can be expected to be extremely difficult to imitate or substitute.

2.4.6 Summary

A particular area of enquiry of this research has focused on the influence of technology transfer and absorptive capacity on the internationalization process of high-tech SMEs. In the international business literature this type of organizations has been somewhat neglected. As reported in the literature, one distinguishing feature of technology transfer is the one from MNE's and second distinguishing feature is that research has been done from manufacturing firm's perspective.

Even though the internationalization process has been analyzed from various angles and seen through different lenses, the need of examining the influence of technology and absorptive capacity has been identified. This suggests a need to understand the internationalization process of a firm at also knowledge creation level because knowledge generation may be imprinted through different layers in firms. Cohen and Levinthal's (1990) suggest that firms need to manage the diversity of their knowledge structures. The possession of diverse and different knowledge structures enhances the organization's potential for innovation by providing an opportunity to make novel linkages and associations and improves firm's absorptive capacity.

Accordingly, the purpose of this study is to assess the ever changing process of absorptive capacity and knowledge creation of high-tech SMEs in the process of internationalization. The focus is on absorptive capacity rather than on the internationalization process and the internationalization process is positioned as the 'dependent variable'.

The following arguments guide this thesis:

First, the theoretical foundation for this study embraces arguments from the international business literature. However, the study addresses concerns that the conceptual frameworks underpinning international business research have relied to a great extent on the large firm literature and do not necessarily incorporate small firm issues in the process of internationalization.

Second, this thesis suggests that the assumptions regarding the limited options for investment in a foreign country by the high-tech industries may be extremely simplistic because the nature of the high-tech industry affects the way in which firms in the industry produce and deliver their products.

Third, the principal proposition advanced in this thesis is that absorptive capacity might assist firms to respond to the imperfect markets with intangible assets, such as technology and build competitive advantage.

The research questions underlying this study draw on the impact and relationship between technology and absorptive capacity of a firm and its international strategy. No prior research has been identified that recognizes the degree and pattern of the internationalization process as likely to be closely interrelated with firm's technology and absorptive capacity. To our knowledge, the literature on the internationalization process is silent on absorptive capacity while the literature on absorptive capacity is silent on the internationalization process. Past research has not considered how firm superior

technology and absorptive capacity may affect the competitive capabilities of firms in foreign markets. This constitutes a *gap* in past research. To date a well integrated approach or research perspective that considers the impact of *both* superior technology and absorptive capacity on the internationalization process has not been found, neither has there been any attempts to measure absorptive capacity using multiple measurements.

2.5 Research Conceptualization

2.5.1 Introduction

This final section describes the conceptual framework used in this study which is based on the research question and the conceptualization of the internationalization process in relation to the technology transfer and absorptive capacity. A framework for the research process is presented as a schematic model and discussed. The theoretical grounding for the research questions and the research model are explained and discussed facilitating understanding of the findings in Chapter 6 and 7.

First, the research question is posed and discussed in Section 2.5.2. The research model and preliminary propositions are presented and discussed in Section 2.5.3 and the theoretical grounding for the research question is considered in Section 2.5.4. The chapter concludes in Section 2.5.5 by reviewing the prior discussion.

2.5.2 Proposed Research Question

Theories of internationalization help to explain the strategic process of expansion into foreign markets. Motivations to commence international expansion and choice of entry mode comprise the initial sequences in the internationalization process. Exporting is one of the most common forms of entering the international marketing arena. Cumulative experience plays an important part in a firm's progression through various "stages" of international development as resources are gradually committed to international

involvement. The needs, motivations, industry and organizational characteristics of firms at the different stages of internationalization are found to vary significantly, with implications for management and performance. However, while frameworks such as the “stages” approach are useful for analyzing international activities and development patterns, there is a need to enhance the existing literature in this area, particularly with regard to explaining relationships between technology transfer and firm’s foreign strategy on one hand, and absorptive capacity and international strategy of the firm, on the other hand.

Although the literature supports the traditionally held view that a marketing orientation and emphasis on marketing activities are important elements in the success of the firm, there is limited empirical research on the role and influence of both technology and absorptive capacity of the firm in the internationalization process. Similarly, research of the impact of technology transfer and absorptive capacity on strategy, international activities and market development is lacking, despite extensive literature on the internationalization process of a firm. This lack may be partially attributed to emphasis in research on understanding the internationalization process from the perspectives of foreign market entry mode and the sequence of stages rather than the managerial perspective in terms of management foreign experience, functions and activities.

Further, as in the areas of internationalization, the literature regarding the influence of technology and absorptive capacity in this context lacks market-specific studies with a small and medium-sized firm orientation. The most common unit of analysis is the multinational firm. However, limited attention has been paid to the two factors with regard to success of small and medium-sized firm in international business. More specifically, for the New Zealand firm there are no clear guidelines based on empirical research, regarding the extent and the influence of the two factors to be expected and the importance of the relationship between the technology transfer, absorptive capacity and firm strategy in doing business with new emerging markets, particularly CEECs markets.

Having briefly examined the theoretical and empirical contributions of previous studies, the conclusion is that there is a research gap and need for theory development. There is a need for a deeper understanding of the managerial aspects in doing business in a foreign market under assumptions that a firm's technology and absorptive capacity may influence the internationalization process. These issues are central to the firm's decision-making process, and provide a basis for formulating the research questions for the study.

The following research question guiding the empirical investigation is proposed:

“What is the impact of firm's technology and absorptive capacity on the internationalization process?”

From the review a number of key factors have also been identified that are believed to impact on firms' decisions to enter the foreign markets. Therefore, in posing the overall research question a number of further questions arise:

In relation to Technology Transfer:

- How does the firms' technology affect the choice of market entry mode for the particular market?
- How is technology transfer and knowledge management organized?
- How does current technology drive cognition of future internationalization strategy of the firm?
- How does the firm's technology influence this ability to anticipate the emergence of new opportunities in the market?

In relation to Absorptive Capacity:

- How does a firm's absorptive capacity affect the choice of market entry strategy for the particular market?

- How does absorptive capacity influence the knowledge environment and firm strategy?
- How does absorptive capacity drive cognition of future internationalization strategy of the firm?
- How does a firm's absorptive capacity influence anticipating the emergence of new opportunities in the market?

These questions provide the basis for some initial hypothesizing about possible relationships, which can be expressed as preliminary propositions to be examined in the empirical investigation. This set of preliminary propositions is presented in the next section.

2.5.3 Preliminary Propositions and Conceptual Framework

The following preliminary propositions are based on the premises that (1) the current firm's technology influences the internationalization process of the firm, and that it drives the future international strategy of the firm, and (2) the more experience the firm has of acquiring foreign market knowledge, the more absorptive capacity it will develop; having increased absorptive capacity, the firm has a more realistic perception of the need for foreign market knowledge, and develops an ability to recognize which new opportunities to exploit.

Technology Transfer and Foreign Strategy

Regarding the relationship between technology transfer and knowledge management, and foreign strategy in the internationalization process:

How international strategy and technology interact with each other is one of the basic themes of this research. In most discussions, technology has been treated as a constraining factor that determines the current opportunity set for the firm. For the firm, a given technology determines a given strategy. Current strategy has to match the firm's

current technology. The dynamic interactions between international strategy and technology are previously explained in more details (refer to Section 2.3.2, p. 51). This leads to the following propositions:

- P1a:** Firm's foreign strategy and international activities change to adjust for changes in development of the firm's technology.
- P1b:** Firm's technology changes to fit the firm's foreign strategy.
- P1c:** Technology development process and knowledge management are part of the future internationalization strategy of the firm.

To summarize, this thesis will analyze the subsequent central proposition:

- P1: A firm's technology is positively related to a firm's degree of international activities.**

Absorptive Capacity and Foreign Strategy

Regarding relationship between a firm's absorptive capacity of and foreign strategy applied in the internationalization process:

The propositions in this thesis are based on three types of international experiential knowledge, which Eriksson et al. (1997) categorize as 'foreign business knowledge', 'foreign institutional knowledge' and 'internationalization knowledge'. In the process of internationalization, the knowledge accumulated in firms must address business, institutions, and internationalization (Eriksson et al., 1997). This approach allows us to ascertain whether the three knowledge constructs identified by Eriksson et al. (1997) capture the full extent of relevant experiential knowledge in the internationalization process and influence firm's strategy.

In addition, the next factor related to absorptive capacity of a firm emerged from Cohen and Levinthal's (1990) research. They argue that the development of absorptive capacity, and, in turn, innovative performance are history- or path-dependent and add that lack of

investment in an area of expertise early on may inhibit the future development of a technical capability in that area, claiming that R&D contributes to a firm's absorptive capacity. Firms that conduct their own R&D are better able to use externally available information (Tilton, 1971). This implies that absorptive capacity may be created as a byproduct of a firm's R&D investment or/and a firm's manufacturing operations.

Internal R&D contributes to technical output because it builds the prior knowledge that is needed in order to identify, assimilate and exploit technological spill-overs from the firm's external environment (Cohen and Levinthal, 1990). Internal R&D is needed because it takes a substantial research capability to understand, interpret and to appraise knowledge. Building on Cohen and Levinthal's claim that investment in internal R&D contributes to absorptive capacity, this research posits that there is a positive relationship between investment in internal R&D and output based on new technical developments, leading to better understanding the firm's external environment and to developing the ability to identify and value new information.

Further, absorptive capacity refers to not only the acquisition or assimilation of information by an organization but also to the organization's ability to exploit it. Therefore, an organization's absorptive capacity does not simply depend on the organization's direct interface with the external environment. It also depends on transfer of knowledge across and within subunits in the company. Thus, to understand the sources of a firm's absorptive capacity, the focus is on the structure of communication between the external environment and the organization, as well as among the subunits of the organization, and also on the character and distribution of expertise within the organization.

Some organizations have a greater capacity to absorb, circulate and utilize information than others (Cohen and Levinthal, 1990). A flexible (non-bureaucratic, non-hierarchical) organizational structure is thought to be associated with higher capacities for knowledge acquisition (Dodgson, 1993; Lyles and Schwenk, 1992). Organizational flexibility promotes the knowledge transfer process by encouraging greater openness of

organization members to new stimuli from the outside, by promoting collaboration and exchanges of information within the organization (Fiol and Lyles, 1985).

This leads to the following propositions:

P2a: Extensive prior international experience including internationalization knowledge, foreign business knowledge about the market, and foreign institutional knowledge in the market, as well as the firm's R&D intensity and organizational structure, are positively associated with the firm's absorptive capacity.

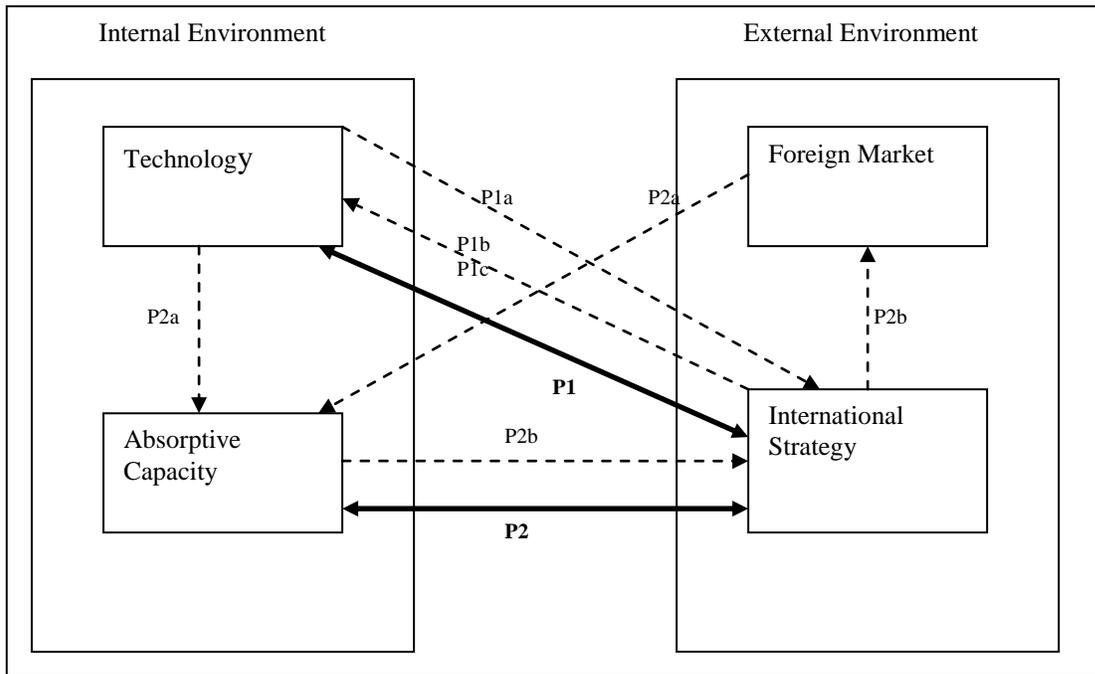
P2b: Absorptive capacity is positively related to international strategy and to success in conducting business in a foreign market.

To summarize, this thesis will analyze the subsequent central proposition:

P2: A firm's absorptive capacity is positively related to a firm's degree of international activities.

Issues in the internationalization process, technology transfer and absorptive capacity that were discussed in previous sections have provided the basis from which the above sets of preliminary propositions are derived. These propositions provided a framework to guide data collection and analysis in the investigation. A conceptual model presented in Figure 2.5 was established as a basis for conducting the investigation.

Figure 2.5: Conceptual Model



P1a: Firm’s foreign strategy and international activities change to adjust for changes in development of the firm’s technology.

P1b: Firm’s technology changes to fit the firm’s foreign strategy.

P1c: Technology development process and knowledge management are part of the future internationalization strategy of the firm.

P1: A firm’s technology is positively related to a firm’s degree of international activities.

P2a: Extensive prior international experience including internationalization knowledge, foreign business knowledge about the market, and foreign institutional knowledge in the market, as well as the firm’s R&D intensity and organizational structure, are positively associated with the firm’s absorptive capacity.

P2b: Absorptive capacity is positively related to international strategy and to success in conducting business in a foreign market.

P2: A firm’s absorptive capacity is positively related to a firm’s degree of international activities.

The provisional framework outlines the major dimensions of the study within which the main categories, key factors or variables, presumed relationships among them, and the

underlying theoretical assumptions about the phenomena can be described as part of the process of internationalization of a firm.

2.5.4 Conceptual Grounding

The elements of the conceptual research model have their base in past theory and research findings, which are discussed below. Previous theories provided the foundation for development of the conceptual model and investigation in this thesis are discussed in previous sections of this chapter.

Because internationalization can be viewed as a process of learning and knowledge accumulation, conceptualization of the internationalization process in this research draws on the learning-based the Uppsala model by Johanson and Vahlne (1977, 1990), as well as innovation models (Bilkey and Tesar, 1977; Cavusgil, 1980, 1984; Czinkota, 1982; Reid, 1981; Leonidou and Katsikeas, 1996)³. Learning theories claim that variation changes the stock of knowledge (Eriksson, Johanson, Majkgard and Sharma, 2000), and theory-in-use (Argyris and Schon, 1978) in firms.

Based on the behavioral theory of firms and the gradual learning process, a considerable amount of literature on the internationalization process of firms has been accumulated. One particular stream of research is increasingly focusing on the factors that affect the accumulation of knowledge in the internationalization process of firms. Factors such as the duration of foreign operations (Erramilli, 1990), the firms' size and age, and the number of foreign countries in which they operate (Barkema and Vemeulen, 1998) influence the accumulation of knowledge. However, both of these studies did not make an empirical examination of the role of knowledge accumulation. Cohen and Levinthal (1990) state that, in the process of learning, the stock of knowledge already accumulated in firms plays an important part.

³ The models are similar in that they are behavioral in nature and in that, experiential knowledge is a prominent factor in the internationalization process. However, the U-model is assumed to be valued for firms of any size while the I-models may be applicable to small firms only (Andersen, 1997). See Chapter 2.

This thesis analyzes the effect of the accumulation of knowledge in firms on formation of international strategy. Even though being subject to criticism related to the theoretical assumptions and its methodological foundation (Akoorie and Scott-Kennel, 2005), the Uppsala model by Johanson and Vahlne (1977) is still one of the most widely cited theoretical perspectives on how firms begin overseas expansion and is the point of departure of the analysis in this research. Further, through an adaptation of the Uppsala model, Eriksson et al. (1997) modeled the effect of lack of experiential knowledge on the cost of commitments in the internationalization process of firms.

Theories of internationalization help to explain motivations to commence international expansion, choice of entry mode and the strategy process of expansion into foreign markets. Cumulative experience plays an important part in a firm's progression through various "stages" of international development as resources are slowly committed to international involvement. While frameworks such as the "stages" approach are useful for analyzing international activities and development patterns, there is a need for a deeper level of analysis than is offered by the extant literature. However, there are few market specific studies on firms with a small and medium sized orientation on the management of leading-edge technology in the internationalization process.

The conclusion is that there is a need for theory development and a deeper understanding of the managerial aspects in doing business in a foreign market particularly for the companies having superior technology. These issues are central to the firm's decision-making, and provide a basis for formulating the research question for the study, which guided the empirical investigation.

The conceptualization of the internationalization process in this research anticipates that firm's perceptions of involvement in foreign operations are derived from their experience and their understanding of the internationalization process. As this experience and understanding is accumulated it increases the stock of knowledge and skill within the firm.

As the conceptual model suggests, firm's international strategy is positively related to technology transfer and knowledge management, as well as to firm's absorptive capacity. Its relative value is the result of the execution of strategy in the international environment. In practice the outcome of the international operations can be expected to vary depending on change in the environment and immediate response to those changes resulting in the appropriateness of the applied strategy.

The research question draws on these suggestions to propose that where there are variations in environment and international strategy of a firm, they will influence the transfer of technology, knowledge management and generally absorptive capacity of a firm. Change in the environment is a constant and continuous process. In the face of such change the activities of firms require ongoing adjustment and revision if their operations are to continue to be effective.

The research model provided a framework to consider the research question in the context of the internationalization process as a whole, grounding it in the past theories and research, and in the context of New Zealand and CEECs, giving it more practical nature of research.

2.6 Conclusions

This chapter has critically reviewed theories relevant to the research question. The purpose was to provide a brief review of the literature on internationalization research in general and to illustrate the importance of absorptive capacity concept and the transfer of technology for firms faced with the new knowledge environments. It continued with illustrating the importance of the transfer of technology and absorptive capacity concept of a firm. Based on a review of the literature, three factors were emphasized (prior knowledge, R&D intensity and organizational structure) as organizational determinants of absorptive capacity. This discussion served as the theoretical starting point for defining

the frame of reference and as the building blocs of the conceptual framework proposed in Section 2.5 of this research.

Further, the research questions underlying this study and the conceptual research model of the internationalization process used in its examination have been presented. The research questions draw on the impact and relationship between technology and absorptive capacity of a firm and its international strategy. From this base, a set of preliminary propositions and an initial conceptual framework have been developed as a foundation for conducting the empirical investigation. In order to conduct the investigation an appropriate method must be established to enable further development of the conceptual framework. Accordingly, the research design and analytic approach selected for this study are discussed in Chapter 4 after giving the explanation of the research context, which covers CEECs and New Zealand explained in the next chapter.

3 Chapter Research Context

The previous chapter introduced the theories of internationalization relevant to the stated research questions. These research questions are related to the relationship between the internationalization process on one hand and technology and absorptive capacity on the other hand.

In this chapter after a brief introduction in Section 3.1, an overview of the New Zealand business environment is presented in Section 3.2. The chapter continues with introducing the countries of Central and Eastern Europe in Section 3.3. Finally, Section 3.4 concludes the chapter.

3.1 Introduction

The aim of this thesis is to distinguish between different patterns of foreign technological activities at the firm level by examining the internationalization process of high-tech SMEs¹. Specifically, the question is ‘how does a firm’s technology and absorptive capacity influence the foreign strategy of a firm’. Since the majority of firms in New Zealand can be classified as SMEs² this is an appropriate location to examine the research question. In addition, the New Zealand economy is still heavily reliant on foreign exchange earnings derived from agricultural production, even though the technology to produce agricultural outputs such as dairy products have historically been embodied in the products exported. More recently outputs from the agro-technology industries which have been used to develop efficiency and innovation in farm systems are now being used to generate earnings through technology transfer.

¹ Differences in measurement refer to Section 1.5.

² For more details refer to Section 1.5.

Along with the New Zealand economy, the market of CEEC was chosen to be a context in this research. The region of CEEC was chosen because it represents both a large market for agricultural and food products and an important region for agricultural production and trade. Further, there is still a sizeable productivity gap between most countries in Central and Eastern Europe and those in the OECD and limited knowledge to uptake the new technology. The productivity gap also means that agricultural producers of CEECs are performing at a level that is far below the region's technological potential. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector. Changes in the region suggest an ever increasing need for further growth, which offers real potential for expansion of New Zealand's agro-technology exporters.

Taking into account the New Zealand high-tech firms' ability to learn and create novel knowledge and constraints posed by the country's remoteness and firms' size, the questions are: *“How do New Zealand high-tech SMEs balance required resource commitment, amount of control and level of technology risk when choosing a foreign market? What kind of knowledge should they possess to successfully transfer their technology to foreign markets?”* and *“What kind of knowledge would facilitate the successful monitoring of the new technological developments and potentials in different business contexts?”*

An overview of the New Zealand business environment is presented in the next section. The section begins with a short discussion of New Zealand and the economic reforms of 1980s. It continues with an investigation of government role and industry policy. Next, an explanation of the instruments of R&D policy and the New Zealand measures to stimulate and regulate R&D is given. Finally, the current spending patterns in R&D in New Zealand are examined.

3.2 New Zealand Economy

3.2.1 The New Zealand Economy - Introduction

Early ventures in the nineteenth century, which led to industrial development in New Zealand, were based on the extraction of raw natural resources with minimal processing, such as whaling, sealing, timber felling, flax collection, gold panning, kauri gum digging and fungus collection. Gradually, as labor skills, capital and equipment became available; these basic activities were complemented by further processing, which evolved into farm-based production as the preservation of perishable animal-based products and transport technology improved. The invention of refrigeration technology in the 1880s added to the export improvement (Pickford and Bollard, 1998). By the end of the nineteenth century, large volumes of dairy products, meat and wool were being exported, mainly to Great Britain.

However, the world recessions, particularly the Great Depression of the 1930s, revealed how vulnerable the New Zealand economy was to instability on world markets for primary products. In response to the 1930s Depression, the government in 1938 introduced import licensing to encourage industrial self-sufficiency and import substitution to reduce the economy's reliance on volatile overseas markets (Pickford and Bollard, 1998).

Food shortages in Europe during the two World Wars reinforced the emphasis on food and primary materials production. Attempt to widen the industrial base occurred in the late 1950s, when protective tariffs and other subsidies were used to encourage overseas companies to set up production in New Zealand.

By the 1970s, unstable commodity markets, uncompetitive local industrial production and a growing demand for social spending had created a growing problem in the economy. The loss of markets accompanying the United Kingdom's entry into the European Community in 1973, and the international recessions caused by the OPEC-

induced oil crises of 1974-75 and 1979-80 left their marks on the economy (Pickford and Bollard, 1998). In order to put an end to escalating inflation and rising unemployment, the government responded with expensive “Think Big” projects designed to reduce the economy’s dependence upon imported oil, and also added to agricultural subsidies to increase production and protect farm income.

The pressure for reform therefore could no longer be resisted. “In this period New Zealand operated under an effective protectionist rate of 50 to 70 per cent”, which was a much higher degree of regulation than most other OECD nations (Enderwick and Akoorie, 1996, p. 72). This was coupled with the poor relative performance of the economy, the double-digit inflation, fiscal and trade deficits of 7 per cent and an external debt equal to 69 per cent of gross domestic product (Gale, 1990).

In 1984 the newly elected Labor government introduced radical reforms of rapid economic liberalization, which was continued at a slower pace by succeeding governments. The reform process was designed to free the market system from government regulation wherever possible. Major deregulations in the finance, transport and energy sectors were included along with reform of the labor market, abolition of agricultural subsidies, large reductions in import protection, the removal of product-specific price controls and quantity licensing, the termination of state-regulated monopoly rights, the removal of controls on the flow of international capital, a comprehensive overhaul of the public sector, and changes in the implementation of monetary and fiscal policies (Pickford and Bollard, 1998). The reform program in New Zealand has been characterized as the pursuit of economic efficiency (Evans, Grimes, Wilkinson and Teece, 1996).

The reforms led into a restructuring recession from 1986 to 1991 and left slimmed-down enterprises across almost all industries and sectors, together with substantial unemployment in the economy. Many manufacturers gave up domestic operations or went out of business entirely. Almost all were forced into new management strategies, operational cuts and labor reductions, and corporate restructuring.

However, in the early 1990s, the economy at last began to grow again, especially in manufacturing exports, demonstrating the sector's improved international competitiveness.

Ownership also changed in the 1980s with many management buy-outs, substantial acquisitions and restructurings in many industries, with some increase in foreign investment, and a growth in publicly-listed companies. Still, the farming and small retail sectors remained almost entirely dominated by traditional, family-owned businesses. An increasing number of firms had contact with the international trading environment despite the fact that it often involves operating in distant foreign markets and that many firms lack the resources and management experience to operate effectively in such markets (Pickford and Bollard, 1998).

The reforms of the 1980s appear to have led to a rebirth of smaller more flexible firms that are able to respond faster and to operate in a leaner way. Having the experience of operating in relatively unregulated markets with low or minimal levels of government assistance firms in general are highly responsive to market signals.

3.2.2 Economic Liberalism and Deregulation - Historical Perspective

“Unlike other resource-rich colonial economies dependent on extractive industries such as plantation crops mining and oil, foreign investment in the agricultural sectors of the New Zealand economy in the nineteenth century provided a comfortable basis for economic existence” (Akoorie, 1997, p. 67). The products such as dairy products, wool and frozen meat were produced primarily for the United Kingdom market. However, the access to this market declined after the United Kingdom's entry in the EU in 1973.

Based on country case studies of the Investment Development Path (IDP) by Dunning and Narula (1996), the country case study on New Zealand shows (Akoorie, 1996) that during periods of EO-OL orientation (19th century – 1938) New Zealand achieved faster growth through FDI-facilitated development while the long cycle (1938-1984) of IL-IS policy orientation visibly slowed down the progress of the country through the stages of the IDP.

Table 3.1: The Investment Development Path for New Zealand

19th Century - 1938	1938 - 1967	1967 - 1984	1984 - Present
FDI influences	FDI influences	P	FDI Influences
O/I banking meat processing land purchase	O/I import substitution manufacturing	O	O/I manufacturing services infrastructure
L access to resources	L access to new resources	L	L access to resources
Non-FDI influences	Non-FDI influences	I	Non-FDI influences
Govt policy E-OL open access, infrastructure	Govt policy IS-IL control of resources control FDI	C	Govt policy EO-OL open FDI non-discriminatory
		Y	
		S	
		H	
		I	
		F	
		T	

Source: Adapted from Akoorie (1996)

Table 3.1 shows the New Zealand investment development path from 19th century to present which is explained in more detail in the following sections.

19th Century - 1938

The New Zealand’s natural resources of fertile land, a mild climate and its proximity to Australia together with capital and know-how in farming initiated the development process. “The initial orientation of the New Zealand economy, from its beginnings [19th century], was of an export-oriented, outward-looking (EO-OL) economy, in which foreign investment played a considerable part in pushing out the production possibility frontier” (Akoorie, 1997, p. 70).

The development process of the country was characterized by its export orientation and outward-looking stance. There were four reasons for this. First, capital was required to finance development. Second, the opening up of the Australia and New Zealand economies in the 1870s to 1880s coincided with the decline in the number of domestic outlets in Britain for publicly mobilized savings. Third, the rapid growth of Australia had shown that there was investment potential in the southern hemisphere colonies. Fourth, the slower rate of average annual increases in population in New Zealand from 1867 to 1901 meant that the rapid growth in agricultural output could not be absorbed by domestic consumption (Roche, 1993). Therefore, a surplus of output was available for export. Public investment was more important than private investment in rapid development, reflecting investment in infrastructure, railways, roads and ports which were essential to facilitate the internal and external movement of agricultural products. (Akoorie, 1997)

The early development was due to private entrepreneurs' initiatives rather than direct government influence (Hunter, Lineham and Wilson, 2003). However, there were a number of ways, which led to the increasing direct involvement of government in economic activity and the foundations for inwards-orientation and import-substituting activity were laid during this period.

Government intervention was evident in four major areas. The first was in land acquisition. Then the state became involved in commercial activity, when it became a direct competitor with other financial institutions through government guarantees on deposits of trustee savings banks, the establishment of the Post Office Savings Bank, Government Life Insurance Office and the State Fire Office in the 1890s. Further, government involvement was in infrastructure development and in labor relations and education (Akoorie, 1997). Foreign investment had influenced the economic activity in this period and at the same time the role of government became increasingly more important in shaping the economic structure in New Zealand, which was even more vivid in the next phase of economic activity.

1938 – 1967

The New Zealand economy, with its high degree of dependence on exports of primary commodities, felt the impact of the Depression of the 1930s (Simkin, 1951), which confirmed the instability of the country. This was coupled by government borrowing for economic and structural development.

Government involvement in the economic activity of the country was even more present than in the previous period. Particularly monetary, fiscal and tariff measures and import controls were used to achieve objectives such as economic self-sufficiency (Deane, 1970). These measures were accompanied by increasing direct intervention in private economic activity through restrictions on entry to particular activities. “These restrictive practices created institutional rigidities within industries, which made it difficult to adapt to changing circumstances. Gradually a pattern was established which emphasized stability and equity in income distribution rather than expansion and growth” (Akoorie, 1997, p. 79).

An example of the restrictions on entry was evident in the agricultural industry in New Zealand. Overseas producers could not directly participate in the dairy industry unless they were land-owners, since farmers owned the dairy co-operatives. Further, government’s intervention was present in the marketing and pricing of the agricultural products and in the meat industry, domestic and foreign processors were subject to controls on quotas and outputs and pricing (Akoorie, 1997).

In this period the government established a system of import licensing and exchange controls. The justification for its use was that it would foster the development of New Zealand industries. The import substitution policy limited the contribution which foreign companies could make towards transforming the economic structure (World Bank, 1968). However, one of the effects of the import substituting activity by foreign firms was that they had established monopolistic or oligopolistic positions in a number of industries (Akoorie, 1997). The same policy encouraged the

development of inefficient businesses usually not able to export competitively which suited companies such as Fisher and Paykel who established their strong domestic market position without competition.

1967 – 1984

In the 1960s attention was drawn to the need for economic change in New Zealand (Franklin, 1978) to facilitate steady industrial development, increasing manufactured exports and full employment. This initiated import licensing to be replaced by tariffs as the main measure of protection.

The policy responses by successive governments in this period were as follows: there was a commitment to sustained protection for domestic industries; the policy approach was to compensate for protection and subsidies the development of new export sectors, which included taxation incentives to encourage the export potential of products such as deer, wine, thoroughbred breeding, kiwifruit; official policy was to encourage foreign investment, but there were concerns about the effects of foreign control on the New Zealand economy. There was a slow trend towards trade liberalization and a greater reliance on market forces, but at the same time there was increased government intervention in the economy to support groups who were negatively affected by changing economic circumstances (Akoorie, 1997)

In this period policies of insulation were no longer an adequate means of isolating New Zealand from changing external economic circumstance (New Zealand Planning Council, 1983). Policy changes laid the foundations for a more outward orientation by the economy, with the first steps being taken towards free-trade arrangements with Australia in 1966.

1984 – Present

Government interventions in previous period and support given to some economic players by using subsidies, “prevented firms from making adjustments to accommodate changing external circumstances” (Akoorie, 1997, p. 87) and achieve competitiveness in the world market. For this reason the new economic policy introduced by the Labor government in 1984 included regulatory reforms and economic liberalization (Bollard, 1987). These reforms included the discontinuation of import licensing, the reduction of tariffs, the floating of the exchange rate and removal of capital controls. Further, in 1987 the CER free-trade agreement with Australia was reached which included the progressive elimination of restrictions on investment in services.

The result of the reforms was that the amount of inward and outward foreign investment increased substantially reflecting the policy of investment liberalization on inward foreign investment and the relaxation of controls on capital movements for outward foreign investment. The exceptionally large investment inflows to New Zealand were the results of several specific transactions, such as the privatization of former state-owned assets (Akoorie, 1997).

From 1984 on the New Zealand economy has been experiencing massive change. New Zealand underwent a radical period of economic liberalization between 1984 and 1991, during which a wide range of reform measures were put into place. Described as deregulation and economic liberalism, major reforms have taken place in capital and labor markets, industry regulation, international trade and government sector. The aim of these reforms has been to create a much more internationally competitive economy. When implemented, they had remarkable implications for New Zealand international business. The New Zealand economy has moved from being one of the most protected market economies in the world, to being one of the most open (Enderwick and Akoorie, 1996).

The reason for introducing reforms into New Zealand economy was related to the poor relative economic performance of New Zealand economy, particularly over the previous three decades. The 1984 Labor Government initiated the program of economic deregulation, which consisted of microeconomic reforms focusing on improved allocative and operational efficiency, and macroeconomic policy aiming to create a stable environment for business. The implementation of the above policies has been characterized by an evident reduction of traditional government intervention in the economy. The deregulation of New Zealand has been accompanied by a reintegration of the country into the world economy.

Even in the period of controlled protectionism, the New Zealand economy has always been an international one to some extent, with the export of primary commodities and some inward investment the majority of which was British capital. The reintegration of the New Zealand economy after 1984 was characterized by product and market diversification. New Zealand international exposure largely depended on a narrow range of commodity exports, such as wool, meat, dairy products (Enderwick and Akoorie, 1996). Diversification into other commodities (apples, pears, kiwifruit, aluminum, forest products and wine), manufactured products and some internationally traded services, such as tourism, has been occurring, as well as diversification by market. Instead of historical dependence on the British market, the export markets have diversified to the more balanced spread which include outlets to North America, Europe, Australia and Asia. The isolation of the New Zealand economy is being replaced by a closer integration with key markets, both financial and real (Enderwick and Akoorie, 1996).

The 1984 reforms have enhanced the internationalization of New Zealand business in a number of ways. As well as increasing foreign ownership of domestic industry (Enderwick and Akoorie, 1994), a number of New Zealand businesses and industries have increased their international orientation, particularly the major commodity exporters, wool, kiwifruit, meat, apples and also the dairy industry.

In summary, from 1840 to 1938 the type of foreign investment undertaken was export oriented and outward looking. From 1967 to 1984 it was almost exclusively for import substituting. From 1984, as a result of economic liberalization, both inward and outward foreign investments increased substantially.

3.2.3 The Role of Government and Industry Policy

New Zealand is a small, geographically-isolated economy with small domestic markets and limited natural resources, and its approach to industry policy is evaluated against that background. Due to the small market size, firms need to export to the foreign markets in order to gain economies of scale. Successful firms are usually those based in one of the economy's key areas of comparative advantage, and those gaining early and privileged access to the British market (e.g., red meat, dairy processing) or from government assistance in the form of subsidies, protection and the encouragement of foreign investment (e.g., forest products, fishing). Other industries have tended to achieve export success by focusing on niche markets for higher quality products (Britton, Le Heron and Pawson, 1992).

The economy-wide reforms in the 1980s characterized a distinctive change of direction (Bollard, 1987). The government withdrew from the direct operation of trading activities, and removed controls which hindered the operation of market forces and limited competition (e.g., import control). Market forces in the newly liberalized economy were to determine "winners", and "losers (Pickford and Bollard, 1998) and government industry policy was allowing firms to organize themselves in ways which they considered were the most effective. Some examples of policy areas of relevance to business, and the corresponding policy instruments currently used, are listed in Table 3.2.

Table 3.2: Instruments of Industry Policy

Policy Area	Policy Tool/Objective
Competition policy	Commerce Act 1986 – promotion of competition in markets
Fair trading	Fair Trading Act 1986 – promotion of fair trading
International trade	Unilateral reduction of import protection; bilateral reduction via CER; multilateral liberalization via WTO, APEC
Utilities	“Light-handed” regulation – separation of non-contestable areas; Commerce Act, information disclosure, threat of re-regulation
Government trading	Corporatization and privatization; local government contracting out
Taxes	Flatter, simpler income and sales (GST) tax rates; but tax collection burden
Labor relations	Employment Contracts Act 1991
Externalities	Resource Management Act 1991

Source: Adapted from Pickford and Bollard, 1998

Tax reform has been carried out reasonably successfully. The aim was to set up as neutral as possible a tax system without incentives or disincentives for particular types of saving or spending, and to sharpen incentives to earn and invest (Bollard, 1993). The flattening and broadening of the tax base had the effect of causing many more businesses to register for tax.

Financial liberalization reform was an important attempt of the early economic liberalization programme. It involved a range of reforms, particularly the removal of the market entry restrictions, operating limitations, price controls and regulatory monopolies. “In contrast to the more cautious reforms in Australia, New Zealand abolished credit growth guidelines, interest rate controls, and official export guarantees in 1984” (Bollard, 1993, p. 7).

Monetary policy was significantly simplified, while exchange rate regulation was removed. In 1985 the currency was freely floated on foreign exchange markets without direct control. Furthermore, a crucial aspect of microeconomic reform has

been removing trade barrier to drive domestic prices toward international levels. Coupled with the reduction in agricultural and industrial subsidies and the removal of export assistance measures, this reduction in import protection has decreased the rate of assistance to New Zealand producers quite noticeably. The effective rate of assistance to agriculture has declined from 50% to less than zero in under a decade (Bollard, 1993). Along with that, the regulation on the inward and outward movement of international capital has almost totally been removed resulting in foreign direct investment in or out of New Zealand being virtually free of restrictions. Similarly, there have been no restrictions on the establishment of foreign owned companies in New Zealand.

One of the most important parts of the New Zealand liberalization programme was the reform of state trading activities. The corporatization of central government trading activities has helped, among others, for the reorganization of state research and development, and local government services. Furthermore, there have been a number of further deregulatory measures which involved the removal of most market entry restrictions, price controls, regulatory monopolies and operating restrictions (Hawke, 1985).

At the same time as deregulation, legislation defining the rules by which businesses should operate within the new environment was revised. Similarly, the intellectual property regime was reformed.

Regulation became light-handed (Pickford and Bollard, 1998), in which certain forms of market conduct regarded as being anti-competitive were proscribed through two pieces of legislation: the Commerce Act 1986, whose declared goal was to promote competition in New Zealand markets; and the Fair Trading Act 1986, which was directed at maintaining the accuracy of information disseminated by sellers about goods and services. Prohibited behavior includes contracts, arrangements or understandings between competitors which substantially lessen competition, and other forms of collusion; the misuse of a dominant position in a market to hinder

competitors; the acquisition or strengthening of a dominant position through a business acquisition; and the provision of misleading or deceptive information by traders (Pickford and Bollard, 1998). Social policy regulation has focused on encouraging the sustainable use of environmental resources through the Resource Management Act 1991, and on making firms responsible for introducing safety and equal opportunity policies within their organizations.

Far-reaching structural reforms commenced in the mid-1980s aimed at improving the microeconomic efficiency of the economy while simultaneously bringing greater stability to the macro economy. From around 1984 onwards, the direction of economic policy in New Zealand turned away from intervention toward the elimination of many forms of government assistance. On the macroeconomic level, policies have aimed at achieving low inflation and a sound fiscal position while microeconomic reforms have been intended to open the economy to competitive pressures. The reforms included the floating of the exchange rate; abolition of controls on capital movements; the ending of industry assistance; the removal of price controls; deregulation across a number of sectors of the economy; corporatisation and privatization of state-owned assets; and labor market legislation aimed at facilitating more flexible patterns of wage bargaining.

The trade policy adjustments that formed part of the policy package after 1984 have altered production, demand and trade incentives very significantly. Prior to 1979, New Zealand followed a strong import substitution policy. Current trade policy is much less biased against exports and efficient resource allocation. By 1996-97, around 80 percent of the distorting effects of trade policies have been removed (Pickford and Bollard, 1998). New Zealand has not moved to a policy of free trade: tariffs are now around rates typical in OECD countries. Following the removal of discriminatory subsidies, there has been a reorientation in agricultural exports. Smaller manufacturing firms in food processing, metal fabrication and textiles have been oriented increasingly towards exports.

Currently New Zealand's trade policy priority is focused on the WTO in terms of reducing import protection and export subsidies, particularly to primary goods (Skilling and Boven, 2006b), because New Zealand's exports of goods have long been dominated by primary goods. Generally these types of goods are subject to relatively high levels of import protection and export subsidies. The reasons for New Zealand reliance on multinational agreements is that multilateral negotiations are the best way to deal with export subsidies that depress agricultural prices and constrains access to primary goods (Skilling and Boven, 2006b). Furthermore, multilateral negotiations offer the most benefits from the perspective of a small country such as New Zealand, which has limited negotiating power. It has been estimated that New Zealand has received additional \$1 billion a year in export earnings since the successful ratification of the Uruguay Round in 1993 (Skilling and Boven, 2006b). Similar estimates have been made of the potential benefit to the country from the current Doha Round. The gain would represent about 2.5% of New Zealand's total export earnings (Skilling and Boven, 2006b).

New Zealand has also been an early mover in regional trade liberalization, signing the comprehensive CER agreement with Australia in 1983. The trend continues in the same manner: New Zealand has signed agreements known as Special Economic Partnerships (SEP's) with Singapore (2001), Chile (2005), Brunei (2005), Thailand (2005), Free Trade Agreement with China (April 2008), the conclusion of ASEAN-Australia/New Zealand Free Trade Agreement (AANZFTA) in May 2008. New Zealand is currently negotiating with Malaysia, Hong Kong and with six countries of the Gulf Cooperation Council.

3.2.4 The Economy of New Zealand – Current Status

Economic Growth in New Zealand

In the 1950s New Zealand was placed sixth in the OECD on a GDP per capita basis (Scobie, 2002). Since then, it has not sustained its position in the top half of the OECD ranking since the 1970s (Kerr, 2001). Currently New Zealand is ranked twenty-first out of the OECD's thirty member nations. "On this basis it might be argued that the reforms of the 1980s and 1990s did not produce the results the architects had hoped for" (Jones, 2006, p. 26).

From 1984 onwards the focus of the economic reforms was on controlling inflation, and later it shifted to generating sustainable economic growth. The adjustment to this new economic framework took time. During the mid-to-late 1980s, the economy virtually stagnated and then entered recession in the early 1990s. Following a prolonged period of poor economic performance, the mid-1990s saw output recover strongly, see Table 3.3. New Zealand's economic performance has improved significantly over the 1990s.

From 1999 to present, economic growth rate in New Zealand has been historically high (Table 3.3), GDP averaging 3.5% per year (Statistics New Zealand, 2007). However, this could not help the country to raise its OECD ranking. To get into the top half in five years would require growth rates of approximately 13 percent (Scobie, 2002).

Table 3.3: New Zealand GDP (1999-2007)

March Years	Primary Industries		Goods-producing Industries		Service Industries		Gross Domestic Product	
Annual	\$(million)	% Change	\$(million)	% Change	\$(million)	% Change	\$(million)	% Change
1999	8,050	-3.9	21,847	-3.7	64,805	2.4	98,557	0.4
2000	8,321	3.4	23,184	6.1	67,968	4.9	103,745	5.3
2001	8,520	2.4	23,321	0.6	69,839	2.8	105,975	2.1
2002	8,608	1.0	23,736	1.8	73,463	5.2	110,146	3.9
2003	8,574	-0.4	25,681	8.2	76,500	4.1	115,283	4.7
2004	8,513	-0.7	26,539	3.3	79,498	3.9	119,379	3.6
2005	8,464	-0.6	27,360	3.1	82,982	4.4	123,782	3.7
2006	8,483	1.8	27,075	-1.0	85,851	3.5	126,009	2.2
2007	8,658	2.1	26,733	-1.6	87,784	2.9	128,152	1.7

Source: Statistics New Zealand (2007)

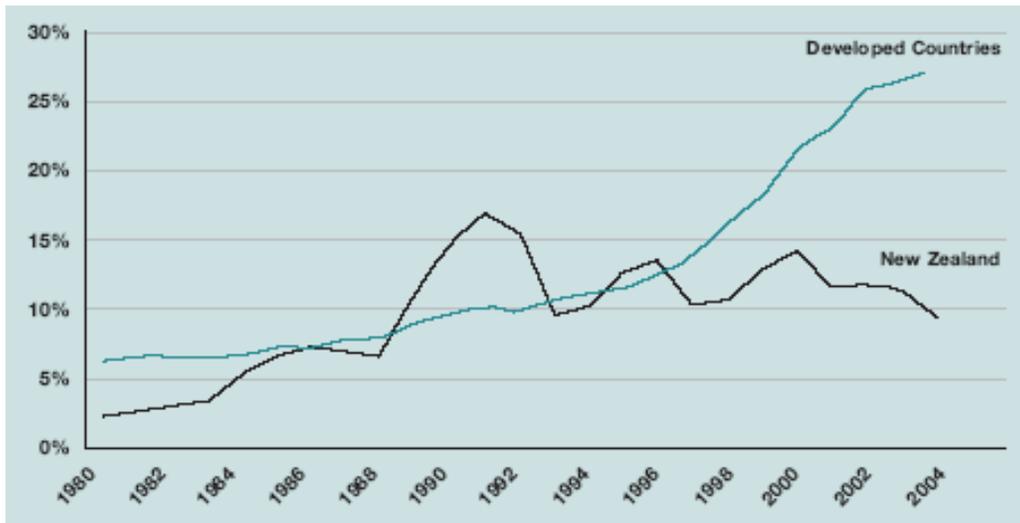
Primary industries such as agriculture and fishing are still very important to the economy, contributing \$8.658 billion to GDP in the year ending 30 March 2007 and accounting for approximately 7.3 percent of total GDP (Statistics New Zealand, 2007). Although contributing only 7.3 per cent of total GDP, the primary sector account for more than 50 per cent of total export earnings (Statistics New Zealand, 2007), suggesting that the primary sector has an important role in the country's international activities.

Foreign Direct Investment

New Zealand's overseas direct investment has gone through several phases. Through the 1970s, there was relatively little outward investment by New Zealand firms (Skilling and Boven, 2005). However, the country's foreign direct investment overseas jumped significantly from the mid- 1980s following the abolition of restrictions on capital flows, with substantial international investments being made by large New Zealand companies such as Fletcher Challenge. However, many their international investments were ultimately short lived, collapsing from a combination

of debt funded acquisitions and lack of top management international experience (Akoorie and Scott-Kennel, 2005).

Figure 3.1: Level of Outward FDI as a % of GDP, 1980-2004

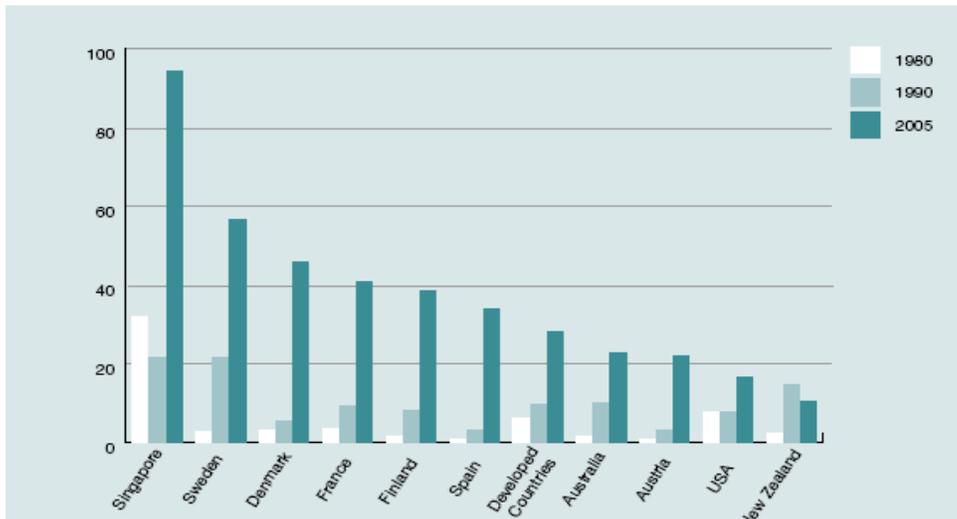


Source: UNCTAD

The average annual investment between 1982 and 1991 was just under \$1 billion (Skilling and Boven, 2005). This investment activity generated a significant increase in New Zealand's level of outward FDI, with the stock rising from 2.3% of GDP in 1980 to 14.7% of GDP in 1990 (UNCTAD, 2005). See figure 3.1.

Most of New Zealand's major foreign investments that have been made are due to large firms such as Fletcher Building (the remaining listed company after the collapse of Fletcher Challenge) and Sky City expanding their activities by buying international assets (Skilling and Boven, 2007). New Zealand's level of outward FDI is very low relative to other developed countries and has been declining over the past 15 years in contrast to global trends (Skilling and Boven, 2007).

Figure 3.2: Outward FDI as a % of GDP



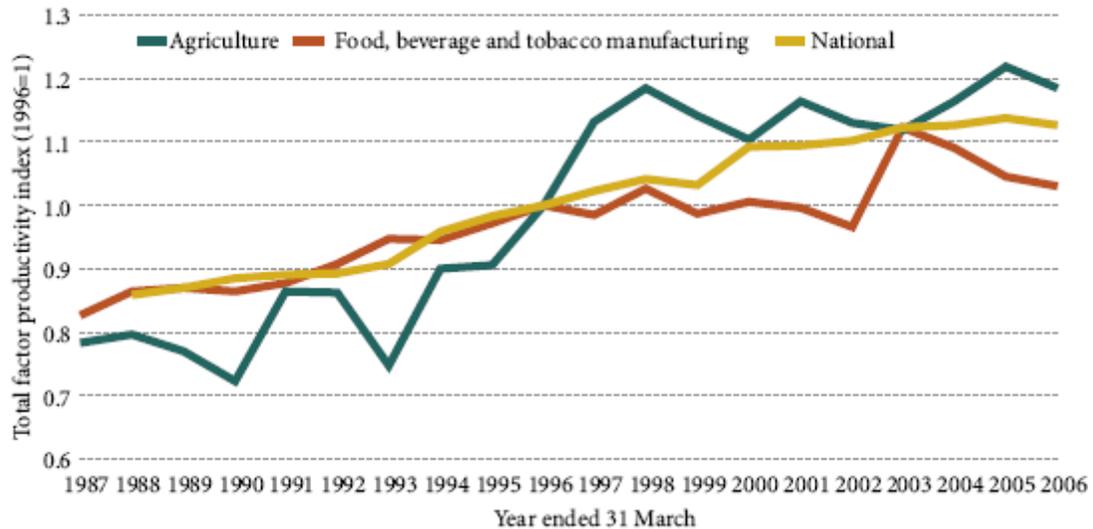
Source: UNCTAD (Skilling and Boven, 2007)

Figure 3.2 shows significant increases in outward FDI across many developed countries compared to outward FDI from New Zealand.

Productivity in Agriculture

The growth in productivity has been dominated by the economic reforms of the mid-1980s. Research done by Ministry of Agriculture and Forestry (2007) shows that productivity growth after 1984 was significantly higher than growth before 1984 for both the agriculture and forestry sectors (3.4 percent compared with -0.5 percent for agriculture and 3.5 percent compared with 1.3 percent for forestry). However, it was not until about 1992 that productivity growth in the primary industries really began to recover from the 1984 economic reforms. Figure 3.3 below shows the level of productivity in agriculture in New Zealand from 1987-2006.

Figure 3.3: Agriculture, Food, Beverage and Tobacco Manufacturing Productivity Growth, Years ended 31 March 1987-2006



Source: Statistics New Zealand and MAF

The primary sector needs innovation to generate new knowledge to allow it to expand the production and to produce highly valued products without environmental degradation. Ultimately, the primary sector needs innovation and new technology to continue driving productivity gains.

Dairy Industry

The high-performing dairy industry is critical to the New Zealand economy. New Zealand is the eighth largest milk producer, accounting for 2.2 percent of world milk production (MAF, 2007). For the year ended 31 May 2007, milk solids production is estimated at 1314 million kilograms, up 3.5 percent on the previous year (MAF, 2007). The contributing factors are a slight increase in milking herd numbers, generally favorable climate conditions, and increasing use of imported palm kernel as a feed supplement. Production is expected to increase as dairy cow and heifer numbers rise and productivity per cow continues to grow. Existing dairy farms will

expand along with conversions from other land uses, particularly as the dairy payout to lamb price ratio increases (MAF, 2007).

In October 2001, the Dairy Industry Restructuring Act 2001 (DIRA) allowed the merger of New Zealand's two largest manufacturing dairy companies – New Zealand Dairy Group of Companies and Kiwi Co-operative Dairies Limited – and the New Zealand Dairy Board (Dairy Board) to form Fonterra Co-operative Dairy Company Limited (Fonterra). Two other co-operative dairy companies, Tatua Co-operative Dairy Company Limited (Tatua) and Westland Co-operative Dairy Company Limited (Westland), decided not to join the merger (MAF, 2007).

On 15 November 2007 Fonterra announced the beginning of a two-year consulting programme with its shareholders around a preferred capital structure option, which could result in the Dairy Co-operative listing its business operations in a separate company, while maintaining a controlling interest. Fonterra wanted to change its capital structure to address three pressures on its current structure: redemption risk, investment choice for farmers and to provide a secure and expanding capital base to implement its growth strategy. Fonterra's proposed partial flotation could address all three issues, (Fonterra, 2007). The unique ownership structure (co-operative) that Fonterra has had to date, has kept FDI out of the industry, because it has required farmers (shareholders) to be consulted and agreed on any issue.

For the moment, farmers' lack of enthusiasm for changes to Fonterra's capital structure deferred the process. However, Fonterra require an increase of capital to continue, which is shown in their latest acquisition of the Chile Dairy Industry. Fonterra bought up the rest of the shares in Chilean dairy company Soprole for \$NZ260.5m (New Zealand Herald, 2008). It now owns almost all of Chile's largest dairy company; Fonterra already controlled Soprole with a 56.85 percent stake; the additional 42.6 percent shareholding gives it 99.4 percent of Chile's second-most recognized corporate brand.

The purchase gives Fonterra an 86.2 per cent stake in Soprole's southern manufacturing subsidiary, Prolesur. Soprole is focused primarily on brands, while

Prolesur supplies ingredients to world markets (New Zealand Herald, 2008). Together the two operations replicated Fonterra's New Zealand model. The increased stake in Soprole is strategically important because Chile has certain free trade agreements, for example, with Mexico, and Chile is a member of the Trans-pacific Strategic Economic Partnership between New Zealand, Chile, Singapore and Brunei and has a free trade deal with China.

In order to maintain the competition in domestic consumer markets, a condition of the 2001 merger approval was that Fonterra sell its 50 percent shareholding of New Zealand Dairy Foods (Dairy Foods). New Zealand's domestic dairy market has two key participants, which manufacture, market and distribute liquid milk and processed dairy products. Mainland Products Limited, 93 percent owned by Fonterra, has close to a 35 percent market share. Dairy Foods, which Fonterra divested in March 2002, has a further 40 percent of the market (MAF, 2007).

The DIRA contains a package of measures to mitigate a number of public policy concerns associated with the merger. These issues relate to the dominant position that Fonterra initially has in the markets for farmers' raw milk and processed dairy products. The main objectives of the DIRA were to maximize the economic performance of the dairy industry by allowing the structure of the industry to evolve in response to changes in the domestic and global markets, to facilitate the emergence of new competition and new strategies. The open entry and exit regime established by the DIRA is intended to foster this competition. Open entry and exit means that a farmer is able to freely join Fonterra as a milk supplier and shareholder, or to leave the company.

In New Zealand, co-operatively owned dairy companies dominate manufacturing. The three main co-operatives are Fonterra Co-operative Group, Westland Co-operative Dairy Company, and Tatua Co-operative Dairy Company. The three co-operatives collected 95.3 percent, 3.2 percent, and 1 percent respectively of total milk solids produced in the year ended 31 May 2006, while twelve other companies collected and processed the 0.5 percent balance (MAF, 2007).

Several new processing companies have recently entered or are seeking to enter the milk-processing market. These are generally investor-owned firms rather than co-operatives. The most significant of these to date is Open Country Cheese Company, which started processing in 2004 and has grown steadily over the last three seasons (MAF, 2007).

To mitigate the risk related to the market power associated with Fonterra's dominance in the raw milk market, the Government regulated for open entry to Fonterra for any farmer wanting to supply Fonterra at its posted share price, as well as open exit from Fonterra. Under this regime Fonterra faces strong incentives to set efficient milk prices and share prices. In this way Fonterra faces dynamic pressure to set an efficient share value and raw milk price, which, in turn, send appropriate market signals to farmers.

Table 3.4: Trends in Production and Payout

	Fonterra		Westland		Tatua	
	kg ms (millions)	Payout \$/kg ms	kg ms (millions)	Payout \$/kg ms	kg ms (millions)	Payout \$/kg ms
2001/02	1111	5.33	29.55	5.43	9.3	6.8
2003/04	1201	4.25	36.82	4.07	12	4.39
% Change	8	-20	25	-25	29	-35

Source: MAF (2007)

Fonterra continues to be the dominant processor of raw milk, collecting around 96 percent of milk produced in New Zealand (Fonterra, 2007). In the season ended May 2004, Fonterra collected around 1.2 billion kg ms from around 12,000 suppliers – equivalent to around 14 billion litres of milk, up 4.6 percent on the previous season. Westland and Tatua have come through the period since deregulation well and now appear to have greater potential than pre-deregulation (Fonterra, 2007).

Westland has experienced strong growth in its milk supply, and plans to double its milk solids production in the next decade (Westland Milk Products, 2007). The growth in milk supply has been due both to ongoing strong growth in cow numbers and excellent production seasons in addition to conversions of land from other land

uses to dairying. Westland's main product is milk powder, and while it has traditionally sold through the Dairy Board's (and more recently Fonterra's) global networks, since deregulation it has been moving to directly market all of its own products. The company's strategy is to move away from commodities into value added products derived from milk, such as high value protein concentrates and specialist nutritional and nutraceutical (foods containing supplements from natural sources that deliver a specific health benefit) products. Westland plans to invest \$63.5 million over the next two years in a protein processing plant. Westland currently has around 370 farmer-suppliers, and collects around 37 million kg ms per season (412 million litres of milk), 3 percent of New Zealand's milk supply (Westland Milk Products, 2007).

Tatua has around 126 suppliers that supply it with approximately 12 million kg ms (136 million litres of milk) per year, around 1 percent of the national milk supply (Tatua, 2007). The company focuses on the research-intensive formulation of new, high- value products. Tatua is now one of the world's leading manufacturers of specialized dairy-based proteins and protein derivatives. Tatua has consistently outperformed Fonterra and Westland in payout (see Table 3.4), but in 2003/04 the premium paid by Tatua was significantly reduced as exceptionally high international commodity prices weakened the competitive position of special product companies relative to commodity suppliers (Tatua, 2007).

Tatua has also been positioning itself to be a truly stand-alone company, marketing all its own production. Until recently Tatua had been placing all its commodity products and many of its specialty products through Fonterra. But this relationship largely concluded in May 2004 and Tatua has been investing heavily in offshore marketing, as well as in new processing plant.

The following companies are directly involved in R&D in the wider dairy industry: genetics business Livestock Improvement Corporation Limited has converted from a subsidiary of the Dairy Board into a farmer-owned co-operative; Dairy InSight Incorporated has been established to levy dairy farmers to fund industry activities

such as research and development; it is directly accountable to farmers; Dexcel Limited has been established to undertake on-farm research and development and extension activities and it is partly funded by the levy collected by Dairy InSight. The key areas of investment of Dairy InSight were biosecurity (\$16.6 million), farming productivity (\$12.6 million), and farming business (\$7.3 million). A merger of Dairy InSight and Dexcel has recently been proposed (MAF, 2007).

A high-performing dairy industry is important to New Zealand economy. In order to stay competitive in the world market, it requires continuous innovation in products and processes, adding substantial value to raw milk, and encouraging the growth of allied cluster industries.

International Trade

International trade is important for a small country like New Zealand. However, the Table 3.5 below shows the mixed results in New Zealand exports activities over a period of more than two decades particularly compared to the international trade of Australia. However, Australia's export trade has been fuelled by strong international demand for the major resources, such as minerals, to fuel the industrialization of the countries such as the People's Republic of China.

Table 3.5: Growth Rate of Exports - Percentage

Countries	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006
Australia	1.080	1.147	1.143	1.028	0.991	1.025	1.005	0.951	0.943	1.014	(p) 1.032
New Zealand	0.267	0.290	0.270	0.264	0.206	0.245	0.222	0.220	0.222	0.208	(e) 0.186

(p) provisional

(e) estimate

Source: UNCTAD (2007)

The export of good and services account for more than 35 percent of GDP (Statistics New Zealand, 2007). Revenues from exports since 2000 have experienced times of both positive and negative growth: in 2001, exports grew by 24.56 percent, while in 2003, they dropped by 9.23 per cent. Table 3.6 presents the country's merchandize trade and service exports from 2000-2006.

Table 3.6: New Zealand Merchandise Trade and Service Exports

\$(million) Year ended December	2000	2001	2002	2003	2004	2005	2006
Merchandize	28,102	31,575	29,820	27,306	29,509	29,471	32,727
Services	-	10,670	11,200	11,622	11,710	11,878	11,868
Total	28,102	42,245	41,020	38,928	41,219	41,349	44,595

Source: Statistics New Zealand, Overseas Trade (2007)

Merchandise exports (Table 3.6) for the year ended December 2006 were \$32.7 billion. This is up from \$29.5 billion in the year to December 2005, an increase of 11 percent. In comparison, imports increased by 9.4 percent in the year to December 2006 to \$40.8 billion. The largest increases in exports were for milk powder, butter and cheese (up \$1.1 billion or 20.4 percent), aluminium articles (up \$398 million or 36.8 percent) and wood and wood articles (up 222.4 billion or 11.7 percent), (Statistics New Zealand, 2007). At the same time New Zealand's service exports were worth \$11.9 billion, down \$10 million from 2005 year. Although New Zealand undertakes national branding activities to promote the country, this is generally undertaken in the context of promoting tourism rather than primary agriculture products.

Table 3.7: New Zealand Exports by Main Partners

Year	Developed economies					Economies in transition ³ %	Developing economies %
	Total %	EU %	USA %	Japan %	Other %		
1990	65.5	16.3	13.1	15.8	19.9	2.0	26.7
2000	65.4	15.0	14.8	13.7	21.7	0.2	31.8
2005	63.6	15.1	14.1	10.6	23.3	0.7	33.7

Source: UNCTAD (2007)

The above Table 3.7 shows that New Zealand's main trading partners come from countries from the developed world (EU, USA and Japan) with 63.6 percent of a total export. The trend has not been changed much over the last fifteen years. The export activities to the developing countries are 33.7 percent, while to economies in transition it is only 0.7 percent.

Table 3.8: New Zealand Trade Structure (Exports) by Product Group

Year	Trade Structure by Main Product Group (percentage)							
	All food Items	Agricultural Raw Materials	Fuels	Ores and Metals	Manu-factured Products	Chemical Products	Machinery and Transport Equipment	Other Manu-factured Products
1990	42.4	18.0	1.6	4.8	30.6	7.6	8.6	14.4
2000	43.9	13.7	2.6	4.7	30.0	6.9	10.4	12.8
2005	49.6	10.2	1.5	4.1	30.4	5.4	11.5	13.5

Source: UNCTAD (2007)

³ Economies in transition (UNCTAD, 2007):

In Asia: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

In Europe: Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Moldova, Macedonia, Romania, Russian Federation, Serbia & Montenegro, Ukraine

The above table shows that in 2005 majority (60%) of New Zealand’s exports consist of food and agricultural raw materials, showing New Zealand’s reliance on the primary production, while manufactured products and machinery and transport equipment make up to 40 percent of total New Zealand exports.

Table 3.9: New Zealand Trade Structure (Imports) by Product Group

Year	Trade Structure by Main Product Group (percentage)							
	All food Items	Agricultural Raw Materials	Fuels	Ores and Metals	Manu-factured Products	Chemical Products	Machinery and Transport Equipment	Other Manu-factured Products
1990	7.4	1.2	5.3	3.5	82.5	13.1	42.2	27.2
2000	7.7	0.9	10.4	3.1	77.8	12.3	39.4	26.1
2005	7.6	0.8	12.1	2.3	76.7	11.2	40.7	24.8

Source: UNCTAD (2007)

Similarly, the majority of the country’s imports consist of manufactured products and machinery and transport equipment, shown in Table 3.9.

New Zealand’s trade deficit is large as it has been for about 30 years (Skilling and Boven, 2005). This is due to New Zealand’s import growth consistently exceeding export growth over the past decades with imports growing at 6 percent per year and exports growing at just 4.2 percent per year (Skilling and Boven, 2005). New Zealand’s relatively low level and growth of exporting makes the country’s composition of exporting both good and services distinctive.

Table 3.10: New Zealand's Top Twenty Export Categories in 2006 and 1980

2006 Rank	Commodity Description	1980 Rank
1	Meat and edible meat offal, fresh, chilled or frozen	1
2	Milk and cream	4
3	Aluminum	5
4	Cheese and curd	10
5	Fruit and nuts, fresh, dried	13
6	Butter	3
7	Starches, insulin and wheat gluten; albuminoidal substances; glues	6
8	Wood, simply worked, and railway sleepers of wood	15
9	Edible products and preparations	79
10	Fish, fresh, chilled or frozen	12
11	Wool and other animal hair (excluding tops)	2
12	Alcoholic beverages	52
13	Aircraft and associated equipment, and parts thereof	47
14	Pulp and waste paper	9
15	Paper and paperboard	7
16	Other wood in the rough or roughly squared	16
17	Cereal, flour or starch preparations of fruits or vegetables	74
18	Crude petroleum and oils obtained from bituminous minerals	New
19	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc	14
20	Vegetables, fresh or simply preserved; roots and tubers	20

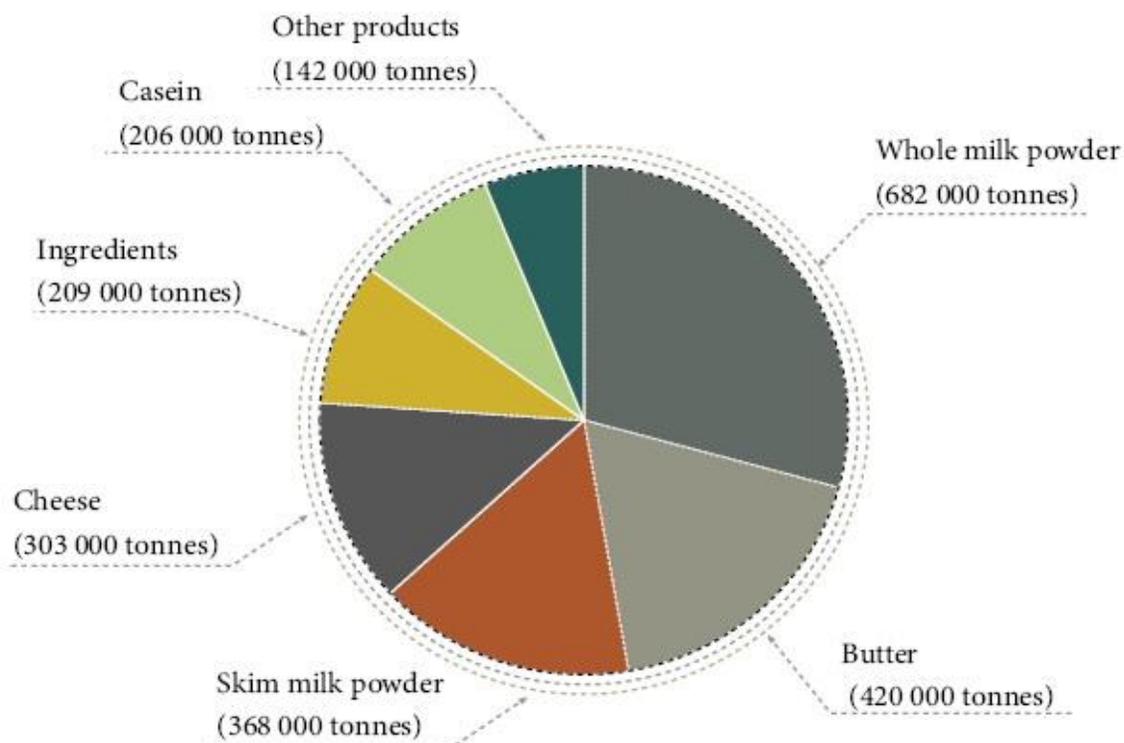
Source: UN Comtrade annual data (Skilling, 2007)

Table 3.10 shows that New Zealand's exports of goods are dominated by primary goods, like meat, dairy, wood and pulp, with about two thirds of goods exports currently coming from the primary sector, while manufactured exports comprise just one quarter of New Zealand's total exports (New Zealand Trade and Enterprise, 2005). The reliance on exports of primary goods comes from land-based activities and involves New Zealand extracting value from its natural resources, particularly land and climate, compared to the most developed countries which rely to a much greater extent on the export of manufactured goods.

Dairy Exports

Over the past decade the contributions of whole milk products, casein and ingredients have tended to increase in the export mix, with declining contributions from the remaining products. Dairy export volumes by product are shown in Figure 3.4.

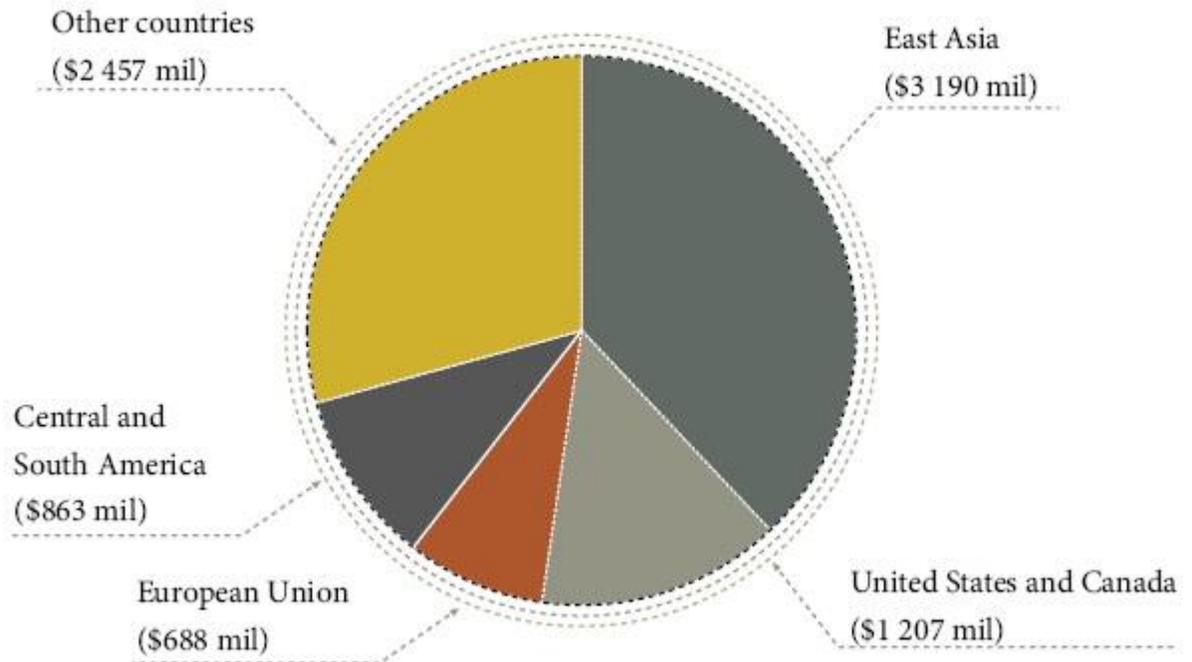
Figure 3.4: Dairy Export Volumes, by Product, Year Ended 31 March 2007



Source : Statistics New Zealand.

From the previous year, New Zealand's total dairy export value for the year ended 31 March 2007 increased 23 percent to \$8.41 billion and export quantities increased 18 percent (Statistics New Zealand, 2007). Export values are projected to increase 39 percent to \$11.68 billion in the year ending 31 March 2011, reflecting an expected depreciating in the exchange rate, increasing cow numbers, and increasing per-cow milk solids production (Statistics New Zealand, 2007).

Figure 3.5: Dairy Export destinations, by Value, Year ended 31 March 2007



Source: Statistics New Zealand.

In year ended 31 March 2007, New Zealand exported dairy products to 152 countries. Dairy export destinations by value are shown in Figure 3.5. New Zealand has country-specific tariff quotas covering several dairy products across the EU, the US, Japan, Canada, and the Dominican Republic. Since its formation in 2001, Fonterra has had exclusive rights to these for initial periods which will be expiring progressively between 2007 and 2010 (MAF, 2007). In May 2007, the Government announced a new policy framework that will allow a wider group of New Zealand dairy exporters the opportunity to export to these markets.

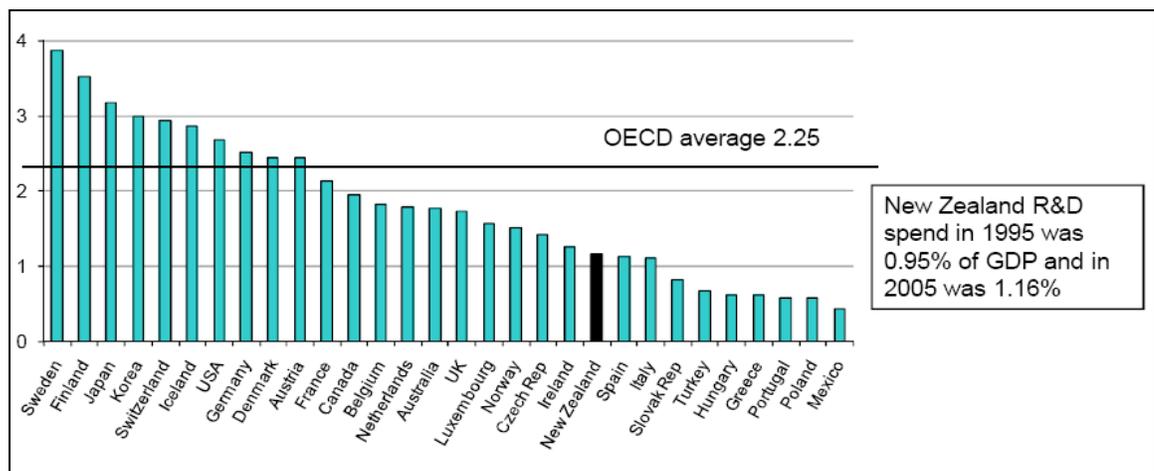
Research & Development

For many firms outside of the primary sector tariff barriers are of secondary significance. They are generally much lower than in the primary sector. The high potential growth areas in the New Zealand export are in areas less affected by formal trade barriers than are primary goods. Based on the discussion in Chapter 2, international technology transfer is important to a small country like New Zealand. In

public policy terms the international transfer of technology becomes a strategic instrument of industry policy. However, there are problems concerning international property rights but broad restrictions on the flows of R&D would be unproductive.

The New Zealand Statistics' calculation shows that in June 2006 the manufacturing sector paid out approximately \$755 million as royalties on license agreements and in return received \$169 million (Table 1.2, Chapter 1). This means that New Zealand is a net importer of R&D. As explained in section 1.6.1, that international technological involvement is of small scale relative to New Zealand's full potential.

Figure 3.6: Gross Expenditure on R&D, % of GDP 2005



Source: OECD (2005)

Figure 3.6 shows New Zealand's R&D spending is below OECD average levels. The country's low R&D spending can be partly explained by New Zealand's large primary sector, which has a lower R&D intensity, and by the absence of large firms who tend to invest more in R&D. R&D intensity is seen as a key part of the task of developing competitive strength and achieving the competitive advantage of a country.

Weightless Services

Substantial improvements in technology offer the opportunity for New Zealand to reduce its emphasis on transporting relatively heavy, low value goods to distant markets. By building virtual infrastructure (Skilling and Boven, 2007), New Zealand has an opportunity to develop the weightless economy⁴. Examples of weightless activities include the creative industries, research-based activity, financial services, contact centers (Skilling and Boven, 2007). However, only a small proportion of New Zealand's current exports fit into the weightless category (Skilling and Boven, 2007). Table 3.11 shows that New Zealand's weightless exports account for only about 5% of the country's total exports, at about \$2.2 billion in 2006.

Table 3.11: Export of Weightless Services

EXPORTS OF WEIGHTLESS SERVICES				
	1996 \$m	2006 \$m	Share of exports	CAGR
Communication services	n.a.	282	0.6%	
Construction services	n.a.	45	0.1%	
Royalties and licence fees	20	170	0.4%	
Financial and insurance services	33	168	0.4%	
Computer and information services	39	272	0.6%	
Other business services	667	1,217	2.7%	
Total weightless services	759	2,154	4.9%	11.0%
Total services exports	6,995	11,872	26.8%	5.4%
Total goods exports	20,546	32,430	73.2%	4.7%

Note: n.a. indicates data not available. CAGR is Compound Annual Growth Rate. Years ending in June.

Source: Statistics New Zealand, adapted from (Skilling and Boven, 2007)

⁴ The weightless economy is a term that describes economic activity that does not involve the transaction of a physical product. In an international context, it means activities that can be delivered to an international market by electronic means in real time.

The relatively low contribution from New Zealand's weightless export is apparent compared to other OECD countries. While New Zealand's weightless services exports account for about 20% of total export services, the average across OECD countries is about 50% (Skilling and Boven, 2007).

External trade is of fundamental importance of New Zealand. The country remains reliant on exports of commodity-based products as the main source of export receipts. It relies on imports of raw materials and capital equipment for industry, making New Zealand strongly trade oriented.

Rationale for the Research

Even though, as a small country, New Zealand's economic future depends on its ability to compete successfully in international markets. New Zealand economy is not well integrated into the global economy by the standards of other small developed countries. New Zealand's international presence is spread thinly across international markets with insignificant strategic investment. Skilling and Boven (2006) state that [outside of Fonterra] there are several constraints to international expansion and meaningful participation in the process of globalization: the first is the perceived absence of an incentive to go global, because of a sense that higher returns can be earned in the domestic market; the second issue is around the capacity of New Zealand firms to compete abroad; third, the absence of aspiration among New Zealand firms to go global; and lastly, the tendency for New Zealand firms to move into foreign ownership as they go global.

Only a small number of New Zealand firms are involved in exporting or outward FDI. New Zealand Trade & Enterprise estimate that only 361 New Zealand firms exported more than \$10 million in the year to September 2005, and only 50 firms exported more than \$75 million (Skilling and Boven, 2006). Further, New Zealand has only a small number of medium and large-sized firms participating actively in

international markets. According to the Forbes Global 2000 index⁵, New Zealand has just one company on this list (Telecom), while Australia has 38 companies. Countries of similar size, such as Singapore and Nordic countries, tend to have 10 or more companies on the list (Skilling and Boven, 2006).

It is combination of the importance of international engagement and the difficulties that some New Zealand firms face in going global, as well as investing in developing countries and understanding of foreign markets that provides the motivation for this research.

3.2.5 Instruments of R&D Policy

The idea of a program of R&D measures is in itself a relatively recent one. While work deriving from Schumpeter had long pointed to the potential role of innovation in growth, it was not till the 1960s that macroeconomic studies began to confirm that technological change was an important source of productivity growth (Nelson and Langlois, 1983). This influenced policymakers to view R&D not simply as a form of private investment beyond their immediate interest, but as a kind of control variable through which the performance of the whole economy could be affected. This led to interventionist programs to promote R&D, and science and technology (Bollard, 1986).

The market failure framework has been one underlying element for comprehensive justification for intervention in most Western countries; market-based R&D decisions are judged sub-optimal and the government may intervene in a wide variety of ways to improve them. Rothwell and Zegveld (1981) view successful innovation as depending on a favorable combination of technology supply and market demand factors. On the supply side they postulate that research on the development of new products and processes depends on three main factors: scientific and technological knowledge and manpower; information about the likely market for the innovation,

⁵ The Forbes Global 2000 index is an index of the world's largest 2000 listed companies.

together with the management skills needed to ensure successful research and development; and sales and financial resources. The demand side is represented by the conditions in domestic markets and international markets for public and private services. These demand and supply side forces interact against a background of social, legal and political framework (the environment for innovation).

Rothwell and Zegveld (1981) see government intervention as being able to affect demand, supply or environmental factors by various policy tools (innovation by publicly owned enterprises; scientific and technical tools – research laboratories, support research and professional associations; education - information through libraries, consultancy services; financial – grants, loans, subsidies, provision on equipment, export credits; taxation; legal and regulatory – patents, environmental and health regulations; political – planning, regional policies; procurement – central or local government purchases and contracts, public corporations; public services; commercial – trade agreements, tariffs, currency regulations). Further, Bollard, et al. (1987) classify public R&D policy into instruments that have an impact on R&D: market R&D transactions, internal R&D transactions, bilateral R&D transactions and trilateral R&D transactions presented in Table 3.12.

Table 3.12: Classification of R&D Instruments

<p><u>Market Transactions</u> Full public funding, e.g. grants Fiscal incentives – subsidies, loans, tax breaks Macroeconomic policy aimed at business climate Market reform Public exhortion of R & D</p>	<p><u>Internal Transactions</u> Direct public provision of R & D Competition policy</p>
<p><u>Bilateral Transactions</u> Property rights Prior contracts – development & employment contracts Patent licenses Copyrights, brand names, trade marks, registered designs</p>	<p><u>Third Party Enforcement</u> Boards, tribunals, courts Standards associations Testing laboratories Intellectual property law Science & technology agreements Research associations Other provisions for collective arrangements (e.g. joint ventures)</p>

Source: Adapted from Bollard, et al., 1987, page 66.

Governments intervene in R&D market place transaction through a wide range of mechanisms. Frequently the justification is to correct what they perceive as market failures in the allocation of resources for investment in R&D. The most direct form of intervention occurs when governments remove the transaction from the private sector and conduct the R&D directly. Further, in most economies there is considerable public funding of R&D. The balance of public funding between public conduct and private conduct of R&D varies significantly between Western countries depending partly on the sophistication of the private sector (Bollard et al, 1987).

3.2.6 New Zealand Measures to Stimulate and Regulate R&D

There has been a long history of public sector intervention in the production and regulation of agricultural and industrial output in New Zealand. This has involved R&D as well as many other forms of investment. The following text summarizes this involvement briefly, presents available data on R&D and New Zealand R&D policy.

Predominance of public sector R&D can be explained by the characteristics of the New Zealand economy. New Zealand's geographical and environmental characteristics are unique and impose certain constraints on R&D transactions (Bollard et al, 1987) such as the small size of New Zealand production by world standards, the difficulty of evaluating products and markets due to isolation, the small scale of most manufacturing firms, the difficulty of appraising overseas technologies, the problem of balancing applied and basic research work, the limited number of scientists and the inability to specialize. Tisdell (1986) emphasizes the problems of: relative lack of specialist agents able to assist in marketing; high unit cost due to the small home market making export more difficult; and high transaction costs incurred in buying in foreign know-how.

The mechanisms used to reinforce market governance in New Zealand are grants, subsidies, tax incentives and tax reform. Grants and subsidies have been relatively

low compared with funding for the conduct of R&D within government departments. Historically, there has been more reluctance to use fiscal measures to signal incentives for R&D through the market-place, but in recent years this has become a preferred option by the private sector.

In 1985, the Government embarked on a wide programme of reform to improve the efficiency of public enterprises through contestable service delivery. A major area of policy reform concerns deregulation of product and factor market in New Zealand. Certain industries have received radical regulatory reform that result in changes in the type and extent of R&D conducted. Subsequent reforms to the provision of research services in 1992 led to the creation of the Crown Research Institutes. The primary intention was to encourage efficiency through competition and clear objectives and robust accountabilities, broadening their revenue base and becoming more market-focused. The reform of the financial services industry has had a significant effect; the New Zealand reforms have opened up entry to traditional financing companies and venture capitalists with little restriction, having a significant effect on R&D. Wider interest through the stock market in innovative companies has also increased research funds available.

A further important change has been the reduction of trade barriers. New Zealand production is subject to more overseas competition with subsequent effects on R&D spending. On the other hand inputs for New Zealand R&D may be more freely imported, and in some cases R&D itself is embodied in these purchases. The CER agreement and the close ties with Australia have led to a number of company integrations and the concentration of R&D activities. Significant growth in international integration and technology transfer is likely to be increasing the use of R&D results in New Zealand, even if the work was not done here.

Public sector science was reformed in the early 1990s focusing on the increased funding, better prioritization of funding, incentives to increase the level of private sector investment, and structural reform to improve efficiency within the overall

system. In addition, the Ministry of Research, Science & Technology (MoRST) is a New Zealand government department established on 1 October 1989, as part of the reforms of the New Zealand science system. Its purpose is to develop research and innovation policies and manages the publicly funded part of the research, science and technology system on behalf of the government.

A key element of the reforms related to R&D was the organizational separation of the government's involvement in: science and technology (MoRST's role), science funding (Foundation for Research, Science and Technology's role) and carrying out research and development (Crown Research Institutes). MoRST does not directly fund research and innovation projects. Its role is to manage the government's investment in research, science and technology. MoRST contracts other agencies, such as FRST, to manage the actual funding of research and innovation projects, while Crown Research Institutes performs actual scientific research. Reforms were based on structure, conduct and performance paradigm (Bollard et al, 1987).

Table 3.13 below shows the level of R&D conducted in New Zealand from 2000-2004.

Table 3.13: Level of R&D in New Zealand

Sectors	2000	2002		2004	
	\$(million)	\$(million)	%	\$(million)	%
Private	321.3	520.6	30.5	648.1	24.5
Government	395.8	459.8	14.5	498.4	8.4
University	374.1	435.8	16.5	454.8	4.4
Total R&D:	1,091.3	1,416.2	19.8	1,601.3	13.1

Source: Statistics New Zealand, R&D Survey, MoRST (2007)

The above table shows total R&D expenditure in New Zealand from 2000 to 2004. It was estimated at more than \$1.6 billion for the year ending 2004 and an increase of

13.1% on the previous survey for the year ending 2002. Possible explanations for the increase include: the government has changed the tax treatment of R&D to permit tax deductions for R&D expenditures; the government has focused on increasing private sector R&D investment by more than doubling the Technology New Zealand fund and using New Zealand Trade & Enterprise to ensure the fund is accessible to firms; the government has encouraged the increasing commercialization of publicly funded research; the business community has begun to realize the benefits of R&D as a mechanism to achieve competitive advantage; the business community is placing greater emphasis on “value-added”, rather than commodity production; research is playing an increasing role in transforming existing industries and in the emergence of whole new industries based on innovative science, such as biotechnology. Total R&D expenditure equates to 1.17% of GDP in the 2004, which reflected a positive trend; however, this figure is well below the OECD average of 2.25% (MoRST, 2007).

Private sector R&D expenditure was \$648 million in 2004 (40% of total R&D), increasing almost 25% between the 2002 and 2004. This increase may be due to more businesses recognizing the benefits that arise from increased investment in R&D and that R&D is a critical element in a firm’s ability to develop niche products and markets and thereby compete. Despite this increase, business R&D still remains dramatically below the R&D investment level of businesses in other OECD countries. Fifty-six percent of business R&D was spent by the manufacturing sector in 2004 (MoRST, 2007). R&D expenditure by the manufacturing sector was concentrated in three areas: machinery and equipment manufacturing (37%); petroleum, coal, chemical and associated product manufacturing (27%); food, beverage and tobacco manufacturing (25%) (MoRST, 2007). Industries with the greatest R&D increases in the manufacturing category include chemicals and pharmaceuticals; food, beverages and tobacco; household appliances and industrial machinery; and communications. The New Zealand business sector continued to fund most of its R&D (77%) from its own resources. However, there was a significant increase in funds sourced from abroad (12%). In 2002, for the first time since the survey started, business R&D (37%) has overtaken government R&D (32%) as a percentage of total R&D.

Government carried out \$498 million R&D investment in 2004, which was 31% of total R&D. Crown Research Institutes were the largest spenders on R&D in the government sector, at 88% of government R&D activity. Government expenditure on R&D was 0.36% of GDP in 2004, higher than the OECD average of 0.24%. Other countries with a level of government R&D investment over 0.30% GDP include Taiwan, France, Finland, Korea, Germany, Netherlands, Denmark, China, Czech Republic, Japan and Israel (MoRST, 2007). In these countries the private sector provides an important R&D function by funding public sector research.

The implications of New Zealand government funding a high percentage of R&D is that it is typically strategic in nature. The transfer of this knowledge to industry for uptake and manifestation in new products or services therefore takes on greater significance. Enhancing New Zealand's ability to commercialize this intellectual property is currently receiving much attention from government which contributed to altering New Zealand investment policy away from promoting inward investment to assisting New Zealand companies to establish offshore representation.

University R&D was estimated at \$455 million in 2004, which was 29% of total R&D; it is down by 4% compared to the amount spent in 2002. Higher education sector expenditure for R&D was 0.33% of GDP in 2004, lower than the OECD average of 0.40% (MORST, 2007).

In conclusion, the 2004 survey results shown in Table 3.6 identified three major sectors that conduct R&D in New Zealand: business, the government, and higher education. The percentage of research conducted by business, compared to that conducted by government, is increasing. This means that business is having a greater influence over what research is conducted, and presumably focusing research on those areas that offer the greatest commercial return. Traditionally the government has tended to carry out more R&D than the business sector, perhaps due to the high incidence of small businesses that lack the resources or expertise to undertake

significant R&D programs. An increased emphasis on the relationship between research efforts and competitive advantage appears to be having an impact. Many businesses, large and small, are realizing the benefits of investing in R&D. Further, the 2004 survey has identified that 20% of R&D carried out in the government sector (such as that by CRIs) was funded by New Zealand businesses (OECD reference country comparison is 9% - reference countries are Norway, Sweden, Denmark, Australia, Ireland, Finland). This result reinforces the fact that many firms are insufficient in size to warrant conducting R&D in-house, but also that Crown Research facilities are able to meet the research needs of the business community.

New Zealand's competitive advantage in world trade terms is agriculture resource base. In 2008, there is a change in attitude at Government level towards the primary industries; the Government's \$700 million Fast Forward research fund (New Zealand Herald, 2008) shows its new-found faith in agriculture. The money will be managed by a Crown-owned company and each year for the next decade or so a portion of the fund will be used to fund farming and food-related projects. Industry is expected to match the funds, so the primary industries could benefit by as much as \$2 billion over the next 10 to 15 years (New Zealand Herald, 2008).

One of the Fund's first initiatives will be, among others, a virtual research institute that will focus on innovative food products. To be known as the Food Innovation Network, it will link existing campuses in Palmerston North, Christchurch, Hamilton and Manukau (New Zealand Herald, 2008). Further, with a goal of funding R&D in the primary sector industries it is expected that the returns from pharmaceutical and nutraceutical products are likely to be far more rewarding and stable than earnings from commodities such as dairy products.

3.2.7 Summary

The past decades have seen the New Zealand economy experiencing enormous change; it has moved from being one of the most protected market economies in the world, to being one of the most open. The aim of the undertaken reforms has been to create a much more internationally competitive economy. The trade policy reforms have taken place in conjunction with many other policy changes, which can be expected to influence trade in both the short run via the business cycle and in the long run through greater responsiveness and competitiveness.

New Zealand is a small economy that depends on exporting and foreign investment by its firms. Exporting and outward FDI provide growth opportunities and great learning opportunities for New Zealand firms. High levels of international economic engagement are vitally important to creating a strong country. However, the country's international performance does not compare well to many other developed countries, and only a small number of firms are significantly engaged in international markets. New Zealand firms do face difficulties in terms of entering international markets because of the small size and remoteness of New Zealand.

Primary industries such as agriculture are still very important to the economy, which account for more than 50 per cent of total export earnings. The country has developed a specialization for innovative niche production in engineering and manufacturing across many sectors, including plant and equipment, food processing, agricultural machinery etc. However, the international technological involvement of New Zealand's companies is of small scale relative to the country's full potential. The high potential growth areas in the New Zealand export are in areas less affected by formal trade barriers than are primary goods. For this reason international technology transfer is important to a small country like New Zealand.

The predominance of public sector R&D in New Zealand can be explained by the characteristics of the country's economy: the small size of New Zealand production

by world standards; the difficulty of evaluating products and markets due to isolation; the small scale of most manufacturing firms; the difficulty of appraising overseas technologies; the problem of balancing applied and basic research work.

3.3 Central and Eastern European Countries

3.3.1 Introduction

In this section, the Central and Eastern European Countries (CEEC) are presented. Changes in the region suggest an ever increasing need for further growth and transformation. CEEC's industries have high demands for various kind of products (equipment, machinery, software solutions etc.) suggesting a real potential for New Zealand high-tech firms expansion. At the same time, since this study is concerned with the knowledge New Zealand high-tech SME's with core capabilities in agro-technology should possess to successfully exploit potential of new emerging markets, CEEC's is found to be the appropriate area for testing the research question.

The section begins with a short presentation of the CEECs in transition and reforms undertaken with a particular emphasis on agriculture. It continues with the issues related to the enlargement of European Union followed by the international activities in the CEECs.

3.3.2 Defining Central and Eastern Europe

It is now common to refer to Central and Eastern Europe as one region. This region is generally considered to consist of Poland, Hungary, the Czech Republic, Slovakia and the Balkan States of Romania, Bulgaria and Albania, the former Yugoslavia comprising Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro, and Macedonia. The Eastern European region also includes countries which formerly were contained within the Soviet Union such as Latvia, Estonia and Lithuania. These generally are classified as the Baltic States and are seen to have a closer affiliation to

the Eastern European countries than any of the other newly created Commonwealth of Independent States (Batt, 1998).

The lack of natural borders has exposed the region to successive waves of migration over the centuries, while inaccessibility and an economic stagnation helped preserve distinctive local cultures, languages and dialects. An enormous variety of people have come to settle in the region and mixed together in a complex ethnic patchwork (Sedoglavich, 2003).

Compared to the western part of the continent, the region is a *mélange* of ethnic groups and cultures. The Slavs (Russians, Ukrainians, Belarusians, Poles, Czechs, Slovaks, Slovenians, Croats, Serbs, Bulgarians), who speak related languages, give the appearance of a certain superficial unity. But these peoples are divided by their different histories, religions, cultures and much else. Other peoples, such as the Greeks, Romanians and Albanians, speak languages distantly related to Slav, falling within what is known as the Indo-European group. Conversely, the Hungarian language is quite unrelated to its near neighbors.

The modern states of Central and Eastern Europe date only from the nineteenth century (Shaw, 1997). Several of them (Poland, Czechoslovakia, Hungary, Yugoslavia) appeared only in 1918, and the successor states to the USSR only in 1991. With such brief histories of state-building and lacking a legacy of mutual cooperation, these countries have proved extremely politically volatile. The post-communist breakup of Yugoslavia and Czechoslovakia is recent evidence of this fragility.

Since World War II the countries operated under a communist ideology that controlled political, economic and social structures. Many of these countries have recently experienced unprecedented economic and political change. Boundaries and constitutions have been altered dramatically and previous government regimes challenged. This has resulted in the implementation of economic reforms.

However, political change and switching to a market economy from a communist state planned economy was proving to be difficult. Lack of familiarity with market conditions, structures of socialism and cultural blinkers that resulted from years of not having to compete were just some of the problems; of the 25 countries in transition towards capitalism, few have achieved true market economies and some have been in economic chaos (Dickinson, 2000).

In the new post-communist era, the states of Central and Eastern Europe all face the challenge of making a success of their independence without provoking either conflict with their neighbors or political instability within. Among other things, this means the construction of a national identity to which most of their citizens can subscribe without threatening the rights of minorities or of neighboring states.

3.3.3 Central and Eastern European Countries – Background

Retrospectively, the end of World War II brought Eastern and Central Europe under Soviet control and communist regimes were installed in all countries. As a consequence, a uniform model of communism was adopted. All countries in the region were incorporated into a system of Soviet-controlled organizations. The national constitutions were modeled upon the Soviet Constitution of 1936 (Elster, Offe and Ulrich, 1998). The planning offices which had been established to handle post-war reconstruction were transformed into Gosplan-type Planning Commissions (Elster, et al, 1998). Nationalizations were undertaken and further extended, and agriculture was collectivized. All countries embarked upon forced industrialization along Soviet lines. The industrialization of the East and Central European economies led both to a massive sectoral reallocation of labor and to rapid urbanization (Elster, et al, 1998). Under communism, the economic and the political sphere were tightly coupled. The political leadership formed a new type of elite, the nomenklatura. With the nomenklatura, a single elite existed which governed both the politics and the

economy. State ownership and state planning, along with the power of the ruling elite, provided nearly complete political control of the economy.

By the late 1980s the limitations of central planning had become very clear, and countries that had maintained centrally planned economies have been – with the assistance of the major international institutions (including the IMF) – engaged in a historic transition process to market economies. As a result, both the economic structure and the behavior of consumers and producers have undergone major changes, although progress has been very uneven among the participating countries. Governments in more than 20 countries are currently involved in programs directed at transforming their economies from the socialist planned-economy system to the market system. Globalization and regional integration (particularly in Europe) meant that new political entities and economic markets that emerged from the downfall of the communist system and its national and regional political and economic arrangements require internal changes to facilitate their integration within the new regional and global arrangements.

The rise and subsequent failure of central planning rank among the most significant events in the twentieth century, posing major challenges to both economic theory and policy. While much has been achieved, the process has turned out to be much more difficult than anticipated at the beginning. Among the many legacies of the now defunct systems of central planning, one of the most unfavorable was the absence of an institutional and legal infrastructure underpinning the operation of market-oriented economies. There was an absence of well-defined property rights, commercial legislation regulating the entry and exit of private enterprises, financial markets, a commercial banking system, open labor markets, and a market-oriented system of taxation. The explanation may lie in the fact that until the end of the 1980s, allocation decisions within the economies of Central and Eastern Europe were primarily central-planned⁶ and bureaucratic rather than market-determined. This period was

⁶ By definition, central planning implied massive direct government involvement in economic decision-making.

characterized by the absence of market-generated signals about outputs and inputs and ideological suppression of the profit motive, and reduced innovation which involved a growing technology gap between the centrally planned and the advanced market economies.

In countries in transition, at least two region specific features have characterized the process of their integration into the global economy: first, this is the only region in the world that was practically de-linked from other parts of the world before the late 1980s; second, the countries of the region have been faced with a highly challenging process of transition from the centrally-planned socialist-type economy into a market economy based on private ownership (Sedoglavich, 2003). Although there were many differences between the countries in the region, the centrally planned economy provided a common institutional background which in many ways defines the starting point of the transition process.

3.3.4 Transformation – Beginning of the End

In 1989/1990, upheaval across Central and Eastern Europe marked a dramatic end for the state socialist regimes. The political, social and economic reform that followed, transformed how the CEECs are governed, their paths of economic development and their integration into wider global frameworks. The ruling communist parties collapsed and parliamentary systems and democratic elections were introduced. The suddenness and rapidity of the political change was, at the time, quite unexpected, but there are number of easily identifiable factors behind the revolutions, such as a worsening economic situation, increased popular dissatisfaction, economic and political reform in the Soviet Union which had encouraged other communist bloc countries to follow suit.

The post-socialist countries began their economic, political and social transformation with a heavy burden of socialist heritage. The main problems included: obsolete production structures and industries, poor productivity and economic management,

over-employment, low levels of technical infrastructure, and dependence on CEECs and Soviet markets. However, the CEECs also had a well-educated workforce, high level of social security and the developed social infrastructure. In comparison with the West, the CEECs were in an unfavorable economic position.

The negative influence of 40 years of communism has left an impact on mentalities of people in the region and on political culture. People in the region have become used to patronage and protection under the old regime. They distrusted legal procedures and political elites and tended to be skeptical of anything new, and resisted changes. Likewise, the economic legacies of communism are supposed to impede current reform efforts. Those countries inherited, among other things, an outdated capital stock, oversized firms, and a huge foreign debt from the past regime (Jowitt, 1992).

Yet the communist decades may well turn out to have been a brief historical episode without a lasting impact. According to Jowitt (1992) in his “return of history” argument, the cultural and institutional heritage of the pre-communist period may prove to be momentous to the processes of consolidation in the region. Traditional values and orientations which survived during the communist period may emerge again and determine the future of post-communist societies. Likewise, nationalist movements and old ethnic conflicts may revive and spread throughout the region. Furthermore, as Mason (1992) pointed out, more than forty years of communism have left their imprint on individual habits, attitudes, and behaviors (certain mental residues ranging from high risk aversion and the inclination toward grab-and-run behavior to negative egalitarianism).

The pre-1989 socialist countries of Central and Eastern Europe were largely characterized by a deliberate isolation from other parts of the world economy (Kolodko, 1999). All segments of their international economic cooperation, including trade, investment and technology flows, were predominantly occupied with intra-Soviet bloc transactions while economic ties with countries outside the region were rather weak. The change of political regime and beginning of the transition process

from a centrally-planned to market economy was a starting point on the region's path towards global economic integration.

During the transformation period, fundamental changes have taken place in all aspects of political, social and economic life in the countries of Central and Eastern Europe. The countries in the region have been striving to integrate into the global economic system and to replace their command and control systems by market economies. For many countries in the region, accession to the European Union is, in fact, considered as a final stage of transition process.

Further, most Central and Eastern European countries introduced policy reform packages early, in the beginning in 1989-1990. Reform policies of the 1990s were aimed at completing the dismantling of the bureaucratic-oriented economy and introducing new policies to support a market economy. Reforms centered around the following processes: liberalization of prices to reflect market value, and opening of markets, encouraging new private business; privatization and transfer of state owned enterprises into private ownership and programs of industrial restructuring; liberalization of foreign trade both into and out of the region; accession to international organizations, e.g. WTO and European Union.

At the beginning of the transition period, policy reforms in the CEECs were driven by the dual objectives of achieving macroeconomic stability and establishing private property rights. In the latter half of the 1990s, many of the CEECs moved on to efficiency concerns, institutional reforms, and the need to develop appropriate strategies for accession to the European Unions. Aligning domestic policies with those of the European Union has been certainly a difficult challenge for most CEECs in light of the high costs of doing so. (Kolodko, 1999)

The transformation process had different starting points in the various CEECs, ranging from highly centralized systems in the Baltic States and Romania to more market oriented systems in Poland and Slovenia. The pace and extent of reforms have

also varied widely due to differences determined by country-specific conditions and political configurations and this has resulted in even greater heterogeneity across the region. But, many shared challenges remain: to enhance macroeconomic stability, to increase competitiveness on domestic and export markets, to accelerate agro-food restructuring and adjustment, to create sustainable off-farm employment, to improve general infrastructure, as well as to establish effective and efficient institutions of governance (Kolodko, 1999).

Understanding the Reform Experiences

There were numerous approaches to reform and highly politicized debates over which approach to adopt. Ideas about the ‘best’ course of reform differed and there was no single course of reform for all countries. Despite a common communist past, economic conditions varied between countries, with some better able to adapt to market conditions than others. Consequently, what was considered appropriate in one country was not necessarily an effective strategy for another. Across the region, each country experienced distinct transformation processes and variable outcomes. They had distinctive starting points, courses of reform and final outcomes.

The early debates about the transition of the enterprise sector in CEECs centered on the opinion that the transfer of property rights to private agents was both necessary and sufficient to achieve efficient restructuring. More than a decade into the transition, it seems that the relationship between privatization and restructuring was not simple (Sedoglavich, 2003). It has been assumed that the shift of property rights from state to private hands and the shift of allocation mechanism from state to free market would soon enhance saving rates and capital formation as well as efficiency. Unfortunately, for a number of reasons this has not occurred. In all transition economies, before any growth has occurred there has been severe contraction, ranging from 20 percent over three years in Poland to more than 60 percent in nine years in Ukraine (Kolodko, 1999). These unfavorable results are the consequence of both the legacy of the previous system and the policies exercised during transition.

The majority of the transition policies were based to a large extent on the so-called Washington consensus. The set of policies designed in accordance with this consensus has stressed the importance of liberalization, privatization, and opening of post-socialist economies as well as the necessity of sustaining financial discipline. A summary of the 1989 Washington consensus given by John Williamson (1997) identifies the proposed set of policies (see Table 3.14):

Table 3.14: Washington Consensus (Summary)

Fiscal Discipline.	Budget deficit should be small enough to be financed without increasing inflation.
Public Expenditure Priorities.	Expenditure should be redirected from politically sensitive areas toward neglected fields with high economic returns and the potential to improve income distribution.
Tax Reform.	Tax reform involves broadening the tax base and cutting marginal tax rates.
Financial Liberalization.	The ultimate objective of financial liberalization is market-determined interest rates, but experience has shown that, under conditions of a chronic lack of confidence, market-determined rates can be so high as to threaten the financial solvency of productive enterprise and government.
Exchange rates.	Countries need a unified exchange rate set at a level sufficiently competitive to induce a rapid growth and managed so as to ensure exporters that this competitiveness will be maintained in the future.
Trade Liberalization.	Quantitative trade restrictions should be rapidly replaced by tariffs.
Foreign Direct Investment.	Barriers impeding the entry of foreign firms should be abolished; foreign and domestic firms should be allowed to compete on equal terms.
Privatization.	State enterprises should be privatized.
Deregulation.	Governments should abolish regulations that impede the entry of new firms or that restrict competition.
Property Rights.	The legal system should provide secure property rights.

Source: Williamson (1997, pp. 60-61)

Even the shortest point on the agenda of the early Washington consensus (“State enterprises should be privatized”) was in reality a long-term policy challenge, because even if there was a strong commitment to privatizing quickly and extensively, it was not always feasible, for both practical and political reasons (Sedoglavich, 2003)

Having been developed for another set of conditions (the crisis in Latin America in the 1980s), initially this approach was missing crucial elements necessary for stabilization and growth – institution building, improvement of corporate governance of the state sector prior to privatization, and the redesign of the role of the state, instead of its urgent withdrawal from economic activities (Kolodko, 1999). The assumption that emerging market forces can quickly substitute for the government in its role in setting up new institutions, in investing in human capital, and in developing infrastructure has caused severe contraction and growing social stress in transition countries (Kolodko, 1999). The need to manage the institutional aspects of transition has been recognized and addressed only in later stages. The experience suggests that for recovery and durable growth healthy financial fundamentals and liberal, transparent deregulation are not the only necessary factors. Sound institutional arrangements and wise governmental policy are also essential (Sedoglavich, 2003).

The early Washington consensus was actually aimed at countries that already had market economies and were not just in a transition to such a system. Its simplified interpretation that it would be sufficient to fix the appropriate financial fundamentals and privatize the bulk of state assets. Subsequently, growth should begin and continue for the long term. Because this has not happened as presumed, the Washington consensus must be reconsidered (Kolodko, 1999).

Further, expectations of growth in transition economies were based on the assumption that market institutions, if they had not yet appeared automatically, would somehow rise up soon after liberalization and stabilization measures were executed. However,

because of a vacuum with neither plan nor market system, productive capacity was utilized even less than previously, savings and investments began to decline, and instead of fast growth there was deep recession (Sedoglavich, 2003). A lack of institutional development turned out to be the missing element in transition policies based on the Washington consensus. Instead of sustained growth, liberalization and privatization without a well-organized market structure led to extended contraction. This was not only the legacy of a socialist past, but also the result of current policies (Kolodko, 1999).

By the mid-1990s it was becoming clear that experiences of economic transformation varied substantially between countries. In terms of progress with reform, a leading group of Poland, Hungary, the Czech Republic and Slovenia, perhaps with Slovakia and the former Soviet Baltic Republics of Lithuania, Latvia and Estonia, moved further and faster than their neighbors towards the creation of a market economy. A middle group including Bulgaria, Romania, Croatia and Ukraine have, so far, experienced a less complete transformation, while a third group, including Belarus, Moldova, the former Yugoslavia and the former Soviet Trans-Caucasus Republics moved least towards any significant changes.

Transition experience

The transition in CEECs can alternatively be viewed as a great success or a dismal failure (Sedoglavich, 2003). In fact, the picture is much less bifurcated, depending on the aspects of the transition process and on the countries under consideration. Looking at CEECs in general, it is obvious that progress has been made toward macroeconomic stabilization. Median inflation rates dropped from three-digit levels in the first half of the 1990s to the tens and below in the late 1990s. The median fiscal balance, after having reached some 7 percent of GDP in the early 1990, had stabilized at about 3 percent of GDP in the late 1990s. Foreign direct investment grew from low levels of barely above \$3 billion to about \$20 billion over the same period. (Linn, 2001)

However, the region lost about 25 percent in terms of real GDP in the period 1990-1999. Unemployment rose rapidly from near zero in 1989 to an average of over 10 percent in the late 1990s. At the same time, median current account deficits have increased over the decade, reaching 6-8 percent of GDP (Linn, 2001). This reflects an increased access to capital inflows, including foreign direct investment, on one hand but unsustainability of external accounts in some countries on the other hand.

Looking retrospectively, with the onset of reforms in 1989, severe macroeconomic instability engulfed all the CEECs in the early part of the 1990s. Economic activity collapsed; inflation and unemployment rates surged; trade in agricultural products fell; consumer food subsidies were abolished, rural income fell, and consumption of the major food products shrank. The governments adopted economic reforms to varying extents, and countries such as Estonia, Hungary, Poland and Slovenia, which fully embraced the reforms, recovered the quickest from the severe economic downturn. By 1992/93, the sharp contraction in economic activity in the early reforming countries had been arrested, and their economies had started to expand, albeit modestly. Other CEECs such as Bulgaria and Romania, where many of the 'unpopular' decisions were postponed until the second half of the 1990s, suffered a second economic downturn in 1996/97 (Linn, 2001).

Some of the differences in reform outcomes were certainly a result of the stronger and more persistent efforts to transform the countries in the region, but very likely they were due to the more favorable starting positions of some countries, and the length and depth of socialist, centrally planned regimes. However, it is important to admit that one of the great achievements of the socialist system was the great improvement in and the wide access of social services (education and health). As a result, the incidence of poverty in the region was low, and the social indicators at the onset of transition were generally very good. Inequality and the incidence of poverty have since increased throughout the region.

As a whole, it is becoming more evident that the transition countries as a group have experienced dramatic changes. Their responses, although different and distinct, have prepared most of them for further progress and growth. Still, a key lesson of macroeconomic management has been confirmed in the transition economies: a sustained combination of tight monetary and loose fiscal policies and fixed exchange rates is a prescription for macroeconomic stagnation and eventual financial crisis (Sedoglavich, 2003). A number of countries managed to bring down inflation through tight monetary policies and fixed exchange rates in the mid-1990s but failed to establish a reasonable fiscal balance. The resulting macroeconomic stability proved more apparent than real: persistently loose fiscal management combined with tight monetary policy resulted in the high interest rates and overvalued exchange rates and hence the stagnation of the real economy, of exports, and of private investment, and contributed to a weak financial sector and the emergence of a foreign debt trap, making these countries very vulnerable to external shocks and financial crisis.

Challenges

The main characteristics of former socialist economic systems which left their marks on the countries in the region are: property rights were concentrated in the hands of the state⁷ with economic activity centrally planned; the concentration of industry in highly specialized industrial districts with priority given to heavy industry at the expense of consumer goods; the absence of horizontal linkages among economic actors, although informal networks evolved between bureaucrats and industrial bosses to circumvent the rigidities of the planning process (OECD, 2003). In general, economic activity was characterized by the absence of conventionally functioning legal and financial systems and clear accounting standards. The population trained to work in highly specialized fields in state-owned enterprises or bureaucracies did not hold independent entrepreneurial spirit in high regard.

⁷ In some countries of the socialist bloc, such as Yugoslavia, from the 1960s onward, state-owned enterprises acquired some autonomy in economic reform experiments.

Since 1989, CEECs have undergone profound economic and political change. Countries have created framework conditions for the operation of private enterprise, such as the establishment of property rights, commercial banking systems, competition and commercial law, codes of business ethics and systems of taxation. Economic reforms have been supported by the inflows of foreign direct investment and the emergence of newly founded domestic firms.

Currently, countries that have successfully made the transition from socialist economic systems to market economies more than a decade ago seemingly face the same challenges as other OECD countries - to increase the international competitiveness of their economies. However, strong regional disparities are still present in the region, which are due to an over-reliance on traditional industry and agriculture that lacks international competitiveness, to uneven distribution of foreign direct investment, power asymmetries in relationship between small firms and international investors, the necessity to embed foreign direct investment and related issues of skills formation (OECD, 2005a). These issues are all too familiar to advanced capitalist economies. Aggravating the situation in CEECs is a lack of social capital which seems to be characteristics of many post-communist economies (OECD, 2005a).

In CEECs high unemployment is often concentrated in specific regions where large state-owned factories once were the sole employers. To avoid the break-down of social fabric, in some cases, these state owned enterprises are artificially kept alive by subsidies with a danger of blocking economic transformation. While this phenomenon can also be seen in other OECD countries such as Germany and the Benelux countries, the economic base of CEE's economies appears to be less diversified in comparison (OECD, 2005a).

Strong regional disparities have also emerged due to the influx of foreign direct investment, as investors have preferred to locate in border regions in an attempt to cut transportation costs. Often economic growth and prosperity has remained

concentrated in areas well endowed with infrastructure (such as national capitals). Further, a highly qualified and specialized workforce has been very difficult to retrain to gain the necessary skills to find employment in the new market economies. A special effort had to be undertaken to upgrade skills to better embed foreign direct investment (Pyke, Nesporova and Ghellab, 2002).

While the conditions for business have vastly improved, entrepreneurs complain about red tape and lack of transparency in regulatory frameworks, which can constrain SMEs (OECD, 2005a). Furthermore, the number of newly founded small and medium-sized firms is steadily declining since its peak in the early 1990s because the change in government often brings unexpected modifications in rules and regulations, while a lack of trained personnel in public institutions at federal, regional and local levels adds to the confusion (OECD, 2005a).

Attitudes can also stand in the way of entrepreneurial activity. It seems that post-socialist economic systems still cultivate a negative business climate with sometimes disinterested or obstructive authorities on one side and distrustful entrepreneurs on the other. Entrepreneurs are often hesitant to co-operate both with authorities and with fellow business owners, preferring instead to go it alone. One reason for this could be a lack of social capital in post-socialist societies (OECD, 2005a).

3.3.5 The Reform Process in Agriculture

After the fall of the Berlin wall, the agricultural sector in CEECs has been confronted by two huge problems simultaneously: transition processes and sustainability. In the pre-transition period agricultural policies in the CEECs were based on the premise that agriculture formed an integral part of the centrally planned economy. Basic production targets were formulated in the national plans, with the overall policy goal to achieve self-sufficiency in food production (Csaki and Zuschlang, 2003). With the introduction of reforms the role of agriculture, although still important, has changed.

The emphasis in most CEECs was to develop an efficient, productive, and sustainable export oriented agriculture based on comparative advantage.

The relative inefficiency of agriculture is one of the most important challenges facing the countries of the Central and Eastern Europe. During the socialist era, agriculture and food production were determined by government planning, without regard to efficiencies or comparative advantage. Input provision was often dominated by a few state-owned firms, in a monopolistic position (Csaki and Zuschlang, 2003). Similarly, a few inefficient state buyers with strong monopolistic power dominated marketing channels. The large-scale livestock and crop cooperatives were unsuited to market-based private agriculture. Creating viable private farming based on private ownership of land and allowing market signals to determine levels and types of production have been some of the most difficult tasks of the transition period (Csaki and Zuschlang, 2003).

The key tenet in the whole process of transition has been the establishment of private property rights accompanied by the adoption of appropriate legislation to enforce these rights. In the agro-food sector, the first half of the 1990s largely focused on land privatization, the demonopolization and privatization of the upstream and downstream sectors, and the liberalization of prices and trade in agricultural products (Csaki and Zuschlang, 2003). The degree of success in implementing these reforms has varied across the region. While the freeing of prices and privatization of the upstream and downstream sectors took place relatively rapidly, privatization of agricultural land and developing land markets has proved to be much more problematic in most countries. During the latter part of the 1990s, the main policy focus has shifted to deeper restructuring and productivity improvement in the agriculture, as well as to integrating agriculture within the broader context of rural development.

In all countries the transformation of agriculture has been influenced by political considerations, often short-term, while economic efforts to create efficient new

structure have played a secondary role (Linn, 2001). Because of the legacy of the inherited collective based structure much emphasis was placed on seeking social justice and privatization. This contributed to a dramatic fall in output, fragmentation in land ownership, and an increase in non-farmers acquiring agricultural land (Linn, 2001).

Remarkable progress has been made in establishing the foundations of a market based agro-food sector across the region, but the process of transformation has proven to be more complex and slower than originally predicted. Policies to support agricultural producers have varied widely during the 1990s. At the beginning of the 1990s, support fell sharply in all countries (became negative), reflecting the dramatic fall in budgetary support, the lowering of border protection and the implementation of the tight macroeconomic policies. As regards the composition of support, market price support has been the dominant type of support in the CEECs, similar to most OECD countries.

Development of primary agriculture has been slowed down in most CEECs by the lack of access to credit and high real interest rates during the 1990s (Linn, 2001). Moreover, investment credits were scarce. In order to overcome the credit constraints, most CEECs have implemented a system of preferential credit and loan guarantees to facilitate the purchase of inputs, grain harvesting and storage, as well as to encourage structural adjustment. The high degree of outstanding indebtedness, absence of a functioning land market, low farm profitability, high risk and uncertainty over property rights, continue to be important impediments to the development of a functioning credit system in many CEECs.

Furthermore, rural development policies are becoming a high priority in the CEECs due to the growing domestic economic disparities between different regions. Within the framework of the EU pre-accession program to assist in the preparation of agriculture for full participation in the EU internal market, a large range of projects

for developing agriculture and rural areas are developed, including help financing farm development and improvement of infrastructure in rural areas.

Prior to 1989 agriculture had been an important sector in all CEECs. However, the role of agriculture has declined sharply in most CEECs during the transition period which has been largely due to a more rapid recovery in the non-agricultural sectors, as well as substantial growth in the service sector (Linn, 2001). Agricultural output fell sharply in all CEECs up to 1993/94. By the end of 1994, gross agricultural output had fallen by more than two-fifths compared to the 1989 level of production (Linn, 2001). The downturn in livestock production was particularly pronounced in all countries in the region. However, since 1995/96 agricultural production has rebounded in many of the CEECs, although the decline continued in Estonia, Latvia and Lithuania in particular. This was mainly due to the sharp drop in food consumption, especially the consumption of livestock products, difficulties encountered in developing new export markets, as well as the ongoing problems associated with land restitution and privatization of the agro-food sector.

In summary, during the 1990s the agro-food sector in all CEECs faced enormous difficulties arising from the transition process. These included the initial cost-price squeeze, the slow pace of privatization, the over-capacity in the downstream sector, the lack of mobility of agricultural assets, as well as the inefficient and underdeveloped market structure and mechanisms. Additional problems related to various barriers to agricultural exports arising partly from the slow implementation of EU quality, sanitary and phytosanitary standards. There was also a shortage of finance for modernization and restructuring, tough competition on third country markets, the insufficient development of human capital, and a lack of any long-term strategy for the development of agriculture.

The agriculture policy agenda in the CEEC is characterized by efforts to complete the transition, to cope with increased social problems in rural areas, and to adjust to the evolving Common Agricultural Policy (CAP). However, in several CEEC countries

the agriculture and agro-processing sectors now resemble those of a market economy and are experiencing very dynamic growth (Csaki and Zuschlang, 2003). Notably, in the Czech Republic, Hungary, Slovenia and Estonia, the degree of private ownership and investment in the sector, supported by a liberal policy framework and the prospect of EU accession, has led to significant developments in the efficiency of agricultural production in recent years. These countries have benefited from a substantial influx of fresh capital, mainly foreign, which has contributed to renew the capacity and performance of the sector. As a result, their agricultural sectors now look increasingly competitive on the European and world markets.

Land Privatization and De-monopolization

Land privatization took place through restitution in most CEECs resulting in a highly fragmented ownership structure across the region (Dickinson, 2000). In the Czech Republic and Hungary, ownership fragmentation was limited as recipients could exchange restituted land for investment vouchers or cash compensation. However, fragmentation was more pronounced in Bulgaria, Lithuania and Romania. The operational structure, nonetheless, is much less fragmented and most of the agricultural land is farmed in large viable units. In Poland and Slovenia most of the land, traditionally owned, continues to be farmed as family type units (similar to the pre-transition period). The process of privatization has resulted in the emergence of a bimodal farm structure in the region with both small and large-scale farms playing an important role especially in Bulgaria, Estonia and Hungary, while large scale farms are dominant in Latvia, Lithuania, Poland, Romania and Slovenia (Dickinson, 2000).

Further, in the upstream and downstream sectors, reforms were aimed at de-monopolization and privatization. This process occurred relatively rapidly in most of the CEECs. However, the process resulted in the formation of private or regional local monopolies in several sectors, e.g. vegetable oil refining in Hungary; grain assembly and distribution in Romania (Dickinson, 2000). In the meat and dairy processing sectors in particular, the early stage of transition was characterized by the

emergence of many small private processing enterprises, which added to the severe over-capacity in these industries.

Challenges for the Agricultural Sector in CEECs

At the beginning of the transition period, policy reforms in the CEECs were driven by the dual objectives of achieving macroeconomic stability and establishing private property rights. In the latter half of the 1990s, many of the CEECs moved on to efficiency concerns, institutional reforms and the need to develop appropriate strategies for accession to the European Union.

The transformation process had different starting points in the various CEECs, ranging from highly centralized system in Romania to more market oriented systems in Poland and Slovenia. The pace and extent of reforms have also varied widely and have resulted in even greater heterogeneity across the region. However, many shared challenges remain: to enhance macroeconomic stability, to increase competitiveness on domestic and export markets, to accelerate agro-food restructuring and adjustment, to create sustainable off-farm employment, to improve general infrastructure, as well as to establish effective and efficient institutions of governance, and most of all, to develop an efficient, productive, and sustainable export oriented agriculture based on comparative advantage.

Rural development policies became a high priority in the CEECs. Within the framework of the EU pre-accession program, the ten CEECs were in the process of implementing the Special Accession Programme for Agriculture and Rural Development (SAPARD), OECD (2000). The main purpose of the programme was to assist in the preparation of agriculture for full participation in the CAP and internal market.

With a population of over 100 million people, the CEECs represent both a large market for agricultural and food products, and an important region for agricultural

production and trade. With greater economic stability in all countries in the region accompanied by progress in farm restructuring and in modernization of the food processing industry, agricultural exports are likely to grow. However, in order to achieve this, further structural reforms are needed to improve the overall performance of the agro-food sector. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector.

Further, there is still a sizeable productivity gap between most countries in Central and Eastern Europe and those in the OECD, although in the most advanced reformers of Central and Eastern Europe, this gap is diminishing quickly. The level of agricultural labor productivity in CEECs was between 3 and 73 per cent of the EU countries in 1998 (OECD, 2000). Only three countries show labor productivity of more than 50 per cent of that of the EU (the Czech Republic, Hungary and Slovenia), and productivity for Central and Eastern Europe as a whole was only 15 per cent of the EU's level.

The productivity gap also means that agricultural producers of CEE are performing at a level that is far below the region's technological potential. Narrowing this gap is critical for the countries of the region to be able to compete with the producers of OECD countries, increase export earnings and raise rural incomes.

Further structural reforms are needed to improve the overall performance of the agricultural sector. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector, and further efforts are needed to overcome management inertia. Increased competition on both the domestic and export markets is likely to lead to further restructuring and rationalization in the food processing sector, in particular in the dairy and meat industries. The future trend in agricultural output will not only depend on the prospects for commodity prices, but also on improvements in productivity and competitiveness in the agro-food chain.

The overall objective of the reforms is to develop an efficient, productive, and competitive market oriented agro-food sector that will contribute to economic growth and welfare. In this respect, establishing a functioning land market and modernizing farming practices is essential in order to develop a viable and sustainable agriculture. Further, improving access to credit in rural areas and raising efficiency in food processing industry are also of vital importance for further advancement in the agricultural sector. In this context, greater emphasis on education and training is essential. (OECD, 2003)

3.3.6 Enlargement of the European Union

On 1 May 2004, ten countries entered the EU, increasing its membership from 15 to 25⁸. This enlargement increased the population of the Union by 20 percent to 457 million, expanded its area by 26 percent and increased total GDP by 5 percent or an amount roughly equal to the GDP of Netherlands (Johnson and Turner, 2006). This enlargement was followed by Bulgaria and Romania in 2007, and later Croatia, Turkey and possibly others, will follow. This enlargement presents a major challenge for the Union in terms of its functioning, economic and business environment and future direction.

Eight of the ten new member states in 2004 were from CEE, fresh from nearly 15 years of transition from communism to liberal market economies. The magnitude of the changes that have occurred in these countries in what is a relatively short time in their history in the process of transition and the legacy of the communist period was briefly explained in previous sections. The 2004 enlargement has far-reaching implications for the old and new member states, for their citizens, for the EU, its

⁸ EU-25 refers to the EU-15 member states (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom) plus the 10 countries that joined the EU in May 2004 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia) commonly referred as EU-10. Bulgaria and Romania joined in 2007 making up EU-27.

institutions and policies, and for business from the old and the new member states and even for businesses with their primary locations outside Europe.

A common concern regarding enlargement is not so much the scope of the enlargement but the big divergence in economic standards between old and new countries (Johnson and Turner, 2006). These disparities it is claimed could lead to large scale population movements as low-paid CEE workers seek a better life elsewhere, thereby depriving workers in old Europe of jobs, placing burdens on social infrastructure and depriving the country of origin of the brightest and the best; others argue the disparities will lead to social dumping as Western European businesses migrate to Eastern Europe in search of lower cost labor (Johnson and Turner, 2006). However, those of a more positive approach identify a multitude of business opportunities arising from enlargement.

Whatever the views about the extent of the enlargement challenges are, it is indisputable that the new member states have structurally and systemically traveled an extremely long way in a relatively short space of time. At the onset of transition, according to Vintrova (2004, p. 522), the institutional framework of former Soviet satellites ‘was diametrically opposed to the institutional framework established by developed market economies.’ The requirements of accession accelerated institutional transformation and provided a solid and stable anchor for these changes. From a business perspective, this brings benefits in terms of predictable and enforceable contracts, lower transaction costs, initially from more transparent rules of conduct and subsequently from greater harmonization of practices, and a business environment which is less liable to graft.

In addition, regarding the economic development of the new member states, the growth of GDP in the 10 new member states (EU-10) picked up in 2004, exceeding by a significant margin the average rate in the old member states (EU-15). However, the labor markets in the EU-10 continued to be weak, with low employment and high unemployment rates. Aside from the need for sustainable fiscal consolidation, the

most pressing policy challenge facing the new member states is to create conditions for a strong growth of employment.

EU membership raises a number of policy challenges. On the structural front, it implies a commitment to the so-called Lisbon strategy that aims to transform the EU into the world's most competitive knowledge-based economy by 2010 (Economic Survey of Europe, 2005). However, the medium-term strategy of the EU-10 is broadly consistent with the official economic policy guidelines for the EU member states, which should enable the 10 economies to achieve sustainable convergence and join the European Monetary Union after a transition period.

Table 3.15: Quarterly Real GDP and Industrial Output in the New EU Member States, 2003- 2004 (Percentage change over the same period of the preceding year)

	GDP					Industrial output				
	2003QIII	2003QIV	2004QI	2004QII	2004QIII	2003QIII	2003QIV	2004QI	2004QII	2004QIII
Cyprus ^a	1.7	2.8	3.6	4.0	3.5	2.1	2.1	2.5	0.6	-0.7
Czech Republic	4.0	4.0	3.5	3.9	3.6	6.0	6.1	9.0	12.6	8.7
Estonia	5.2	6.2	6.8	5.9	6.2	10.0	9.4	7.4	7.1	7.4
Hungary	3.0	3.8	4.3	4.2	3.7	6.5	10.1	10.4	10.4	6.0
Latvia	7.3	7.5	8.8	7.7	9.1	7.8	4.2	9.2	6.5	3.9
Lithuania	9.3	11.5	7.1	7.3	5.8	20.0	19.3	9.8	17.4	7.3
Malta	-1.6	3.0	2.1	-1.6	1.4
Poland	4.0	4.7	6.9	6.1	4.8	9.1	11.8	18.9	16.6	9.7
Slovakia	4.5	5.2	5.4	5.5	5.3	2.3	4.2	6.6	5.7	3.8
Slovenia	2.3	2.5	3.8	4.6	4.9	0.2	4.9	4.1	7.4	5.7
<i>Memorandum items:</i>										
Euro area ^a	0.3	0.8	1.9	2.4	1.6	-0.3	1.4	1.0	3.0	2.6
EU-15 ^a	0.5	1.1	2.1	2.4	2.3	-0.1	1.2	1.0	2.8	2.0
EU-25 ^a	0.7	1.2	2.2	2.6	2.3	0.3	1.6	1.6	3.3	2.4

Source: National statistics: Eurostat; OECD; UNECE secretariat estimates in Economic Survey of Europe (2005)

As shown in table 3.15, economic growth was strong throughout the EU-10 in 2004. In central Europe, it accelerated and became more broadly based, underpinned by strong private consumption and fixed investment as well as robust external demand (Economic Survey of Europe, 2005) building economic confidence in the new EU economies. The available national accounts and industrial production data indicate that economic activity continued to expand throughout central Europe. Growth was driven by large increases in consumption and investment and by strong external

demand. Export grew rapidly and the central European economies continued to increase their share of west European markets. The underlying factors include the expanding capacities of export-oriented FDI firms, the one-off effects of full trade liberalization at the time of the EU accession, and rapid labor productivity growth (Economic Survey of Europe, 2005).

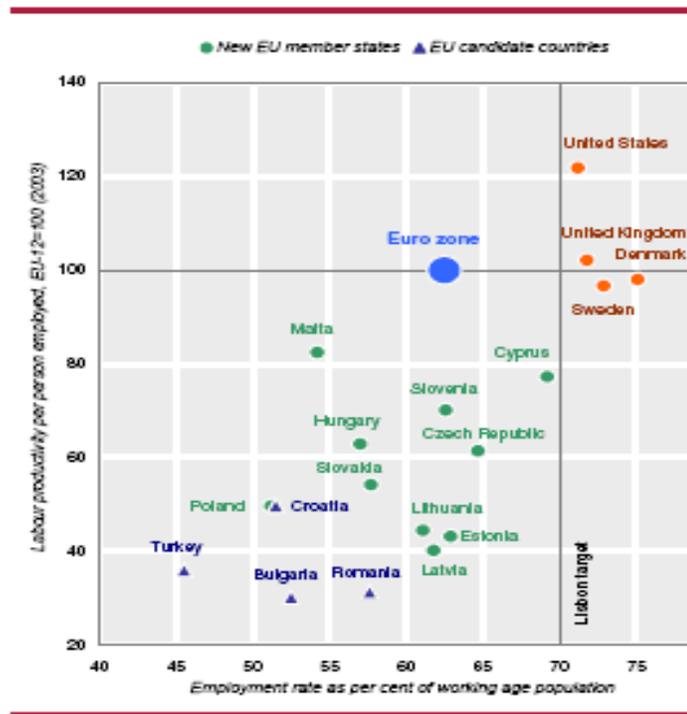
Table 3.16: Components of Real Final Demand in the New EU Member States, 2002-2004 (Percentage change over the same period of the preceding year)

	Private consumption expenditure			Government consumption expenditure			Gross fixed capital formation			Exports of goods and services			Imports of goods and services		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
			Q1-Q1			Q1-Q1			Q1-Q1						
Cyprus	1.5	2.6	6.8	7.5	4.7	11.3	8.1	-2.2	15.5	-5.2	-1.4	4.0	-0.5	-0.4	15.4
Czech Republic	2.8	4.9	3.0	4.5	4.2	-1.1	3.4	4.8	10.0	2.1	7.3	18.4	4.9	7.9	18.8
Estonia	10.3	5.7	6.1	5.9	5.8	4.5	17.2	5.4	6.1	0.9	5.7	18.7	3.7	11.0	16.7
Hungary	10.2	8.0	4.2	5.0	5.4	-0.3	8.0	3.4	13.5	3.7	7.6	18.4	6.2	10.4	18.6
Latvia	7.4	8.6	9.3	2.2	1.9	2.3	13.0	10.9	19.3	5.2	5.0	7.6	4.6	13.0	18.4
Lithuania	6.1	12.4	11.1	1.8	4.0	6.1	11.1	14.0	15.9	19.5	6.9	3.7	17.6	10.2	14.6
Malta	-0.4	1.6	0.4	3.8	1.6	-0.4	-29.6	41.4	-4.1	6.6	-3.8	2.7	-2.4	7.1	0.1
Poland	3.4	3.1	3.8	0.4	0.4	2.0	-5.8	-0.9	3.6	4.8	14.7	13.6	2.6	9.3	9.8
Slovakia	5.5	-0.6	3.0	4.9	2.7	1.2	-0.6	-1.5	2.4	5.6	22.5	16.1	5.5	13.6	14.6
Slovenia	0.3	2.7	3.5	1.7	2.6	0.8	3.1	6.3	7.3	6.7	3.2	11.5	4.9	6.8	12.9

Source: National statistics; Eurostat; OECD; UNECE secretariat estimates in Economic Survey of Europe (2005)

Table 3.16 indicates that economic activity continued to expand throughout central Europe, although slowing somewhat in the third quarter of 2004. Growth was driven by large increases in consumption and investment and by strong external demand. Exports grew rapidly and the central European economies continued to increase their shares of west European markets. The underlying factors include the expanding capacities of export-oriented FDI firms, the one-off effects of full trade liberalization at the time of the EU accession and rapid labor productivity growth that has preserved their cost competitiveness. Imports grew rapidly throughout the region in response to the expansion of domestic demand.

Figure 3.7: Employment Rates and Productivity Gaps in the New EU Member States and Candidates, 2003



Source: Eurostat

Note: Labor productivity refers to GDP in purchasing power standards per person employed. Employment rates are ratios of total employment in the 15-64 years age group to the total population of working age (15-64 years).

The average per capita GDP level (at purchasing power parity) in the EU-10 is currently less than one half of the comparable level in the euro zone, reflecting low labor productivity and low employment rates in the former, see Figure 3.7, (Economic Survey of Europe, 2005). Productivity levels and employment rates differ significantly across the EU-10 economies, some of them being closer to the characteristic pattern of the EU candidate countries than that of the euro zone or the three mature economies remaining outside the European Monetary Union (the United Kingdom, Denmark and Sweden). While a strong productivity catch-up has occurred in recent years, the gap in employment rates has not diminished. The real convergence challenge is amplified by shortcomings in the human capital stock. The intensity of R&D spending in the EU-10 is less than one half of the EU-15 average

(Economic Survey of Europe, 2005). There is no obvious development strategy that would be able to transform the EU-10 into dynamic knowledge-based economies in the medium term given the differences in their education systems. Policies to deal with these issues can be classified into two major categories: the “liberal” model based on the British and Irish experience or the “dynamic welfare state” model based on the Austrian and Scandinavian experience. Economic Survey of Europe, 2005) However, the experience of economies that joined the EU in earlier rounds of expansion, and which have been successful in catching up, suggests that neither approach can work without credible fiscal consolidation.

Table 3.17: Selected Fiscal Indicators for the New EU Member States, 1998, 2007 (Percent of GDP)

	<i>Cyclically adjusted general government deficit, 2003</i>	<i>Targeted cyclically adjusted general government deficit, 2007</i>	<i>Public investment, average 1998-2003</i>
Cyprus	5.4	1.6	3.1
Czech Republic	5.2 ^a	3.6	3.6
Estonia	-2.6	-0.1	4.2
Hungary	6.2	2.7 ^b	3.7
Latvia	1.4	2.0	1.4
Lithuania	1.8	1.8	2.6
Malta	5.4 ^c	0.2	4.3
Poland	5.0 ^d	3.7 ^d	3.4
Slovakia	3.7	3.1	2.9
Slovenia	1.5	0.7	2.2
<i>Memorandum item:</i>			
<i>EU-15</i>	1.6	..	2.3

Source: Economic Survey of Europe (2005)

Table 3.17 shows that fiscal consolidation remains a serious problem in most of the new member states. The majority of the 10 economies have also failed so far to satisfy the European Monetary Union inflation criterion, which partly reflects the ongoing process of productivity catch-up. But it is fiscal consolidation that remains the principal macroeconomic policy challenge in most new member states. Further, these economies need to undertake a lasting effort to improve their public

infrastructure, which is essential precondition for a successful catching up to higher productivity and income levels.

3.3.7 International Activities in the CEECs

The transition of Central and Eastern Europe toward a market economy affords new opportunities but also new risks to international companies. Despite the threat of uncertainty, the notable economic growth that was taking place in some of the former communist countries was the motive for international firms to enter these markets (Ghauri and Holstius, 1996), even before accession to the EU when many reforms changed economic conditions in the region.

Further, with a population of over 100 million people, the CEECs represent both a large market for agricultural and food products, and an important region for agricultural production and trade. Historically, the region has been a net exporter of agricultural and food products. However, CEEC agricultural exports are mainly lower value added commodity products. The most important exports include dairy products, pig meat, grains, fruit and vegetables and wine (FAO, 2002). With greater economic stability accompanied by progress in farm restructuring and in modernization of the food processing industry, agricultural exports are likely to grow.

Furthermore, foreign direct investment in the agro-food sector is low across the region, but varies substantially from country to country. FDI in primary agriculture is significantly lower than investment in the upstream and downstream sectors. During the transition decade, investment has been impeded by various factors including the special preferences given to domestic producers during privatization, the lack of profitability in the sector, the uncertain legal framework, as well as labor and other social restrictions placed on investors and management. On the other hand, expectations of EU membership and low production costs, as well as macroeconomic stability have had a positive impact on FDI inflows to the sector. Inflows of FDI have focused on a small number of countries (the Czech Republic, Hungary and Poland). It

should be noted that investment in the agro-food sector has concentrated on a narrow range of products including tobacco, beverages, sugar, confectionery products and vegetable oils.

Frequent motives for an engagement in these markets are: to achieve corporate growth; to develop sustainable competitive advantages; to neutralize competitors; high cultural and historical affinity with some of the countries in the region; preferential market access to both the European Union and the former centrally planned economies. Further, the decision to enter the region is also driven by the current strengths and weaknesses of its countries (Kostecki, 1993). Some of the strengths are large population, low wages, and geographic proximity to Western Europe, privatization opportunities, low market entry costs, and long-term growth potential. On the other hand, low per capita income, limited management skills, low productivity, overdrawn expectations, poor infrastructure, an unstable business environment, large bureaucracies, short-term decline, and crises represent some of the weaknesses (Kostecki, 1993).

Moreover, entry strategies of international business are adapted to the local institutions in host economies. Institutions are important for the functioning of a market economy as they constrain or facilitate business, and their establishment is essential part of economic development and transition (Clague, 1997; Harriss, Hunter and Lewis, 1995). No matter how the firm responds to the internal and external factors that affect the entry mode decision, neither in Western countries nor in transition markets exists an optimal entry mode that maximizes long term value. A company simply has to reconcile itself to using an option that seems like the best one at the moment (Gannon, 1993).

FDI in the CEECs

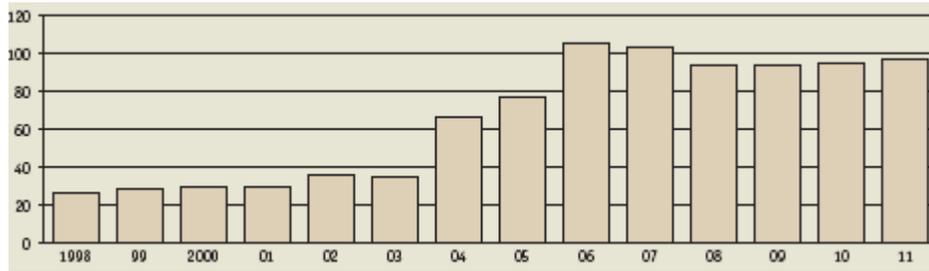
At the onset of transition, hopes were high in the CEECs that large inflows of FDI would facilitate their economic restructuring, improve the quality of their capital

stock and increase their technology, quality and environmental levels. However, it was not until the mid-1990s that FDI began to flow to the region in any significant volumes (Johnson and Turner, 2006). This is not surprising because foreign investors look for a stable business environment and a transparent and effective regulatory and institutional framework to support and protect their interests. The earliest transition years were ones of economic turmoil and instability and it took time before the satisfactory legal environment took shape. As the CEECs progressed toward accession, so the requirements for adopting particular policies help to reassure investors about the region and FDI inflows continued on their upwards trend.

By the mid-1990s, FDI stocks in the region were ten times those at the beginning of the decade – in part, a reflection of the exceedingly low level of FDI at the beginning of transition (Johnson and Turner, 2006). At this stage 85 percent of FDI into the region had been directed towards the three most advanced transition countries, the Czech Republic, Hungary and Poland. However, during ten year into transition, the more developed countries of CEE experienced some loss of attractiveness and FDI is being diverted to other countries in the region, such as Bulgaria and Romania (Johnson and Turner, 2006).

FDI inflows into the transition economies of CEECs reached a record total of US\$106bn in 2006, compared with US\$77bn in 2005—the rate of increase, 37%, was exactly equal to the growth rate in global FDI in 2006, which meant that the transition economies' share in global FDI inflows in 2006 remained unchanged compared with 2005, at 7.9% (The Economist Intelligence Unit, 2007). In 2006 the region displaced Latin America and the Caribbean as the second most important emerging market destination for FDI after developing Asia.

Figure 3.8: FDI Inflows to East European EU Member States 1998-2006 and Projection to 2011



Source: National Statistics, Economist Intelligence Unit; IMF

Figure 3.8 shows FDI inflows to Eastern European EU member states for period 1998 to 2006, as well as projection to 2011.

Three economies in the region were among the top emerging-market FDI recipients in 2006—Russia (third), Poland (tenth) and Romania (11th). (The Economist Intelligence Unit, 2007) Table 3.18 shows that the US\$106bn total inflows represented almost 5% of the transition region’s GDP, the highest ratio achieved so far. For the Balkans the FDI inflows/GDP ratio exceeded 10% in 2006, and it was almost 8% for the Baltic States (The Economist Intelligence Unit, 2007).

Table 3.18: FDI Inflows into CEECs

	1996	1997	1998	1999	2000	2001	2002	2003
Eastern Europe Inflows (US\$ bn) % of world total	16.8 4.2	24.1 4.9	26.7 3.7	29.1 2.6	29.5 2.1	30.0 3.5	36.0 5.8	35.1 6.2
% change, year on year % of GDP	1.2 1.8	43.1 2.6	10.8 3.2	5.6 4.0	1.5 3.7	1.5 3.4	20.3 3.6	-2.7 2.9
<i>East-central Europe</i> Inflows (US\$ bn) % of regional total % change, year on year % of GDP	9.7 57.9 -14.7 3.2	10.9 45.1 11.4 3.6	14.2 53.2 30.6 4.4	17.4 59.7 24.3 5.5	19.3 65.4 6.1	17.4 58.0 -9.9 5.0	21.4 59.5 23.3 5.5	9.8 27.8 54.5 2.2
<i>Balkans</i> Inflows (US\$ bn) % of regional total % change, year on year % of GDP	1.1 6.5 45.2 1.2	3.1 181.4 3.3	3.9 26.1 3.6	3.7 -4.5 3.8	3.6 12.2 -1.8 3.4	4.2 14.2 17.5 4.3	4.2 -0.8 3.7	8.0 23.0 91.1 5.4
<i>Baltics</i>								

Inflows (US\$ bn) % of regional total % change, year on year % of GDP	0.7 4.1 50.8 3.7	1.1 4.7 66.8 5.4	1.9 7.0 63.1 7.9	1.1 3.9 - 38.8 4.8	1.2 4.0 3.4 4.7	1.1 3.7 -5.0 4.2	1.3 3.5 11.7 4.1	1.4 4.0 12.1 3.6
<i>CIS</i>								
Inflows (US\$ bn) % of regional total % change, year on year % of GDP	5.3 31.6 32.4 1.1	9.0 37.5 69.9 1.7	6.8 25.4 -24.9 1.8	6.9 23.7 -2.7 2.4	5.4 18.4 -21.3 1.5	7.2 24.1 32.9 1.8	9.1 25.3 26.6 2.0	15.8 45.2 73.5 2.8
	2004	2005	2006	2007	2008	2009	2010	2011
Eastern Europe Inflows (US\$ bn) % of world total	66.9 9.2	77.1 7.9	105.9 7.9	104.0 7.1	94.3 6.7	94.1 6.4	94.8 6.2	96.9 6.0
% change, year on year % of GDP	90.8 4.4	15.4 4.1	37.2 4.7	-1.8 3.8	-9.3 3.0	-0.3 2.8	0.8 2.6	2.3 2.4
<i>East-central Europe</i> Inflows (US\$ bn) % of regional total % change, year on year % of GDP	24.3 36.4 149.4 4.5	31.2 40.4 28.2 5.0	31.2 29.4 -0.1 4.5	26.6 25.5 -14.8 3.2	26.3 27.9 -1.1 2.9	26.0 27.7 -1.0 2.8	26.3 27.8 1.1 2.7	26.7 27.5 1.5 2.6
<i>Balkans</i>								
Inflows (US\$ bn) % of regional total % change, year on year % of GDP	13.3 19.9 65.6 7.4	15.1 19.6 13.7 7.2	27.4 25.9 81.0 10.9	22.0 21.2 - 19.7 7.0	18.5 19.6 - 16.0 5.2	16.5 17.5 - 10.8 4.4	16.7 17.6 0.9 4.1	17.1 17.6 2.5 3.9
<i>Baltics</i>								
Inflows (US\$ bn) % of regional total % change, year on year % of GDP	2.4 3.6 70.0 5.0	4.8 6.2 99.7 8.6	5.0 4.8 6.0 7.6	3.4 3.3 - 32.6 4.1	3.3 3.5 -2.9 3.5	3.6 3.8 8.5 3.7	3.9 4.1 7.5 3.7	4.1 4.2 6.2 3.7
<i>CIS</i>								
Inflows (US\$ bn) % of regional total % change, year on year % of GDP	26.8 40.1 69.4 3.5	26.1 33.8 -2.9 2.6	42.2 39.9 62.1 3.3	52.0 50.0 23.1 3.4	46.3 49.0 -11.0 2.6	48.0 51.0 3.7 2.4	48.0 50.6 0.0 2.1	49.1 50.6 2.3 1.9

Sources: National statistics; IMF; all forecasts are from the Economist Intelligence Unit.

The 2006 increase in FDI inflows affected all transition sub-regions—except east-central Europe, where inflows equalled the 2005 total—and most economies in the area. For a large number of countries, the 2006 inflows represented a record total (Russia, Poland, Romania, Slovakia, Bulgaria, Croatia, Serbia, Montenegro, Latvia, Lithuania and Kazakhstan) (The Economist Intelligence Unit, 2007). The growth in FDI inflows was the result of large-scale privatization sales in some countries; growth in reinvested earnings, as well as a real estate boom in many new EU member states;

ongoing strong growth in FDI into previous laggards such as the Balkans; and commodity investments into some CIS states.

Nevertheless, despite the high 2006 inflow into the region, it is noticeable that despite widespread fears in western Europe about dislocation of economic activity to the east, the share of the eight new east European EU member states that joined in 2004 in total FDI flows to the EU25 was a mere 7% in 2006, down on the 8% share recorded in 2005 (The Economist Intelligence Unit, 2007).

There are a number of reasons to believe that FDI inflows into the region may have peaked in 2006. A modest decline is already shown in 2007 to a still very high US\$104bn. Total FDI inflows are likely to continue to trend downwards after that over the medium term, both in absolute US dollar terms and in terms of the percentage of the region's GDP (The Economist Intelligence Unit, 2007). The main reason for this is the near-exhaustion of major privatization opportunities in much of the region. But sharply increasing labor costs in many countries, competition from other destinations and the absence of large privatization sales will probably contribute to a moderate FDI inflow into many of the new EU member states.

FDI inflows into the ten new EU member states from Eastern Europe (including Bulgaria and Romania, which joined in January 2007)—the “EU10”—peaked in 2006 at US\$53bn. They are forecast to decline to US\$43bn in 2007 and to fall further, stabilizing at just under US\$40bn per year, in 2008 11. Although well below the 2006 peak, this will still amount to a good performance in terms of FDI inflows as a share of GDP (The Economist Intelligence Unit, 2007).

Certain sectors, such as services outsourcing, will be very attractive (The Economist Intelligence Unit, 2007). However, services outsourcing does not tend to be associated with large capital flows. Overall, given rising wage costs in the region, the danger of a diversion of cost-sensitive forms of FDI to even cheaper destinations may appear to slow down FDI inflows to these countries from the West.

3.3.8 Summary

Almost two decades have elapsed since the start of the transformation toward market economies in the countries of Central and Eastern Europe. During this period, fundamental and irreversible changes have taken place in all aspects of political, social and economic life. All countries have been striving to integrate into the global economic system and to replace their command and control systems by market economies. At the beginning of the transition period, policy reforms in the CEECs were driven by the dual objectives of achieving macroeconomic stabilization and establishing private property rights. In the latter half of the 1990s, many of the CEECs moved on to efficiency concerns, institutional reforms, and the need to develop appropriate strategies for accession to the European Union. The transformation process had different starting points in the various CEECs, ranging from highly centralized systems in the Baltic States and Romania to more market oriented systems in Poland and Slovenia. The pace and extent of reforms have also varied widely and have resulted in even greater heterogeneity across the region. But, many shared challenges remain: to enhance macroeconomic stability, to increase competitiveness on domestic and export markets, to accelerate agro-food restructuring and adjustment, to create sustainable off-farm employment, to improve general infrastructure, as well as to establish effective and efficient institutions of governance.

The agricultural sector in CEECs countries is confronted by two huge problems simultaneously: transition processes and economic sustainability. The emphasis now in most CEECs is to develop an efficient, productive, and sustainable export oriented agriculture based on comparative advantage. The relative inefficiency of agriculture is one of the most important challenges facing the countries of the Central and Eastern Europe. More investment is needed to improve market infrastructure and to modernize plant and equipment in the processing sector, and further efforts are needed to overcome management inertia. Changes in the region suggest an ever-

increasing need for further growth, which offers real potential for expansion of New Zealand's agro-technology exporters.

3.4 Conclusions

This chapter explained the research context, which covers New Zealand economy and CEECs. The purpose was to provide a brief overview of the two areas. The chapter has established a background for the study in outlining the significance and rationale for using New Zealand and CEECs as the research context for the study, particularly because there was no empirical research that deals specifically with the New Zealand companies that expand to new emerging markets of CEE.

Further, the context for this research, New Zealand high-tech companies with core capabilities in agro-technology are small to medium sized firms. They each produce unique products that are in growing demand among world food producers seeking increased productivity and efficiency through knowledge-based technological advantages, as well as offering new distinctive products. On the other hand, in accordance to the EU membership and a commitment to the so-called Lisbon strategy that aims to transform the EU (including the CEECs) into the world's most competitive knowledge-based economy by 2010 (Economic Survey of Europe, 2005), CEEC's industries will have high demand for various kind of products (equipment, machinery, software solutions), which suggests that there is a potential for New Zealand high-tech firms to improve their international presence and performance. This potential was a reason for the selection of New Zealand and the CEEC's region as the context for this study. In addition, the chosen context for the study provided to some extent the basis to proceed with selection of research methodology and research design explained in Chapter 4. The methodology in the following Chapter provides a structure for answering the research questions discussing the applied research strategy and research methods employed in the study.

4 Chapter Methodologies, Method and Design

This chapter discusses the methodology, the applied research strategy and research methods employed in the study that supports this thesis. The chapter begins with a research problem and the complexity of the proposed research, while the Section 4.2 addresses the research approach followed by the mixed methods discussion in Section 4.3. The qualitative method is explained in Section 4.4, while the quantitative method is explained in Section 4.5. Section 4.6 concludes the chapter.

4.1 Introduction

As the research problem and research objectives in this study became too complex to rely only on one discipline (explained in more detail in the following sections), multi-disciplinary methods and analysis became necessary. To solve the complex research objectives, this thesis had to go beyond standard mathematical techniques or pure interpretation of data. Instead, there was a need for complementary research approaches. This supports Buckley's (2002) call for interdisciplinary research in international business. From a methodological perspective, this study is also a response to Coviello and Jones' (2004) recommendations that international entrepreneurship research should combine positivist and interpretivist methods within its design.

Three phases of research were undertaken: the phase one, *the development of a conceptual model*. The examined literature identifies the components for a conceptual model and reveals the relationships between both absorptive capacity and technology, and the internationalization process. Then, the information from the literature is integrated with the findings to arrive at a refined model. Phase two incorporates *the development of measurements to measure absorptive capacity* and phase three features the generation of *the absorptive capacity model*.

4.2 Research Approach

4.2.1 Research Paradigms

Despite many proposed differences between quantitative and qualitative epistemologies, ultimately, the focus of the quantitative-qualitative “debate” is philosophical, not methodological. Philosophical assumptions or theoretical paradigms about the nature of reality are critical to understanding the whole perspective from which the study is designed and carried out. A theoretical paradigm gives the underlying basis that is used to construct a scientific investigation; or, “a loose collection of logically held together assumptions, concepts, and propositions that orientates thinking and research” (Bogdan and Biklan, 1982, p. 30). Likewise, a paradigm can be defined as the “basic belief system or world view that guides the investigation” (Guba and Lincoln, 1994, p. 105).

The most conventional paradigms available to researchers are positivism, realism, critical theory and constructivism, as posited by Burrell and Morgan (1979) and adapted by Perry, Alizadeh and Riege (1997), shown in Table 4.1.

Table 4.1: Basic Belief Systems of Alternative Inquiry Paradigms

Item	Paradigm			
	Positivism	Realism (Post-positivism)	Critical Theory	Constructivism
Ontology	<i>Naïve realism:</i> reality is real and apprehensible	<i>Critical realism:</i> Reality is ‘real’ but only imperfectly and probabilistically apprehensible; triangulation from many sources is required to try to know it	<i>Historical realism:</i> ‘virtual’ reality shaped by social, economic, ethnic, political, cultural, and gender values, crystallized over time	<i>Critical relativism:</i> multiple local and specific ‘constructed’ realities
Epistemology	<i>Objectivist:</i> finding true	<i>Modified objectivist:</i> findings probably true	<i>Subjectivist:</i> value mediated findings	<i>Subjectivist:</i> created findings
Methodology	<i>Experiments/surveys:</i> verification of hypotheses: chiefly quantitative methods	<i>Case studies/convergent interviewing:</i> triangulation, interpretation of research issues by qualitative and quantitative methods	<i>Dialogic/dialectical:</i> researcher is a ‘transformative intellectual’ who changes the social world within which participants live	<i>Hermeneutical/dialectical:</i> researcher is a ‘passionate participant’ with the world being investigated

Note: Essentially, ontology is ‘reality’, epistemology is the relationship between that reality and the researcher and the methodology is the technique used by the researcher to discover that reality.

Source: Adapted from Perry, Alizadeh and Riege (1997, p. 547).

A research paradigm is based on a number of key assumptions. The first of these to consider is the issue of *ontology*. In terms of ontology, it is necessary to consider how people view their world and to understand what they see as reality. Creswell (1994) indicates that multiple realities exist in any given situation – those of the researcher, those of the individuals under investigation, and the reader or audience interpreting the study. Therefore, to understand this world means that the researcher must represent or reconstruct the world as seen by others.

The second philosophical issue governing the research position is that of a suitable *epistemology*. Epistemology poses the following questions: What is the relationship between the knower and what is known? How do we know what we know? What counts as knowledge? The epistemological question describes the nature of the relationship between the researcher and the subject of the research. These two

theoretical ‘issues’ are perhaps best put in context by Healey and Perry (2000) who describe ontology as the ‘reality that researchers investigate’, where epistemology is the ‘relationship between that reality and the researcher’.

Many qualitative researchers operate under different epistemological assumptions from quantitative researchers (Guba and Lincoln, 1994). For example, many qualitative researchers believe that the best way to understand any phenomenon is to be part of its context. By becoming immersed and moving into the culture or organization being studied, one experiences what it is like to be a part of it. Rather than using measurement for constructing a fixed instrument or set of questions, qualitative researchers allow the questions to emerge and change as one becomes familiar with the study content.

In addition, many qualitative researchers also operate under different ontological assumptions about the world. They do not assume that there is a single reality apart from our perceptions because each of us experiences a different reality. As such, the phenomenon of “multiple realities” exists. In general, qualitative research is based on a relativistic, constructivist ontology that posits that there is no objective reality. Rather, there are multiple realities constructed by human beings who experience a phenomenon of interest differently (Guba and Lincoln, 1994).

Methodological decisions are not made in isolation but are always related to the researcher’s assumptions of the phenomenon itself (ontology), the basis of the knowledge (epistemology) and the relationship between human beings and their environment (Burrell and Morgan, 1979). Thus, a researcher with a positivist/objective approach emphasizes the methods and values of research in the natural sciences and is bound to adopt quantitative methods. On the other hand, a researcher with a constructivist/subjectivist orientation attempts to get as close as possible to the phenomenon in question in order to acquire a more hermeneutic understanding. This in turn, requires the use of qualitative methods (Burrell and Morgan, 1979).

Positivism predominates in science and assumes that science quantitatively measures independent facts about a single apprehensible reality (Healy and Perry, 2000). In other words, the data do not change because they are being observed as researchers view the world through a “one-way mirror” (Healy and Perry, 2000). Positivism holds the position that the goal of knowledge is simply to describe the phenomena that we experience. As such, positivists separate themselves from the world they study, while researchers within other paradigms acknowledge that they have to participate in real-world life to some extent so as to better understand and express its emergent properties and features (Healy and Perry, 2000).

According to the positivist epistemology, science is seen as the way to get at truth, to understand the world well enough so that it might be predicted and controlled. In science deductive reasoning is used to postulate theories that can be tested. Based on the results of studies, we may learn that a theory does not fit the facts well and so the theory must be revised to better predict reality. The positivists believe in empiricism, the idea that observation and measurement are at the core of the scientific endeavor (Healy and Perry, 2000). The key approach of the scientific method is the experiment, the attempt to detect natural laws through direct manipulation and observation.

Positivism has been defined by numerous individuals over the years. Kolakowski (1972), for example, states that positivism embraces a four point doctrine: (1) the rule of phenomenalism, which asserts that there is only experience; all abstractions be they “matter” or “spirit” have to be rejected; (2) the rule of nominalism – which asserts that words, generalizations and abstractions are linguistic phenomena and do not give new insight into the world; (3) the separation of facts from values; and (4) the unity of the scientific method. Burrell and Morgan (1979) define it as an epistemology which seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements.

The most obvious difference between the positivist belief system and that of the *interpretive* system in terms of epistemology is that the former is essentially objectivist, or, there is the belief that it is possible for an observer to exteriorize the reality studied, remaining detached from it and uninvolved with it (Burrell and Morgan, 1979). On the other hand, the constructivist posture contends that epistemologically, the inquirer, and the inquired, is interlocked in such a way that the findings of the investigation are the literal creation of the inquiry process. The constructivist, therefore, takes the position that the knower and the known are co-created during the inquiry.

Realism, as a philosophical paradigm, has elements of both positivism and constructivism (Healy and Perry, 2000). While positivism concerns a single, concrete reality, realism concerns multiple perceptions about a single, mind-independent reality (Healy and Perry, 2000). Rather than being supposedly value-free, as in positive research, or value-laden as in interpretive research (Lincoln and Guba, 1985), realism is instead value cognizant; conscious of the values of human systems and of researchers. Realism recognizes that there are differences between reality and people's perceptions of reality (Bisman, 2002).

Within this framework, the discovery of observable and non-observable structures and mechanisms, independent of the events they generate, is the goal of realism (Tsoukas, 1989). In other words, researchers working from a realist perspective observe the empirical domain to discover by a "mixture of theoretical reasoning and experimentation" (Outhwaite, 1983, p. 332) knowledge of the real world, by naming and describing the generative mechanisms that operate in the world.

Within a realism framework, *both qualitative and quantitative methodologies are seen as appropriate* (Healy and Perry, 2000). Methods such as case studies and unstructured or semi-structured in-depth interviews are acceptable and appropriate within the paradigm, as are statistical analyses, such as those derived from structural equation modeling and other techniques (Bisman, 2002; Perry, Alizadeh, and Riege,

1997). With realism, the seeming discrepancy between quantitative and qualitative is replaced by an approach that is considered appropriate given the research topic of interest and level of existing knowledge related to it (Healy and Perry, 2000).

The *realism* paradigm was the preferred paradigm for this research because first, realism is particularly appropriate in those areas of management which are contemporary and which may be deficient in theory or in well established constructs and principles (Perry, 1998). Second, the phenomena under investigation (technology transfer and knowledge management) occurs in a very dynamic business environment, reinforcing the need for a research approach which can attempt to capture as much as possible of the context in which such firms operate (Yin, 1994). Third, and as explained above, within a realism framework, both qualitative and quantitative methodologies are seen as appropriate, which is a specific requirement in this research.

4.2.2 Research Methodologies

With the intention of developing better understanding and to explain causality, some researchers have chosen to use ideographic methodologies which examine situations subjectively by gathering and translating qualitative data in terms particular to the individuals involved. These methodological approaches have been used to improve understanding of the internationalization process. Established conceptualizations of the internationalization process have been tested and new conceptualizations generated using ideographic methodologies and case study research methods (Chetty and Hamilton, 1996; Lindsay, 1998; Lindsay, 1999b; Simmonds and Smith, 1968). For example, the theory of stages of internationalization process was generated from longitudinal case study research among four Swedish firms drawing on published data and interviews in order to identify factors generating international growth (Johanson and Wiedersheim-Paul, 1975). In the same way, Rennie (1993) uses focus groups and in-depth interviews (qualitative research methods) to identify how born global exporters do business.

Some comparisons (but not mutually exclusive) between different methodologies (ethnography, phenomenology and grounded theory) are illustrated in Table 4.2.

Table 4.2: Comparison between Potential Ideographic Methodologies

Research Issues	Ethnography Qualities	Phenomenology Qualities	Grounded Theory Qualities
Context Issues			
Understanding of action and relationships required	Focuses on social relationships and phenomena	Investigates the direct experience of subjects	Uses a range of research approaches
Understanding of subject's perceptions required	Focuses on the cultural significance of phenomena	Focuses on subject's subjective experience of phenomena	Uses a range of research approaches
Need to get close to the context	Participant observation a key tool	Seeks to understand through subject's experience	Uses a range of research approaches
Question Issues			
Presence of a conceptual framework	Starts from theory to ground in the context	Draws on theory to identify phenomena and things	Seeks to discover new concepts and theory
Some theoretical basis for the question	Findings grounded in the reality of the social group	Assumes some theoretical basis for the question	Rejects a priori assumptions and theory

From a contextual point of view the study requires a methodology that would allow the researcher to get close to the context to discover the realities and perceptions of the respondents. While all three methodologies seek a close relationship with the subject, they focus on drawing different information from those relationships. Ethnography seeks to observe social and cultural information through participation (Fetterman, 1989; Goetz and LeCompte, 1984), phenomenology seeks to identify phenomena and events through the experience of informants (Remenyi et al, 1998; Spiegelberg, 1970), while grounded theory is arguably the most well-developed for the purpose of building theory; “one begins with an area of study and what is relevant to that area is allowed to emerge” (Strauss and Corbin, 1990, p. 23). With their focus on experience of phenomena, phenomenology and grounded theory appeared to be the most appropriate methodologies for investigation in the context of this research.

Postulation of the research questions was built on existing theoretical models of the internationalization process and while the questions themselves lacked a theoretical basis they were bounded by existing theory. Of the methodologies considered in Table 4.2, grounded theory rejects a priori theory, seeking to discover new concepts and theory from a zero base (Glaser and Strauss, 1967; Strauss and Corbin, 1990), ethnographic draws on theory but seeks to ground findings in the subjective reality of the respondents (Baszanger and Dopier, 1997) and phenomenology assumes a theoretical basis for the identification of things and phenomena experienced (Crotty, 1988; Mercer and Powell, 1972).

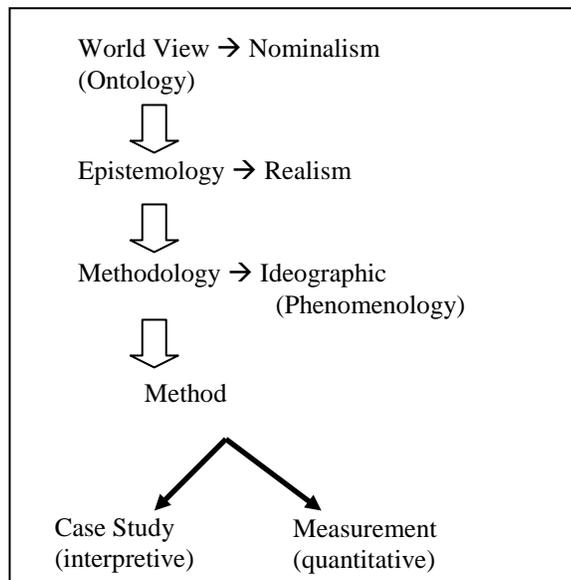
Grounded theory with its rejection of a priori assumptions and ethnography with its striving to ground findings in the social reality revealed from studies, seemed unsuitable to investigate the questions which sought to build on a specific theoretical framework. On the other hand, phenomenology, in seeking to build and expand on existing thinking on specific phenomenon appeared more appropriate to address the research questions. When evaluated from both the perspective of the context and the question, phenomenology seemed to be the most appropriate methodological approach among those considered for this research.

In this research the focus tends to be on dynamic processes with the aim of explaining, rather than predicting phenomena (Leavy, 1994). This kind of research is, according to Gordon and Langmaid (1988), centrally concerned with the understanding of things rather than measuring them. There is a need, therefore, for a research approach in the technology driven organizations of today that reflects their individual and unique characteristics and circumstances. The phenomenological principles provided a basis to address the research questions within the context of New Zealand agro technology companies. In the theory underpinning the research question, this research was treated as explanatory for which there was a need to employ a methodology that would provide an in-depth knowledge of the matters concerned with the research question (Churchill, 1979; Strauss and Corbin, 1990; Winklhofer and Diamantopoulos, 1996).

The interpretive paradigm employed in this thesis is based on the requirements of the research objectives #1 (to explore the nature of technological activities undertaken by firms outside their home base and to understand the process of internationalization of high-tech companies with the core capabilities in agro-technology), research objective #2 (to develop a conceptual model that seeks to describe the dynamic interaction between strategy and technology, on one hand, and absorptive capacity and strategy, on the other hand) and a number of key theoretical assumptions explained above. The research objective #3 (to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate development of absorptive capacity in firms) may require a different approach. However, the main focus is on significance rather than precision (explained in Section 4.5). For this reason the same phenomenological principles still apply.

These underlying characteristics provide a basis for the philosophical and the practical framework for this research as illustrated in Figure 4.1.

Figure 4.1: Framework Suggested by Context and Research Questions



This approach is suitable for a number of reasons: firstly, the interpretive approach recognizes the diversity of disciplines and associated characteristics (activities and processes) that include the technology transfer in the context of the internationalization process of the organization; secondly, the experience from the extant literature suggests that existing quantitative approaches for researching technology transfer and the role it might play in the strategy formation in the organizations is inappropriate to take account of the developing themes and sub-themes; thirdly, to research the technology transfer interface whilst being aware of the actors involved in technology transfer and strategic activities, suggested an epistemological approach, which dictates a reduction of the distance between the researcher and the personnel. Such, interpretive research methods allow for managerial recommendations that is highly contextualized and lead to more actionable prescriptions. The research does not pre-suppose that there can only be one right way for transfer technology. Interpretive research allows for the refining of the key themes, sub-themes and contrasts that emerge as the research progresses, and doing so, enhances the opportunity for validity and reliability.

Section 4.3 gives justification for using mixed methods in this research following the nature of the research objectives' requirements.

4.3 Mixed Methods

4.3.1 Quantitative vs. Qualitative Approach

The methodological sphere in management research consists of both quantitative and qualitative approaches, both attracting support and criticism. However, the dominant world view in international research appears to be that of positivism¹, a belief in a physical and social world external to the individual that can be measured using

¹ In more recent years in response to criticism (Feyerabend, 1987; Kuhn, 1962; Lakatos, 1978; Popper, 1965) a Post-Positivist view has evolved with more sympathy for subjectivism, for example Phillips (1990) and Crotty (1988).

objective methods of measurement (Easterby-Smith, 1991). This positivist view seeks to presume conclusions from the research which can be generalized across a wide range of firms. The primary use of research tools such as surveys, data reduction and statistical analysis to conduct and translate market entry mode research, suggests that internationalization process phenomena is real and objectively definable, indicating a nomothetic methodology.

Quantitative research reflects the traditional scientific approach to problem solving. It assumes that there is a single reality that can be broken down into variables which help establish cause, effect and relationship between variables. The purpose of this type of research is to test hypotheses that have been developed before the research project started and to form conclusions that can be generalized to other situations. The emphasis in this approach is upon measurement, comparison, and objectivity (Hurmerinta-Peltomaki and Nummela, 2004). The purpose of a quantitative approach is to gather, analyze and measure statistical data. The questions asked are usually not of a complex nature and they are close-ended. It is possible to gather a large sample selection, which makes it possible to generalize the findings. Finally, the findings can be presented in the form of numbers.

Qualitative research² has always had a place in the field of international business. Early contributions on firms' internationalization processes, such as the Uppsala model (Johanson and Vahlne, 1977) typically drew upon a range of techniques, including qualitative methods, in order to generate theory and new insights. Vernon (1994) went so far as to comment that questionnaires are often inadequate instruments for the complex issues that are the subject of international business, particularly when the behavior of individual firms is investigated.

² There is extensive debate about the most appropriate definition of 'qualitative research'. Even the distinction between qualitative and quantitative research is not clear. Moreover, qualitative research is often defined by what it is not, that is, non-numerical data and non-statistical analysis. Denzin and Lincoln (1994, p.2) try to move beyond this by defining qualitative research as involving a multi-method approach to 'study[ing] things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them'.

Qualitative research is based upon the assumption that multiple realities exist in peoples' perceptions of the world. For this reason, in order to understand phenomena, information from a wide variety of sources must be sought and combined in a meaningful way (Hurmerinta-Peltomaki and Nummela, 2004). One of the prime methods for obtaining information is by talking with people.

The purpose of qualitative research is to gain deeper understanding of a phenomenon through the gathering and analysis of detailed data of ideas, feelings, motivations and attitudes. It is achievable (among others) through conducting in-depth interviews in one or a limited number of companies in order to obtain comprehensive information (Tull and Hawkins, 1990). The emphasis in this approach is on description, uncovering patterns in the data, giving voice to the participants, and maintaining flexibility as the research project develops. Consequently, in qualitative interviews the questions are usually open-ended. The received empirical data is not easy to transform into numbers, and is best described in words (Tull and Hawkins, 1990).

Even though qualitative research still remains a minority and even marginalized pursuit within international business, certain arguments in favor of qualitative international business research have been popularized. The first is that international business, lacking the sophisticated theory development, requires more exploratory and theory-generating research rather than empirical testing (Mendenhall, Beaty, and Oddou, (1993); Osland and Osland, 2001). The second justification is that qualitative research allows for deeper cross-cultural understanding and is less likely to suffer from cultural bias and ethnocentric assumptions on the part of the researcher than survey instruments (Goodyear, 1982; Osland and Osland, 2001).

Compared with quantitative methods, qualitative research takes a more holistic approach to the research object and studies a phenomenon in its context. The third argument takes a contingency approach, namely that research instruments need to be chosen to suit the particular location in which the research is being conducted (qualitative research may be preferable in developing countries, where the secondary

data required for random samples may be lacking and respondents may be unfamiliar with questionnaires). The fourth benefit is that qualitative research goes beyond the measurement of observable behavior (the 'what'), and seeks to understand the meaning and beliefs underlying action (the 'why' and 'how'). As Wright (1996, p.70) explains, qualitative research provides answers to 'messy' problems and complex issues that are typical for international management research. Qualitative methods can take advantage of rich data and in this way allow the researcher to obtain more meaningful results about inter-relationships between factors.

Both the quantitative and qualitative approaches are valid ways of doing research. However, the quantitative approach has been and currently is the dominant method for doing research in social science. While qualitative research is developing a strong following, it still does not carry the prestige of quantitative research in the international business journals, for example, the preference of the publication outlets such as JIBS which favors quantitative approach (Marschan-Piekkari and Welch, 2004).

4.3.2 Defining Mixed Methods

The validity problems stemming from a reliance on single method were first highlighted by Webb, Campbell, Schwartz, and Sechrest (1966). First initial attempts to increase methodological pluralism were made by researchers in the social sciences with a quantitative background (Hurmerinta-Peltomaki and Nummela, 2006). This resulted in various combinations of research strategies. Denzin (1978) introduced a seminal typology in which he classified them as data, investigator, theory and methods triangulation (Hurmerinta-Peltomaki and Nummela, 2006).

A number of terms have been used to describe the combination of different research methods: multi-method, methodological mix, combined, triangulation, integrated mixed and multiple methods (Creswell, 1994; Teddlie and Tashakkori, 2003).

However, the use of these concepts has been rather inconsistent (Teddlie and Tashakkori, 2003).

Several diverse schools of thought have emerged from the discussion on the use of mixed methodology in international business (Hurmerinta-Peltomaki and Nummela, 2004). Opinions vary considerably with the opposite ends of the continuum being the 'purists' and the 'pragmatists' (Creswell, 1994; Tashakkori and Teddlie, 1998); each having different philosophical and methodological characteristics (Patton, 1990).

According to the strictest purists, methodological decisions are not made in isolation, but are always related to the researcher's assumptions of the phenomenon itself (ontology), the basis of the knowledge (epistemology), and the relationship between human beings and their environment (Burrell and Morgan, 1979). Therefore, a researcher with a positivist/objective approach emphasizes the methods and values of research in the natural sciences and adopts quantitative methods. In contrast, a researcher with a constructivist/interpretive orientation attempts to get close to the research phenomenon in order to acquire a more hermeneutic understanding (Gummesson, 1991), which requires the use of qualitative methods (Burrell and Morgan, 1979). Purists conclude that compatibility between quantitative and qualitative methods is not possible because of the fundamental different paradigms (Tashakkori and Teddlie, 1998).

Some scientists argue that methods must be consistent with the epistemological assumption of the researcher, the theory and the research problem (Brannen, 1992). However, they do admit that the philosophical assumptions of the researcher seldom determine the choice of method, which is usually affected by several practical limitations (Brannen, 1992). This acknowledgment brings us closer to the other end of the continuum, the pragmatists (Hurmerinta-Peltomaki and Nummela, 2004). Pragmatists maintain that researchers should use both paradigms to facilitate increasing their understanding of the phenomenon (Creswell, 1994). As a conclusion, the method should be selected based on its theoretical relevance (Denzin, 1978).

The choice of mixed methods should be based on the fact that the research problem would remain unsolved if only one method were used (Bryman, 1992). Therefore, the aim of mixing methods is to capture as complete picture of the subject as possible (Hurmerinta-Peltomaki and Nummela, 2004). As explained in previous sections, within a realism framework, *both qualitative and quantitative methodologies are seen as appropriate* (Healy and Perry, 2000). Methods such as case studies and unstructured or semi-structured in-depth interviews are acceptable and appropriate within the paradigm, as well as statistical analyses, equation modeling and other techniques (Bisman, 2002; Perry, Alizadeh and Riege, 1997). Particularly in the field of international business, the interest of researchers often lies in very complex and multi-faceted phenomena (Hurmerinta-Peltomaki and Nummela, 2004), so the mixed methods could facilitate better understanding of the research problem.

Following Creswell, Piano, Gutmann and Hanson, (2003) and Hurmerinta-Peltomaki, and Nummela (2006), a mixed method study used in this research is defined as one that combines qualitative data collection and/or analysis with quantitative data collection and/or analysis. The data may be collected concurrently or sequentially and combined at one or more stages in the research process (Hurmerinta-Peltomaki and Nummela, 2006). The mixed method strategy refers here to studies that combine quantitative and qualitative elements in the data collection and analysis.

4.3.3 Rationale for Using Mixed Methods

McGrath (1982) argued that all research methods are imperfect and incomplete and methodological pluralism has been strongly encouraged because the richness of the data/phenomenon could not be captured using a single method. In the field of international business the justification for methodological pluralism arises from the subject matter itself - international business in a multi-faceted area of research, crossing national, cultural, organizational and personal boundaries, and inspiring quite complicated research questions (Hurmerinta-Peltomaki and Nummela, 2006).

The research of international business with its special characteristics requires innovative methodological solutions which necessitates the use of more multidisciplinary and multi-method approaches (Hurmerinta-Peltomaki and Nummela, 2006).

The perspectives of qualitative and quantitative researches appear to be rather fixed (Tashakkori and Teddlie, 1998). For that reason it is usually believed that if methods are mixed, the most important one is quantitative and the qualitative results are just supplementary and somehow less important. A growing number of studies in the field of international business confirm that there are alternative ways of using mixed methods (Hurmerinta-Peltomaki and Nummela, 2004). The different methods follow each other in the research process, and the researcher first collects qualitative, then quantitative data, or vice versa (Tashakkori and Teddlie, 1998). The research may be a balanced combination in which all methods are equal in importance, or one method may play a more important role (Creswell, 1994). The combination of different data or analytical techniques not only increased the validity of the results but also produced new, often surprising findings (Hurmerinta-Peltomaki and Nummela, 2006), i.e. it created knowledge that would not have emerged otherwise.

The use of mixed methods in this thesis is based on the belief that a deeper understanding of the research subject will be acquired by utilizing this research strategy (Newman, Ridenour, Newman and DeMarco, 2003). It is assumed that the analysis of complex issues, such as the internationalization process and particularly absorptive capacity requires methodological variety in order to show the complexity of the phenomenon as completely as possible and to add to the existing knowledge. The reason for using a mixed approach is that one cannot objectively allocate a value to a firm's absorptive capacity due to its core complexity. Despite the extant literature covering this construct, absorptive capacity cannot be defined clearly, which was explained in Chapter 2 (p. 60). Therefore, a mediated approach to merging the objective and subjective approach was sought.

The assumption of this research was that a research strategy that features more rigorous and comprehensive use of available data which is analyzed both qualitatively and quantitatively would assist in knowledge creation resulting in more detailed and richer description than either of the analytical methods would have offered separately. The objective of this thesis was to describe and analyze how firms organize and manage the internationalization process and innovation projects. This was divided into two sub-objectives: first, to explore the relationships between technology transfer, absorptive capacity and foreign strategy, and second, to measure absorptive capacity within the firms. For this reason, the study combines a qualitative multiple-case study and a quantitative measurement.

The research process started with a literature review that gave the study a preliminary purpose. The next step was the multiple-case study, the cases being the internationalization process at eight New Zealand based high-tech innovation SMEs. In order to develop a basic understanding of the process, personal interviews were first conducted with managers of eight technology-based companies. The data collection was based on several different types of data sources, consisting of primary (interviews and written material produced for both internal and external use, such as annual reports) and secondary material, although on a limited scale. By conducting the personal interviews, it was possible to explore the relatively complex process of the internationalization process and the influence of firm's superior technology and absorptive capacity.

However, it was decided to also supplement the cases quantitatively to more accurately evaluate the effectiveness of absorptive capacity which a qualitative approach did not. The aim of the use of quantitative data could be summarized as follows: first, to describe the characteristics of internationalization process, second, to determine which types of absorptive capacity (types of knowledge) should be emphasized in order to identify the problem areas perceived to be most important and most difficult to solve, third, to find out the factors that affect absorptive capacity, and fourth, to develop a tool applicable to the real world cases and situations.

At the beginning, mixed methods were not an obvious solution in this study. Quite the opposite, the researcher initially considered starting with a qualitative approach only. As Denzin (1978) observed researchers need flexibility and readiness to alter courses of action, change methods, re-conceptualize problems and even start over if necessary. This supports the view that methodological flexibility and pluralism was necessary. Researchers must continually evaluate their methods, assess the quality of incoming data and note the relevance of the data to the theory (Hurmerinta-Peltomaki and Nummela, 2004). Since the creation of a set of testable and meaningful measurements would have been difficult in the internationalization process, particularly related to the absorptive capacity, a combination of methods was used instead, and quantitative data complemented the case-based interpretations.

As a final point, the overall study adopted a philosophical paradigm of *realism* because within a realism framework, *both qualitative and quantitative methodologies are seen as appropriate* (Healy and Perry, 2000). The use of qualitative and quantitative methods took place in parallel. The importance of this emerged in the process of analysis as both quantitative and qualitative data complemented each other. However, the qualitative method did have the dominant role in relation to the research objectives³ #1 and #2 as the case studies were the main source of information. The quantitative method dominated when the research objective⁴ #3 was to be achieved. Both methods were used to study the same subject but they had specific objective related purposes and they offered the possibility of acquiring rich empirical data as well as a more comprehensive understanding of the subject under the study.

³ The **first** one is to explore and describe the nature of technological activities undertaken by firms outside their home base, and understand the process of internationalization of high-tech companies with the core capabilities in agro-technology and their development activities (from the perspective of technology transfer, knowledge management and absorptive capacity).

The **second** objective is to develop a conceptual model that seeks to describe the underlying determinants of the strategy choice and dynamic interaction between strategy and technology, on one hand, and absorptive capacity and strategy, on the other hand, and to answer the question 'how firm's superior technology and absorptive capacity affect the way the international business is conducted'.

⁴ The **third** objective is to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate development of absorptive capacity in firms.

The following sections explain the qualitative research first, followed by quantitative research utilized in this thesis.

4.4 Qualitative Method

4.4.1 Introduction

Given that this research inquiry was to investigate how case organizations handle the specificities of their internationalization process, methods capable of providing meaningful insight into the complex, dynamic, interrelated processes were needed.

Reflection on the research objectives #1 and #2 and associated questions (explained in Section 1.7, p. 27), suggests the use of a *qualitative* research approach. The actual research context under examination characterized by the importance of knowledge and its impact on international activities and the contextual nature of both the case organizations and their technology developments, requires a research strategy that is empowered to answer the principal research questions. This provides a clear case for qualitative methodologies.

Within the philosophical range of ideographic methodologies, *phenomenology* was considered to be the most suitable to investigate the research question in its specific context which is explained in more details in Section 4.2. The selection of phenomenology draws on the underlying ontology of *nominalism* and an epistemology of *realism* evident in the conceptualization of that specific part of the internationalization process that the research question addresses. Phenomenology is one of ideographic research methodologies which utilize *qualitative* methodology. Out of that, *case study* method was employed.

4.4.2 Research Method Selection and Design

Given the influences of the interpretive paradigm on this research, the selection of methods and approaches offers several traditions. These range from case studies (Gummesson, 1991; Yin, 1994), grounded theory (Strauss and Corbin, 1990; Glaser and Strauss, 1967) and ethnography (Creswell, 1994). In short, the variety of methods available within the qualitative paradigm is extensive.

Having the diversity of methodological views and the research questions and context for this study, phenomenology was identified as the most suitable of these. Knowing the principles of phenomenology and in consideration of the research questions and context, the case study was selected as a strategy for the data collecting and analysis process.

Before the data collecting commenced, the phase one⁵ of the research had been undertaken which included *the development of a conceptual model* using a combination of inductive and deductive approaches. Inductive inquiry was adopted to develop the conceptual model generated from the extant literature. A deductive approach was then undertaken when the conceptual model was integrated with the experience of industry practitioners to develop a refined, finalized model.

The rationale for using both inductive and deductive approach was based on the following reasons: firstly, the strength of the inductive approach was that, in developing a conceptual model, the extant literature provided a comprehensive foundation. Secondly, the deductive approach integrated the model based on the existing literature with contemporary perspectives from respondents, who had experience and practical knowledge of the field. In sum, the examined literature identified the components for a conceptual model and revealed the relationships between both absorptive capacity and technology, and the internationalization process. Then, the information from the literature was integrated with participants'

⁵ Phase two and three are explained in Section 4.5.

responses to arrive at a refined model. The refined conceptual model still contains the same antecedents (absorptive capacity, technology and internationalization process), but relationships between components were modified.

Given that the literature is only able to offer a theoretical guide as to the nature of international strategy and technology transfer, the epistemological stance advocated here requires researcher immersion in the case organization. The researcher needs to interact closely with the subjects of the study. Before fieldwork commenced, the instruments to be used in evidence gathering and analysis were established in a case study protocol which guided the research and ensured consistency in the research process.

4.4.3 Case Study Design and Analysis

In order to further the research process a research method provided a framework for gathering and processing field information. For this research the case study was identified as the most appropriate research method. Case studies together with other research tools provided “devices whereby the researcher, once close to the organizational members, can gain the sort of insights into people and situations” that are required (Easterby-Smith, 1991, p. 71).

This section details the specific research procedure for the current investigation and discusses in depth the analytic techniques and processes related to the qualitative part of the study. The research design encompasses three phases: first, *development of a provisional concept*, second, *collection of empirical data*, and third, *analysis and theory construction*.

Case Study

Case study research has been defined as an empirical enquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between

phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 1989). Case studies are meaningful and rich compared with the sometimes rigid empiricism of quantitative techniques (Yin, 1989).

Case study research consists of a detailed investigation, often with data collected over a period of time, in one or more organizations, or groups within organizations, with a view to providing an analysis of the context and processes involved in the phenomenon under study. The phenomenon is not isolated from its context but is of interest precisely because it is in relation to its context.

The case study method is considered the most appropriate strategy for collection of the data in this research, based on the nature of the research question and the research approach (Eisenhardt, 1989). According to Yin (1989) case studies are preferable when the research question leads to exploratory, descriptive or explanatory theories, in examining contemporary events, but where the relevant behaviors cannot be manipulated. In addition, case studies provide the researcher with rich understanding and are therefore useful as an all-encompassing method (Yin, 1994). Since no control over behavioral events was required and the study was focusing on contemporary events, the case study was found the most suitable strategy to use in this thesis.

Case studies have the potential to deepen our understanding of the research phenomenon, first because they allow us to take a longitudinal approach. We are able to extend the time period under study by later returning and conducting a follow-up study.

The second strength of case studies is, as Yin (1994) has observed, their contextuality. In business studies, case study research is particularly useful when the phenomenon under investigation is difficult to study outside its natural setting – as typically occurs in international business research, since researchers often study the impact of different national contexts. Case studies are an effective way of

understanding the links between macro-environmental factors, industry-level relationships and firm decision-making.

Third advantage of this method is that case studies permit the investigation of a phenomenon from a variety of viewpoints, covering a period of time, and crossing the boundaries between different factors (Ghauri and Holsltius, 1996). Concepts and variables under study are often difficult to quantify since there are too many variables to be considered, which makes experiment or survey methods inappropriate to use (Yin, 1994).

A fourth advantage of this method is that the level of depth with which each case is investigated allows for theory building, not just theory testing. Eisenhardt (1989) notes that case study research is particularly appropriate in a theory-building approach because the method does not rely on previous literature or prior empirical evidence. Further, case studies are generalizable to theoretical propositions and not to populations (Silverman, 1993). The goal in this investigation is analytic generalization – to expand and generalize theories, not to enumerate frequencies, which is statistical generalization (Yin, 1989).

Case study is described both as a research method (Crotty, 1988) and as a research strategy (Eisenhardt, 1989; Yin, 1981; Yin, 1994). Whether method or strategy, case study is seen as a vehicle that would allow sufficient depth of enquiry of the phenomena under investigation within the context of the research setting and to facilitate the identification of the phenomena concerned with the research question (Remenyi, Williams, Money and Swartz, 1998). This is significant because, for this research, organizational context is important, there is no right way to transfer technology, and therefore no one data source, but itself, is likely to be sufficient to allow identification of the phenomena concerned with the research questions. Its ability to allow the researcher to get close to the context and its informants is seen as aiding access to their experiences, to understand the phenomena involved.

Because technology transfer is a complex, dynamic and multi-functional process, qualitative and inductive case study research methods have been adopted, drawing on thematic analysis to illuminate both the activities and processes (themes) that enhance technology transfer outcomes, and the role of technology in the development of future foreign strategy. The research questions posed in this thesis seek to understand the detailed relationship between the firm's strategy and technology. In asking "How" the research question assumes the absence of an established hypothesis which makes consistency in quantitative research measurement difficult (Axinn, Noordewier, and Sinkula (1996); Matthyssens and Pauwels, 1996). This absence of a specific hypothesis suggests that research should be undertaken by gathering qualitative data, to build a good, in depth, understanding of the questions

Shenkar (2004) suggests that international business needs to sharpen its identity, retool its routines, and undertake steps that will strengthen its standing in the current scholarly and institutional milieu. Shenkar (2004) further states:

"Use case study method: Case studies provide opportunities for context-rich research that are unavailable from large-scale data mines, as has recently been acknowledged even by economists. International business and its flagship outlets should lead the way in encouraging such research and in showing that 'qualitative' often means more rather than less rigor." (p. 168)

Selection of a case study method for this research allows investigation in a real-life context in which the boundaries are not entirely clear (Yin, 1994). The interpretive view implicit in case study research allows freedom for developing understanding by drawing on a variety of data sources and the use of prior theory and hypothesis (Yin, 1994).

Arguments for single-case designs are strongest where cases are critical or unique (Yin, 1994). In this situation, the questions posed address relatively common phenomena indicating a multiple case design is most appropriate, which will provide good potential for cross pattern matching and extension of the research question to

theory (Benbasat, Goldstein, and Mead, 1987). On the other hand, the rationale for a multiple-case study is based on replication logic, which is to build evidence by replicating previous cases. Multiple-comparison case design increases the scope and the degree of freedom in the study (Miles and Huberman, 1984). Each individual case study represents an entire study in which convergent evidence is sought regarding the facts and conclusions for the case in relation to the provisional theoretical framework (Ragin, 1987). While complete theoretical saturation is the ideal outcome for the current study, the number of replications for this research is dependent on the extent of saturation achievable within the time scale for the study and the desired level of certainty about the multiple-case results for theoretical adequacy. Guidelines for a reasonable number of cases have been established with reference to the literature.

Regarding manageability of sample size in a multiple-case design, Ragin (1987) argues that eight cases as a “modest number” and twenty cases as “thorough” (p. 50) while drawing attention to the associated number of possible comparisons which increase geometrically as the number of cases increase. Eisenhardt (1989) also argues several examples of case study research featuring a similar range in number of cases. Both authors warn about the risk that large number of comparisons can easily get out of hand in terms of consideration of all the relevant theoretical similarities and differences. However, Eisenhardt (1989) indicates that while there is no ideal number of cases, generating complex theory is difficult with fewer than four cases. To determine the parameters for the current study and considering Ragin (1987) and Eisenhardt (1989) suggestions as a guideline, eight cases were accepted to be sufficient number.

The first step in case study design is to build a clear understanding of the research questions in order to provide direction to future strategies (Yin, 1994). In an effort to build the understanding required for this case study design an in depth study of the relevant literature in the general field was undertaken. Both Miles and Huberman (1994) and Eisenhardt (1989) suggest that further development of the research questions into possible constructs would provide accuracy to the research effort.

Detailed research design drew on past research to help define the specific content of the constructs and a basis for elements of the case study protocol.

Key issues in this design process were the degree of pre-structuring, identifying the unit of analysis, selection of a specific case study design and identification of case firms. Decisions about these issues together with the details of specific research tools were included in the case study protocol which provided a framework strengthening consistency across cases.

The case study protocol was used a major tactic in increasing the reliability of case study research and is essential when using multiple case study design (Yin, 1994). The protocol included the following information: a statement of the research objectives and purpose and selected methodology; the details of the cases to be studied; the details of procedures to be followed in executing the study; case study questions; analysis and reporting procedures.

A well constructed protocol was the key tool in this research project, giving credibility to the process and the resulting theory. Field procedures were used to identify initial contacts and onsite activities and protocol for the interview process. Specific likely data sources for both interviews and direct observation, and secondary data were identified and matched against possible concepts and relationships developed from the research questions.

This case study design was pre-structured through the identification of the empirical field/context for the study, the data collecting methods to be employed and a framework for the management of the research (Yin, 1998).

Context

For this research, a cross-case study approach has been adopted, with units of analysis being New Zealand agro technology SMEs⁶ engaged in the development and transfer of leading-edge technology. The single unit of analysis, the firm, was incorporated in a multiple-case study design. The selection of a multiple-case design strengthened and broadened the capacity to draw analytic generalizations from the study (Yin, 1998). This potential was further enhanced by the selection of cases on a basis of theoretical or literal replication (Glaser and Strauss, 1967; Yin, 1998) allowing the use of replication logic to anticipate propositions across cases enhancing the external validity of this study (Yin, 1998; Yin, 1994).

The research was conducted within the New Zealand agro-technology industry. The study was undertaken within the geographical boundaries of the Waikato Region. Since it was decided to study the internationalization process of the high-tech SMEs, the cases selected belonged to the agro-technology internationally active companies. A particular care was taken to ensure consistency among them. These case organizations vary in their size, structure, and modus operandi, but all share an interest in the development and ultimate transfer of new technology based products and services to effect competitive advantage. The focus of the research was on the exploration of high technology transfer by small to medium sized firms since the previous studies in absorptive capacity and technology transfer literature have mostly involved technology oriented and large firms.

Fieldwork during this stage of the research focused on obtaining data for comparison of New Zealand high-tech agro-technology SMEs' international experience. The data collection was approached procedurally through multiple case studies which allowed comparison to be made. Empirical data gathering technique include in-depth personal interviews guided by a semi-structured questionnaire.

⁶ The definition of SME in this thesis complies with both New Zealand and OECD definition of SMEs. See footnote 3, p. 19.

The eight cases which made up the study were drawn from a database of New Zealand agro-technology companies compiled by the researcher. Suitable cases were identified from published material. These firms were selected based on geographic convenience from a database of potential firms compiled by the researcher with an assistance of a legal firm specializing in intellectual property rights protection.

Case selection was focused on specific criteria (see Table 4.3) which were considered appropriate to the selection of a purposive sample.

Table 4.3: Case Selection Criteria

Firm Criteria	Measure	Rationale
Product Type	Agro-technology products	Confirms fit with the context of the research
Business Experience	3 years or more business experience	Confirms that firms may be familiar with business practice
Firm Size	No less than 10 staff	Indicates a likelihood of systematic management processes and management infrastructure
International Activity Criteria		
Experience in international operations	3 years international operation experience	Indicates that firms are experienced in conducting business internationally

This selection procedure provided a group of cases, which addressed theoretical and practical objectives. Their business experience and firm size suggested that they would operate using familiar business practices rather than idiosyncratic practices that might be expected in less experienced or smaller businesses. Their common product type and association with a community of similar firms suggested that there may be a similarity of practices among them, a possibility that enhanced the concept of theoretical replication (Eisenhardt, 1989; Yin, 1994). In addition to being likely to demonstrate the phenomena sought in the research question the firms were geographically convenient for the researcher, allowing ready, quick access to the appropriate data (Silverman, 2000).

Of the possible additional sources of evidence for the study, those of documentation in the form of relevant news clippings, reports, and articles published in the

international and national business media, and archival data such as official trade statistics, together with personal interviews were selected as the focus of data collection. These sources further have proven to have general relevance to the study.

Participants and Interviews

Among the variety of qualitative techniques available for this investigation personal in-depth interviews were seen appropriate for this study. Because case studies are usually about human behavior and social processes, Yin (1989) regards interviews as one of the most important sources of case study information.

The interview with the legal company and recommendations made by industry experts in intellectual property protection served as a starting point in the process of investigation. This contact provided names of firms and the appropriate senior personnel. The respondent in an interview was the most senior person within each company. In all circumstances, the respondent's primary role was a decision-maker in both science and commercialization of products.

After ethical approval had been obtained (see Appendix B), the prospective participants were initially contacted by letter explaining the proposed subject and nature of the research and inviting them to participate. The relevant senior manager from each firm was then telephoned for his/her agreement to be personally interviewed by the researcher and in order to make suitable arrangements for this meeting (see Appendix F for the interview time-frame).

The question guidelines were mailed to participants several days before the scheduled interview to enable them to give thought to the areas of questioning and to allow access to specific data if required for some questions. Participants could also clarify before the interview any areas of questioning about which they were uncertain. Interviews with case participants were conducted on the companies' premises on an informal basis using the interview question guidelines.

All participants were personally interviewed by the researcher and were of 1-2 hours duration. All interviews were recorded on tape and fully transcribed. In addition, field notes were taken during each interview, systematically written up in memo form, and included in the analysis. Brief summaries were also prepared immediately following each interview, thereby combining reasonable immediacy with reflective review. Annual reports were obtained from the case companies as well. These transcriptions, notes and summaries provided not only a basis for data analysis, but also served a number of other purposes including planning for the following interviews.

The main operational sites of all case companies were visited for the interviews to be conducted. The majority of the data collection for this thesis was undertaken from May – July in 2005 (see Appendix F) and total of eight interviews with eight people were conducted. In addition, the researcher made field notes of site observations and collected further additional and supporting evidence directly from firms and through the media.

For this investigation, personal interviews were conducted with appropriate top-level managers of eight high-tech companies belonging to the agro-technology industry. Interviews were semi-structured as they were controlled through use of an interview guide listing the topic areas to be covered in the discussion (see Appendix B). The set of topics was derived from the preliminary conceptual framework and initial propositions. Interviews were controlled by the question guidelines not only in providing a general structure for the discussion, but also in ensuring that the same questions were addressed by each informant. However, flexibility existed in the interview process because of the areas of investigation that might not have been foreseen or planned, yet appear to provide insight to the area of investigation.

Case study questions in this research were structured to address the elements of the research questions and layered to prompt the interviewer to consider the implications

at several levels (Yin, 1994). Both textual and quantitative data (specifically, annual reports) were generated as part of the field collection procedure to facilitate analysis. Case study interviews were of an open-ended nature in which respondents were asked for the facts of a matter as well as for the personal opinions regarding the topic, and even their insights into certain occurrences. The probing technique was used during the interview, which means that the correctness and accuracy of the given answers were continuously checked by posing follow-up questions to the respondent. The adjustments in the current study were the addition of cases to probe particular themes or issues which emerge from previous cases. Changes of this nature were systematically identified and noted, together with the situations arising from them.

Prior to classification and coding started, transcripts of interview were sent back to informants for their comments. This provided an opportunity for informants to identify any omissions in the transcripts and served to extend informant involvement in the research process. Once initial transcripts were complete, data classification and coding started.

Analysis

Data analysis is, according to Yin (1994) one of the least developed and most difficult aspect of doing a case study. In order to better manage analysis case studies should be designed to facilitate analysis (Miles and Huberman, 1994). For this project data analysis was systematic, considering with-in case data and across case data (Yin, 1994), seeking ongoing data reduction and pattern matching with-in and across cases.

Yin (1994) indicates that there are two different analytical strategies that the researcher can choose from before data can actually be analyzed: first, relying on theoretical propositions - when the results from previous studies concerning the research questions are compared to the researcher's findings from the case study; theoretical propositions about causal relations and answers to "how" and "why" questions can be very useful in guiding case study analysis, and second, developing a

descriptive framework is another general analytic strategy. It is used when there is little previous research on the subject.

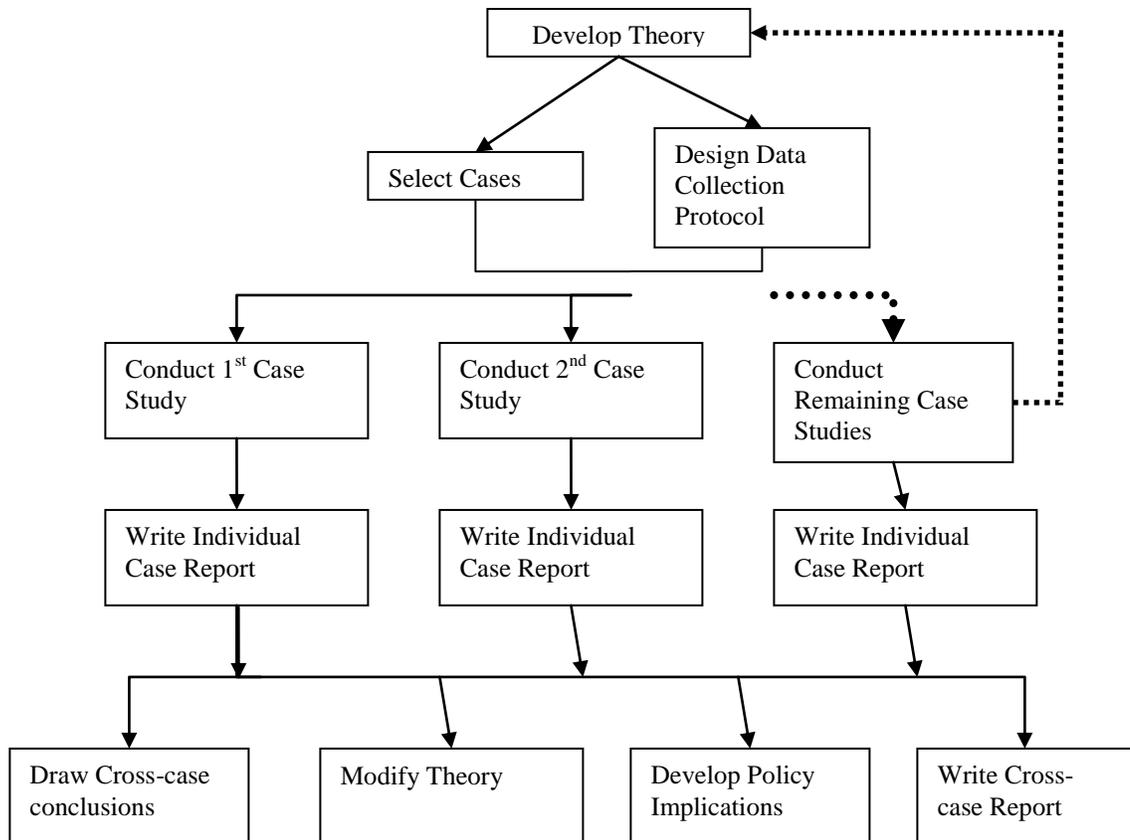
To facilitate analysis, the formulation of the research question and the development of the conceptual model during the concept development phase were based on analysis of the literature together with personal discussions and informal interviews with industry experts. When the initial conceptual framework had been established for the study, the analytical approach, one of comparison between the research question and the conceptual model was accepted. From this process the links between the various emerging themes and constructs were identified for research and aligned within the underlying framework. The theory obtained from the literature was a background and a template for comparison from which the first step in reaching full comprehension of the research setting was taken (Morse, 1994).

As outlined above, the research questions underlying the study have been derived through a process of, first, reviewing the research literature, and second, analyzing relevant published material and informally interviewing industry experts. Analysis of published material included articles and reports in the international business press. Views expressed within this material were compared with those provided in discussion with expert personnel from local industry organizations. From this *pre-analysis* process the research question and several preliminary propositions and conceptual framework were developed (explained in detail in Chapter 2, p. 93). The conceptual framework outlined the major dimensions of the study within which the main categories, key factors or variables, presumed relationships among them and the underlying theoretical assumptions about the phenomena. The concept phase then continued to undergo further review and refinement throughout the data collection and analysis phases.

Figure 4.2 shows the above explained steps undertaken in this research. It indicates that in order to facilitate analysis, the initial step in designing the case study must consist of theory development. Further it shows that case selection and the definition

of specific measures are important steps in the design and data collection process which also assists in the analysis process. Each individual case study consists of a “whole” study, in which suitable evidence is sought and each case’s conclusions are then considered to be the information needing replication by other individual cases.

Figure 4.2: Case Study Method



Source: Adapted from Yin (1994, p. 49).

Comparison in its broadest sense is defined as the process of discovering similarities and differences among social phenomena (Oyen, 1990). Comparative studies examine similar or comparable outcomes in different settings (Ragin, 1987). There are several features of the comparative method that are particularly consistent with the requirements of this investigation. First, the comparative method is essentially a case-oriented strategy where cases are examined as a combination of characteristics. Each

case is examined directly and compared with all other relevant cases, to arrive at modest generalization concerning relatively narrow classes of phenomena. Second, the comparative method is especially well-suited for the task of building new theories because it highlights deviating cases (variation) and requires explanation of them. Third, it is usual to work with small, theoretically defined sets of cases, with the boundaries of the study set by the investigator (Ragin, 1987). Comparison was the central strategy in the analytical approach and was used in all phases of the research procedure for the investigation.

Before commencing detailed systematic analysis and without prejudice to the identified general analysis strategy or specific methods, a loose ‘play with the data’ (Yin, 1994) provided preliminary ideas about what to analyze and what not to analyze. This was carried out at the same time with transcription of tape-recorded interviews and in the context of the interviewer’s direct observations noted in the summary sheet.

The analytic procedures of questioning and comparison in relation to the data provided the basis for identifying and labeling concepts and categorizing these according to their attributes and dimensions or common themes. This sorting and clustering stage centered on the search for underlying similarities and differences in the data set. This research accepted manual data analysis being more convenient to the researcher, obtaining more depth of analysis and direct comparison from the very beginning of the process. The coding for this first level of analysis was developed directly from the questions in the interview guides. Analysis of the transcripts proceeded on a line by line basis and was coded with a separate code for the each question on the interview guide, together with remarks placed on the margin of the transcript. For example, several cases were merged and aggregated to describe the typical range and variation in patterns, behaviors and responses of the sample. The purpose of data synthesis was to move from the initial propositions generation stage to verification.

Within these modes of analysis there was an ongoing reduction of data to increase the focus on key elements of the evidence. The process started with coding decisions in which less relevant evidence was put aside and that considered more relevant was coded and classified. As data was continually reduced and focused, care was taken to ensure that it is not “stripped” of its contextual content (Miles and Huberman, 1994). In order to maintain a consciousness of the relevance of data and in pursuit of the essence of their underlying phenomena, regular reference was made back to original full text transcripts of interviews and field notes. Further, the informants had been contacted on several occasions to clarify the information provided in the interviews and to give their opinion about the naming of the constructs that emerged from the analysis (refer to Section 6.3 footnote).

Across-case analysis was done when data from one case is compared to other cases. The next level involved identifying patterns and themes and making a note of ideas about relationships. The following stage involved the comparison of found relationships to the initial conceptual framework. This is done through comparing the data collected from the case studies to relevant theories. Firstly, data reduction was conducted, then the data was displayed and finally, conclusions drawn and the data verified. It is from this process that a theory was produced. Theory at this stage was the systematic selection and fitting of alternative models to the data until a best fit that explains the data most simply was obtained (Morse, 1994). This identification of pattern matches within and across cases strengthened the internal validity of the study (Yin, 1994).

Overall results from the analysis were thus integrated and summarized in a framework which originated from the initial provisional conceptual model. Locating the relationships between internationalization process on one hand and technology transfer and absorptive capacity on the other hand within the model enabled the associated range of influencing conditions, their effects and potential consequences to be systematically traced and interrelated. Provisionally, these were expressed within

the initial conceptual framework which becomes explanatory and generalisable when the provisional conditional relationships were confirmed by the data.

The purpose of this qualitative data was to address the research objectives #1 and #2 (to explore the process of internationalization of high-tech companies in relation to technology transfer and absorptive capacity, and to develop and to refine a conceptual model). Yet the gap still exists regarding the research objective #3 (to measure absorptive capacity). The following section gives details of quantitative data used in this study, as it relates to the gap in addressing the objective #3.

4.5 Quantitative Research

4.5.1 Introduction

To facilitate meeting the objective #3 requirements, which was to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate development of absorptive capacity in firms, this research adopted a *positivist* ontological paradigm (explained in Section 4.2). Within epistemology, the empirical, *objectivist* epistemological paradigm was adopted (see Table 4.1) which required using a *quantitative* methodology to establish generalizability of the research findings.

The research was divided into three phases. Phase one was explained in Section 4.4 while phases two and three are illustrated as follows. Phase two of the research included *the development of valid and reliable measurements to measure absorptive capacity* using *quantitative methods* because there was a clear need for further understanding of the absorptive capacity concept. Phase three incorporated the absorptive capacity model development. The steps taken in phase two and three (explained in the following sections) are as follows: first, *seven variables* were developed to measure absorptive capacity for the reason that if a firm is able to

measure its absorptive capacity, this may result in improved performance; second, a *multiple linear regression* was applied to identify the fundamental relationships between each of the dependent variables and their constituting factors; third, these dependent variables were implemented in the extended *Karnaugh map* in order to classify results into discrete zones; fourth, *fuzzy logic* was implemented to refine Karnaugh map into a more robust, non-linear absorptive capacity model. The software used was the MATLAB, Fuzzy Logic Toolbox.

4.5.2 Measurements and Variables

In order to fulfill the requirements of the research objective #3, to measure absorptive capacity, the demographic data was collected from the interviews. Since that absorptive capacity is not a single measure construct (see Section 2.4.1, p. 60), a search of literature was unsuccessful in finding equivalent *multiple* measures to measure absorptive capacity. For this reason, an existing degree of internationalization (DOI) was adapted in this thesis (Sullivan, 1994). DOI was the only other prior research method found that used multiple measures instead of single measure.

Degree of internationalization (DOI) can be measured in terms of the share of total sales, assets, income or employees located outside a company's home country (Sullivan, 1994). Sullivan (1994) explains why he uses three objective measures and two subjective measures, which he argues is an improved measure of degree of internationalization than single variable measures. The choice of the following variables was founded on previous research under the related topics and designed "that we could estimate objectively," (Sullivan, 1994, p. 331). This section establishes the link between the DOI of a firm's activities and its absorptive capacity and proposes the absorptive capacity variables.

1. Previous studies (Buckley, Dunning and Pearce, 1977; Beamish and daCosta, 1984; Stopford and Dunning, 1983; Daniels and Bracker, 1989) suggest "that a

company's foreign sales are a meaningful first-order indicator of its involvement in international business" (Sullivan, 1994, p. 331). Consistent with the majority of previous studies, international diversification was operationalized as the ratio of Foreign Sales to Total Sales (FSTS) in this study (e.g., Grant, 1987; Tallman and Li, 1996), which is an objective variable. The international diversity of a firm may affect its level of knowledge acquisition and exploitation (Autio, Sapienza and Almeida, 2000). Zahra, Ireland, and Hitt, (2000) found that international expansion had a positive effect on a firm's technological learning and on the firm's performance. Because internationalization may be correlated to the level of social capital achieved by a firm, it is important to differentiate the effects of internationalization in examining knowledge acquisition and knowledge exploitation. Other measures used, besides the FSTS measure in some studies include the number of countries in which the firm operates (Tallman and Li, 1996) and the ratio of foreign assets to total assets (Gomes and Ramaswamy, 1999). However, firstly, because of data availability constraints and for comparative purposes, the FSTS ratio only has been used in this study. Secondly, following Sullivan's (1994) research about measuring the degree of internationalization, the initial measure of AC adopted in this study is the ratio of foreign sales to the total sales in 2005 (**FSTS**) for each firm or more precisely, Foreign Sales as a proportion of Total Sales (Daniels and Bracker, 1989; Geringer, Beamish and daCosta, 1989; Stopford and Dunning, 1983).

2. A further influencing factor considered was top managers' international experience. Maisonrouge (1983) states a top manager's attitude towards international orientation correlates positively to the degree of their foreign experience. In a similar manner, Sullivan (1994) included the total number of years of work experience of the top management team of the firm. For this reason, Managers' International Experience (**MIE**), which is a subjective variable, is included in the research by adding the cumulative duration of top managers' international assignments identified in the interview process.

3. The justification for the next variable offered in this research draws on the learning-based Uppsala model by Johanson and Vahlne (1977, 1990). In the Uppsala model, knowledge and learning have a profound impact on how the firm approaches foreign markets. Accumulated knowledge drives internationalization by influencing the entry mode selection (Johanson and Wiedersheim-Paul, 1975; Kogut and Singh, 1988), the country-market selection (Kogut and Singh, 1988; Vernon, 1966; Erramilli and Rao, 1993) and captures the firm's absorptive capacity in the internationalization process (Cohen and Levinthal, 1990). Factors such as the duration of foreign operations, firm size and age, and the number of foreign countries in which they operate (Barkema and Vemeulen, 1998) influence the accumulation of knowledge. Companies with more international business experience might have gained more resources and skills which would ultimately affect their performance. For this reason, Firm International Experience (**FIE**), a subjective variable, is utilized.

4. The international business literature finds R&D activities significant to the firms' prosperity (particularly high-tech companies). Caves (1982, p. 198) in Sullivan (1994, p. 331) notes that "R&D activities themselves predict the rise of MNEs," which was confirmed by Franko's (1989, pp. 470) findings, where it is stated that Research and Development Intensity (**RDI**) was a "principal means of gaining market share in global competition". The RDI variable as a percentage of total sales is also included in this research as an objective variable.

5. Caves (1996) in his review of the theory of multinational enterprises stated that R&D intensity and advertising intensity have emerged as the most robust measures of intangible assets in the international business literature. Further, Sullivan and Bauerschmidt (1989, in Sullivan, 1994, p. 331) suggest that the degree of export activity distinguishes "the relative internationalization of American and European firms." Following the previous studies and to facilitate precise results, this study introduced a novel measure which relates the amount of investment into Research and Development to the revenue earned from Foreign Sales (**FSRD**) and includes it as an objective variable. This is because the research is concerned with the relationship

between internationalization process and firms' absorptive capacity, which according to the international literature is linked to the R&D investment. The FSRD is computed as the ratio of firm's FSTS to RDI. E.g. The FSRD factor is trying to determine the amount of foreign revenue contributed to by each dollar invested in R&D.

6. The next measure aims to estimate the psychic dispersion of international operations of a firm. Johanson and Vahlne (1977) claim that the scope of interaction between home and host nationals, in terms of the degree of psychic distance, correlates positively with the internationalization of the firm. In the same manner, Sullivan (1994) incorporated Psychic Dispersion of International Operations (**PDIO**), a subjective variable, by calibrating the dispersion of the subsidiaries of a firm. This research looks at the dispersion of the firms' international activities amongst the ten psychic zones of the world identified by Ronen and Shenkar (1985). This is because each zone has, as Hofstede (1993, pp. 84) noted, a unique "cognitive map" of the principles of management and ultimately affect the decision-making process and strategy formation. It is accepted that the greater the dispersion of the foreign business activities across the ten zones identified by Ronen and Shenkar (1985), the greater the psychic dispersion of firm's operations. Ronen and Shenkar's (1985) research of cross-cultural studies divided the world into ten psychological zones (Anglo, Germanic, Nordic, Near Eastern, Arab, Far Eastern, Latin American, Latin European, Independent and Other). This research used these categories as a pattern to assess the psychic dispersal of each firm's foreign business activities. Each corresponding zone was assigned a score of 10%, which were accumulated as a total PDIO (Ronen and Shenkar, 1985).

7. The last variable employed in relation to the cultural similarity (distance) is the perceived level of Cultural Comparability (**COMP**), a subjective variable that the firm has on the foreign countries where it operates. This construct is introduced by Sohn (1994) aiming to measure the relative ease with which social knowledge might be developed. Since Hofstede's (1980) research on culture, cultural similarity and

distance has commonly been identified to be important in international business research and his index were utilized successfully to measure cultural distance, the cultural diversity of countries was measured using Hofstede's (1980) classification of national cultures. Eleven country groups were indicated. A number of cultural groups were counted in a business enterprise's markets.

Note: one more country group 'Other' is included in this thesis because at the time of the Hofstede's research (1980), neither communist country of CEECs nor China were included.

Control Variable

This research also included a control variable that might affect the hypothesized relationships. Consistent with previous studies (e.g., Gomes and Ramaswamy, 1999) firm *age* was employed as a control variable. As has been seen in FSRD, the firm's age was used in order to balance out significant differences in business experience amongst younger and more established companies. The *age* of the firm may have an influence on the firm's ability to learn in the customer relationship and on knowledge exploitation (Lane and Lubatkin, 1998; Zahra et al, 2000). Older firms may have an experience advantage, or, on the other hand, younger firms may have a higher capacity to take in new knowledge (Autio, et al, 2000). The firm age was measured by the number of years a firm had been in existence as of 2005.

4.5.3 Reliability and Validity

This research seeks to measure firms' absorptive capacity based on the key variables. Yet reliability and validity of the measurement process are important and the following section supports the mixing of subjective and objective analyses.

Reliability

The reliability of a measure refers to the level to which the measurement process is free from random errors. Reliability can be viewed as stability and equivalence. While equivalence reliability entails obtaining the same or similar results with different types of measures taken at the same time, which involves using the same constructs but applying one or more different indicators, operational definitions and/or data collection procedures, stability reliability involves obtaining the same or similar results for each unit measured every time a measure is taken (Walizer and Wienir, 1978). This method uses the same indicators, same operational definitions and same data collection procedures each time the measurement is taken.

The literature has provided evidence for four methods of assessing a measure's reliability. These are: a) the test-retest, b) equivalent-forms, c) split-halves, and d) internal consistency methods. The test-retest method evaluates the stability of the measures in a study, while the remaining three methods are related to the internal consistency of the measures rather than their stability over a period of time.

For the purpose of this study, the modified test-retest was used to test the reliability of the measures employed, explained further in Section 7.2.5 (p. 351). There were two reasons for making this decision. The first was drawn from the specific design of this research which includes the mixed methods applied (qualitative and quantitative research). The second reason for using the modified test-retest was the lack of previous research on a similar topic. The basic assumption for using the test-retest method is that the variables under investigation have not changed in between the two tests. This thesis undertook a modified test-retest method which instead of doing the same test at different point in time rather used the interpreted outcomes of the qualitative method to confirm or oppose the outcome of the quantitative method.

Validity

The validity of a measure refers to the extent to which the measurement instrument is free from both systematic and random errors. A measure is said to be valid if it measures what it is assumed to measure. To the extent that a measure is valid it is also reliable since reliability is a necessary but not sufficient condition for validity. In theory, valid measures represent an optimum level of capturing a construct. Typically such measures would not under-identify the construct by excluding some of its unique characteristics. At the same time, they would not contain excess characteristics that might contaminate the construct (Peter and Churchill, 1986).

Validity is divided into two main groups: content and construct validity. Content validity is a subjective evaluation by ‘professionals’ to determine if the measurement is going to measure what it is intended to measure. According to Nunnally (1978) content validity is by and large determined by subjective evaluations on the adequacy and the manner in which the domain of the construct was sampled. “If it is agreed by most potential users of the test, or at least by persons in positions of responsibility, that if the plan was sound and well carried out, the test has a high degree of content validity” (Nunnally, 1978, p. 92).

In this study, it is believed that the instrument employed achieved a high degree of content validity because all the constructs were drawn from their relevant, respective, well-known literature and were measured in a multidimensional way. In addition, senior members of staff were consulted at the time of developing the instruments, which perfectly match interview outcomes. Nunnally (1978, p. 258) in Sullivan (1994, p. 331) concluded that “since content validity depends on a rational [subjective] appeal to an adequate coverage of important content, and explicit outline of content provides a basis for discussing [and accepting] content validity.”

Construct validity determines what instrument is in fact measuring and it is divided into three categories. The first is determined by the extent to which the measure

correlates highly with other techniques designed to measure the same construct and does not contradict known theories about the construct. However, some researchers have indicated that the logic of convergent validity is tautological. For example, Churchill, Ford and Walker (1974, p. 259) suggest: “There is, however, a logical fallacy in claiming that a measure is valid if it relates to other constructs in hypothesized ways. To determine construct validity, a measure must fit a theory about the construct; but to use this as evidence, it is necessary to assume that the theory is true.”

In this study ascertaining the existence of convergent validity was exceptionally difficult because the theory of internationalization process and absorptive capacity is based on the conventional perception that there is a positive relationship between the international experience and absorptive capacity. However, the theory itself has not been substantially tested to ensure that this is the case. In the absence of known ‘acceptable standards’ and measurements for testing the existence of convergent validity, and because of small sample size, an arbitrary approach was accepted. Under these circumstances, this is an acceptable approach to assessing convergent validity. Since the items in the scale were selected to reflect different aspect of the internationalization process in firms, it was expected that factors representing each of these variants would emerge. A similar approach was used by Allison (1978).

4.5.4 Basic Karnaugh map

It is assumed that the analysis of complex issues such as absorptive capacity requires methodological variety in order to show the complexity of the phenomenon as completely as possible and to measure it to facilitate improved firm performance. The reason for this is that one cannot objectively allocate a specific value to a firm’s absorptive capacity, due to its core complexity which was explained in Chapter 2.

To solve the complexity of the research objective #3 (to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate

development of absorptive capacity in firms), the variables themselves, however, need more advanced mathematical techniques to answer the research question of how absorptive capacity affects the manner in which a lack of market knowledge is perceived as an obstacle to carrying out the ongoing business.

To achieve this, three techniques were applied to develop the measurement instrument⁷: first, a *multiple linear regression* was applied to identify the fundamental relationships between each of the dependent variables and their constituting factors; second, these dependent variables were implemented in the extended *Karnaugh map* in order to classify results into discrete zones (Low, Medium and High) to define areas of business strength in firms; third, *fuzzy logic* was implemented to refine the Karnaugh map into a more robust, non-linear model to allow for a smooth, gradual transition between states (zones).

The Karnaugh map⁸ is a conventional tool that may allow presenting all possible absorptive capacity's combinations of its variables. For this research, Karnaugh maps allow one to lay out a situation whose variables can then be further minimized through Boolean logic, giving a simplified means of characterizing (modeling/viewing) and optimizing a system. Such maps provide easily inspected, two-dimensional visualization. "Most useful for functions of two, three, and four logic variables, the Karnaugh map become steadily more unwieldy beyond these numbers" (Dewdney, 1989, p. 118). It is a tool to facilitate management of Boolean algebraic expressions. A Karnaugh map is unique in that only one variable changes value between squares.

The Karnaugh map is used in digital electronic industry for laying out all possible combination of variables in a complex system. It facilitates optimizing systems by the method of simplification. The problem of minimizing system is called *Boolean minimization*, and one of the best techniques for solving small instances of this

⁷ See Chapter 7 for the detailed explanation.

⁸ The Karnaugh map is also known as a Veitch diagram (K-map or KV-map for short), and was invented in 1953 by Maurice Karnaugh, a telecommunications engineer at Bell Labs (Dewdney, 1989).

problem is the *Karnaugh map* (Dewdney, 1989). Usually extensive calculations are required to obtain the minimal expression of a Boolean function⁹, but a Karnaugh map can be used instead. Karnaugh maps make use of the human brain's excellent pattern-matching capability to decide which terms should be combined to get the simplest expression and it is an excellent aid for simplification of up to six variables.

The Karnaugh map is an array of cells, and each cell stands for a specific product of variables and their complements. For example, the two-variable map has four cells standing for X_0Y_0 , X_1Y_0 , X_0Y_1 and X_1Y_1 (Table 4.4).

Table 4.4: Functional Layout

Z	Y_0	Y_1
X_0	X_0Y_0	X_0Y_1
X_1	X_1Y_0	X_1Y_1

Each row and column of the map corresponds to a value of one of the two logic variables. These values are assigned in a way that produces a 1 when they are substituted into the product lying at the intersection of their respective row and column. A simplifying in part of the formula can be expressed in the following manner (shown in Table 4.5).

⁹ According to Dewdney (1989), a *Boolean variable* can have one of only two possible values, namely, 0 or 1. A *Boolean function* has a number of input variables, all Boolean, and for each possible combination of input values, such a function has a Boolean-valued output, either 0 or 1, sometimes referred to, respectively, as *false* and *true*. For more details see Dewdney (1989, pp. 75-83).

Table 4.5: Example of the Basic Karnaugh Map Design

Z	Y ₀	Y ₁
X ₀	1	1
X ₁	1	0

$$Z = X_0 \bullet Y_0 + X_0 \bullet Y_1 + X_1 \bullet Y_0$$

$$Z = X_0 + Y_0$$

Source: Adapted from Katz, (1994, pp. 70-71)

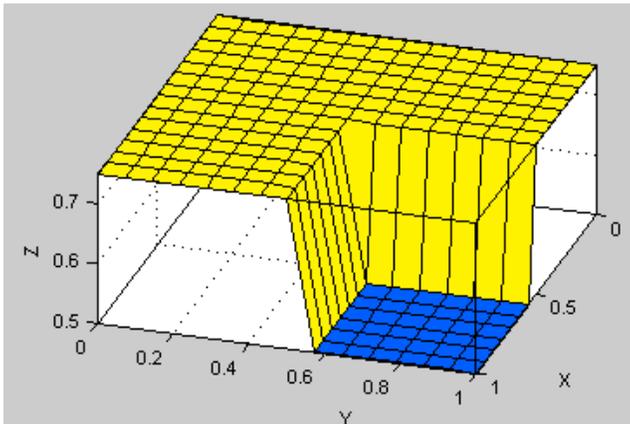
Note: $\bullet \Rightarrow$ logic AND

$+$ \Rightarrow logic OR

To reach the same conclusion when solving a problem, but avoiding all algebra involved, the rule used in Karnaugh maps is simply to replace each rectangle by the constant factor in the corresponding products (Dewdney, 1989): the top rectangle stands for $X_0 \bullet Y_0$ and $X_0 \bullet Y_1$, the constant part of which is X_0 .

A Karnaugh map may have any number of variables, but usually works best when there are only a few - between 2 and 6, because three-variable Karnaugh maps are twice as complicated as two-variable maps and four-variable Karnaugh maps are twice as complicated as three-variable maps (Dewdney, 1989). Each variable contributes two possibilities to each possibility of every other variable in the system. Karnaugh maps are organized so that all the possibilities of the system are arranged in a grid form, and between two adjacent boxes only one variable can change value. The basic Karnaugh map has two discrete states (zones) per variable (High and Low or True and False). A surface plot of the Karnaugh map is shown in Figure 4.3. The two states (zones), yellow and blue can be viewed; yellow representing High or True, and blue representing Low or False state. It is clear that an abrupt change occurs, rather than a gradual transition between states (zones).

Figure 4.3: Karnaugh Map Surface Plot

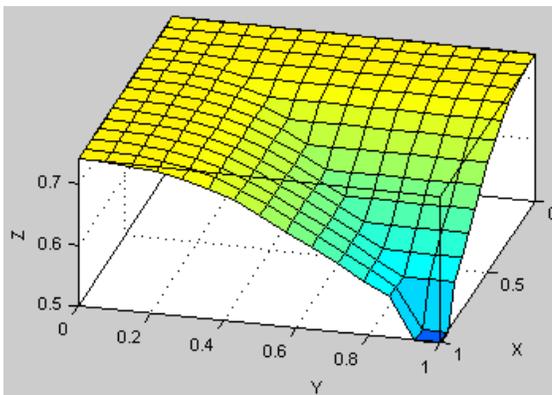


The same model was refined using the following rule governing the fuzzy model¹⁰:

1. If (X is Low) or (Y is Low) then (Z is High)

This was done in MATLAB, Fuzzy Logic Toolbox using the FIS Editor. As a result, the surface plot was generated. Here it can be clearly seen in Figure 4.4 that a fuzzy logic introduces a gradual transition between different states.

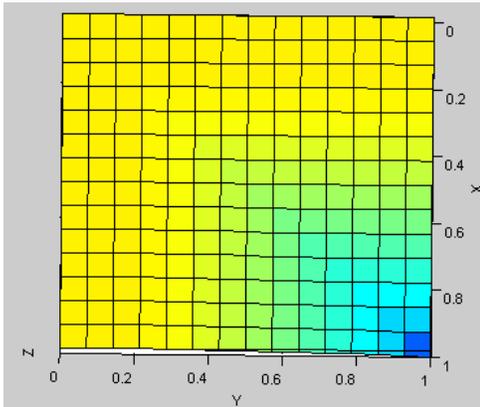
Figure 4.4: Karnaugh Map Surface Plot Generated by Applying a Fuzzy Logic, Viewed from the Side



The same gradual transition is shown below, in Figure 4.5, viewed from the top.

¹⁰ Fuzzy logic is explained in Section 4.5.6

Figure 4.5: Karnaugh Map Surface Plot Generated by Applying a Fuzzy Logic, Viewed from the Top



In conclusion, Karnaugh maps are intended for the exclusive use of human designers (Dewdney, 1989). Because of our ability to take in large amounts of information visually, the method works more quickly than a process of, for example, scanning lines of algebraic formulas looking for common factors. Given the research inquiries in this thesis Karnaugh map was used as a tool that allows the presentation of all the possible combinations of absorptive capacity's variables and classification of results into discrete zones such as Low, Medium and High to define areas of business strength in firms: High zone presents areas in which the organization should invest and grow; Medium zone represent areas that the organization should maintain its level of investment and more focus on slightly weaker variable; Low zone presents areas where the organization should give serious thought to divesting or focus towards the variables with the most significant importance.

4.5.5 Expanded Karnaugh map

The basic Karnaugh map in Table 4.5 was expanded (see Table 4.6) to three discrete states (zones) so to suit our model to better define areas of business strength. The new Karnaugh map allows for Low, Medium and High level per variable. Using the expanded principles of the Karnaugh map design, the areas of business strength can be defined using the basic Boolean arithmetic principles. The expanded design

incorporates three dimensions (High, Medium and Low), while the standard Karnaugh map utilizes only two possibilities (True or False). Therefore, the basic Boolean algebra still applies but with expanded arithmetical principles.

Table 4.6: The Expanded Karnaugh Map

		(Y)		
		H	M	L
(X)	H	A	A	B
	M	A	B	C
	L	C	C	C

Zone A can be expressed using the Boolean algebra:

$$A = X_H \cdot Y_H + X_M \cdot Y_H + X_H \cdot Y_M$$

$$A = X_H \cdot (Y_H + Y_M) + X_M \cdot Y_H$$

Zone B can be expressed using the Boolean algebra:

$$B = X_M \cdot Y_M + X_H \cdot Y_L$$

Zone C can be expressed using the Boolean algebra:

$$C = X_L \cdot Y_H + X_M \cdot Y_L + X_L \cdot Y_L + X_L \cdot Y_M$$

$$C = X_M \cdot Y_L + X_L$$

Furthermore, by the use of the modified Karnaugh map to identify the areas of business strength in the firms, and using fuzzy-logic design to facilitate transition between zones (High, Medium and Low), an absorptive capacity model was established (see Section 7.2.7 and 7.2.8). The model can be applied to any company for self-evaluation and gaining insight towards further growth and development of

their strategies. For the model to better represent a real world case, fuzzy logic was implemented as it allows for a smoother transition between states. Fuzzy logic principles are explained in more detail in the following sections.

4.5.6 Fuzzy Logic - Introduction

Fuzzy logic is a superset of conventional (Boolean) logic that has been extended to handle the concept of partial truth – truth values between “completely true” and “completely false” (Hellmann, 2001). It was introduced in the 1960’s by Zadeh (1965). The concept of Fuzzy Logic was presented not as a control methodology, but as a way of processing data by allowing partial set membership rather than crisp set membership or non-membership (Kaehler, n.d.). Zadeh’s (1965) view was that people do not require precise, numerical information input, and yet they are capable of highly adaptive control. Indeed, real-world language is plentiful with vague and unclear concepts¹¹. Often such vagueness is an obstacle to clarity of meaning, which is just what happens when human language is tried to be translated into classic logic. However, when one wants to allow for natural language queries, or “knowledge representation” in expert systems, the meanings lost are often those being searched for (Brule, 1985).

Even though we depend largely on precise, scientific tests and measurements, our view of the world encompasses evaluations in a “fuzzy” instinctive manner. While some of the decisions and calculations in mathematics could be done using traditional logic, fuzzy systems affords a broader, richer field of data and the manipulation of that data than do more traditional methods (Brule, 1985).

A fuzzy system is an alternative to traditional philosophy of set membership (Brule, 1985) and it has its origins in ancient Greek philosophy. The precision of mathematics owes its success in large part to the efforts of Aristotle and the Greek

¹¹ E.g., “Sally is tall,” or “It is very hot today.” Such statements are difficult to translate into language that is more precise without losing some of their semantic value (Brule, 1985).

philosophers before him. In their efforts to create a succinct theory of logic, and later mathematics, the so-called “Laws of Thought” were proposed (Korner, 1967). One of these, the “Law of the Excluded Middle,” states that every proposition must either be True or False. Even when Parmenides proposed the first version of this law (around 400 B.C.E.) there were strong objections: for example, Heraclitus proposed that things could be simultaneously True and not True (Korner, 1967).

It was Plato who laid the foundation for what would become fuzzy logic, indicating that there was a third region (beyond True and False) where these opposites “tumbled about” (Korner, 1967). Other, more modern philosophers supported his belief, notably Hegel, Marx, and Engels. Nevertheless, it was Lukasiewicz who first proposed a systematic alternative to the bi-value logic of Aristotle (Lejewski, 1967). In the early 1900’s, Lukasiewicz described a three-valued logic. The third value he proposed could best be described as the term ‘possible’, and he gave it a numeric value between True and False. Finally, he proposed an entire system from which he hoped to develop modern mathematics. However, a real leap forward in the area occurred in 1965 when Lofti Zadeh published his seminal work “Fuzzy Sets” (Zadeh, 1965, 1968), which described the mathematics of fuzzy set theory, and by extension fuzzy logic. This theory proposed making the membership function (or the values False and True) operate over the range of real number $[0.0, 1.0]$. New operations for the calculus of logic were proposed, and showed to be in principle at least a generalization of classic logic (Brule, 1985).

Fuzzy sets, which are used in fuzzy logic, are an augmentation of classical set theory. In classical set theory, the membership of elements in relation to a set is assessed in binary terms according to a crisp condition (Hellmann, 2001): an element either belongs or does not belong to the set. In contrary, fuzzy set theory permits the gradual assessment of the membership of elements in relation to a set (Hellmann, 2001). Fuzzy logic accepts the degree of truth as an extension of valuation.

In addition, in recent years, it has been shown that uncertainty may be due to fuzziness¹² (Aminzadeh, 1991) rather than chance and fuzzy logic is considered to be appropriate to deal with the nature of uncertainty. Zadeh (1965) first introduced the basic theory of fuzzy sets, claiming that unlike classical logic which is based on crisp sets¹³ of ‘true and false’, fuzzy logic sees problems as a degree of ‘truth’. However, despite the meaning of the word ‘fuzzy’, fuzzy set theory is not one that permits vagueness (Nikraves and Aminzadeh, 2003). “It is a methodology that was developed to obtain an approximate solution where the problems are subject to vague description. ...it can help ...researchers to tackle uncertainty and to handle imprecise information in a complex situation” (Nikraves and Aminzadeh, 2003, p. 15).

Nikraves and Aminzadeh (2003) further state that the uncertain, fuzzy, and linguistic nature of data makes it a good candidate for interpretation through fuzzy set theory; the main advantage of this technique is in combining the quantitative data and qualitative information and subjective observation. The imprecise nature of the information available for interpretation or, like in this thesis, subject of the research, absorptive capacity, makes fuzzy set theory an appropriate tool to utilize.

The value of fuzzy logic was illustrated in this thesis using the two different approaches to the same problem: *linear and fuzzy*. Karnaugh map is a linear system. As was demonstrated in previous sections, the implementation of fuzzy logic introduces a gradual transition between the states of the Karnaugh map. This in turn behaves like a multitude of states, which become non discrete. Therefore, fuzzy logic was implemented so as to refine the Karnaugh map into a more robust, nonlinear model.

¹² Zadeh’s original definition of fuzzy sets (Zadeh, 1965): “A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is characterized by a membership (characteristics) function which assigns to each object a grade of membership ranging between zero and one.” Zadeh (1973, p. 244) further elaborates that fuzzy sets are “...classes of objects in which the transition from membership to non-membership is gradual rather than abrupt.”

¹³ “Conventional (or crisp) sets contain objects that satisfy *precise properties* required for membership” (Bezdek and Pal, 1992, p. 539). Each member of a crisp set is either ‘true’ or is ‘false’.

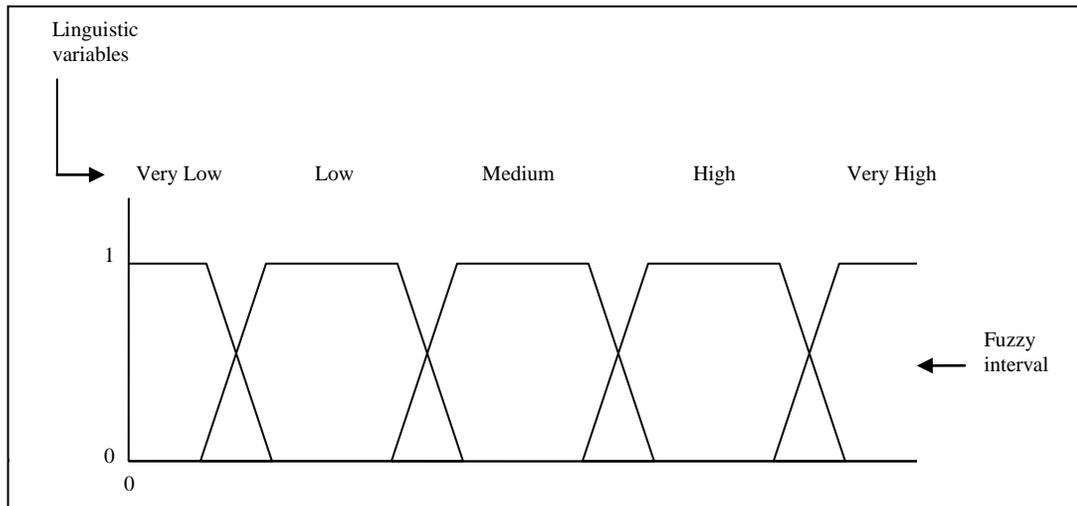
4.5.7 Fundamentals

According to Klir (2003, p. 33), "...fuzzy logic is viewed as a formalized language, based on fuzzy set theory, that is sufficiently expressive to deal with modes of reasoning that are approximate rather than exact. The principal role of fuzzy logic ... is to represent, in a realistic way, knowledge expressed by statements in natural language, and to formalize reasoning based upon this representation."

The notion principal to fuzzy systems is that truth values or states (in fuzzy logic) or membership values (in fuzzy sets) are indicated by a value on the range [0.0, 1.0], with 0.0 representing absolute Falseness and 1.0 representing absolute Truth. Fuzzy logic allows for set membership values between and including 0 and 1, and in its linguistic form, imprecise concepts like "slightly", "quite" and "very" (Hellmann, 2001). Particularly, it allows partial membership in a set (Hellmann, 2001).

Further, in most typical fuzzy systems, the states (values) are fuzzy intervals that represent linguistic terms such as *very small*, *small*, *medium*, *large*, depending on the interpretation in the particular context. These kinds of variables are called *linguistic variables* and they are used for approximating the actual values of the associated base variable (Klir, 2003). These meanings are captured by appropriate fuzzy intervals (levels). An example of a linguistic variable is shown in Figure 4.6. The same principle was applied to the case companies' areas of business strength (explained in Section 7.5).

Figure 4.6: An Example of a Linguistic Variable



Source: Adapted from Klir, G.J. (2003).

Three linguistic states (intervals) are distinguished by the linguistic terms *very high*, *high*, *medium*, *low* and *very low*. The meaning of each of these terms is represented by a trapezoid-shape fuzzy interval, as shown in Figure 4.6.

It could be said that giving values to linguistic meanings such as 0.90 to “very” or high and vice versa, is a most imprecise operation. Fuzzy systems do not claim establishing a formal procedure how to ‘convert’ such linguistic meanings into numbers. What fuzzy logic does propose is to establish a formal method of operating on these values, once the parameters have been established (Brule, 1985).

In an effort to maintain close links to natural language, and to allow for the generation of fuzzy statements through mathematical calculations, fuzzy systems have developed the ability to define “hedges”, or modifier of fuzzy values. Some common hedges are “more or less”, “somewhat”, “rather”, “sort of”, and so on. Even though their definition is entirely subjective, the system operates with the same formality as classic logic and their operation is consistent: they serve to transform membership/truth values in a systematic manner according to standard mathematical functions (Brule, 1985).

A more involved approach to hedges is best shown through the work of Wenstop (1976) in his attempt to model organizational behavior. For his study, he constructed range of values for various terms, either as vectors or matrices. Each term and hedge was represented as a 7-element vector of 7x7 matrix. He then intuitively (Brule, 1985) assigned each element of every vector and matrix a value between 0.0 and 1.0, in a consistent manner. These values were then translated back into natural language statements, so as to allow fuzzy statements as both input to and output from his simulator. For example, when the program was asked to generate a label “lower than sort of low,” it returned “very low”; (slightly higher) than “low” yielded “rather low” (Brule, 1985).

Doing this, Wenstop proved that algorithmic procedures can be devised which translate “fuzzy” terminology into numeric values, perform reliable operations upon those values, and then return natural language statements in a reliable manner. Owing to its flexibility and power in matrix operations, similar methods have been adopted by others, primarily in the study of fuzzy systems as applicable to linguistic estimation (e.g., Bandler and Kohout, 1981; Eschbach and Cunnyngham, 1984; Esragh and Mamdani, 1981).

Nevertheless, there were some resistance and disagreements related to a fuzzy systems in the professional community. While there have been general complaints about the “fuzziness” of the process of assigning values to linguistic terms, probably the strongest criticisms come from Haack (1979). A formal logician, Haack argues that there are only two areas in which fuzzy logic could be demonstrated to be “needed”. The first area she defines is that of the nature of Truth and Falsity: if it could be shown that these are fuzzy values and not discrete ones, then a need for fuzzy logic would have been demonstrated. The other area she identifies is that of fuzzy systems’ utility: if it could be demonstrated that generalizing classic logic to include fuzzy logic would help in calculations, then again a need for fuzzy logic would exist.

Fox (1981) has responded to her objections, indicating that there are areas in which fuzzy logic can be of benefit: as a “requisite” tool (to describe real-world relationships, which are inherently fuzzy); as a “prescriptive” apparatus (because some data is fuzzy, and as a result requires a fuzzy calculus); and as a “descriptive” apparatus (because some systems are naturally fuzzy). His most powerful arguments come, however, from the notion that fuzzy and classic logics need not be seen as competitive, but complementary (Brule, 1985). Finally, Fox argues that despite the objections of classical logicians, fuzzy logic has found its way into the world of practical applications, and proved very successful there; he maintains that this is sufficient reason for continuing to develop the field.

One of the controversies related to fuzzy logic is the claim that fuzzy logic is the same as “imprecise logic”. However, fuzzy logic is not any less precise than any other form of logic (Hellmann, 2001); it is an organized and mathematical method of handling inherently imprecise concepts. The concept, for example, of “coldness” cannot be expressed in an equation, because although temperature is a quantity, “coldness” is not. However, people have an idea of what “cold” is, and agree that there is no sharp cutoff between “cold” and “not cold”, where something is “cold” at N degrees but “not cold” at $N+1$ degrees. This is a concept that classical logic cannot handle due to the principle of bi-valence. Further, Hellmann (2001) noted that fuzzy logic is not just a new way of expressing probability. It is just the opposite, fuzzy logic and probability refer to different sorts of uncertainty. Fuzzy logic is designed to deal with *imprecision* of facts, such as fuzzy logic statements, while probability deals with chances of happening.

Following Fox’s (1981) argument that fuzzy and classic logic need not be seen as competitive but complementary, this research established that fuzzy logic is not any less precise than any other form of logic (Hellmann, 2001). It is an organized and mathematical method of handling inherently imprecise concepts such as absorptive

capacity. Due to its flexibility fuzzy logic was found to be the most appropriate method in this research where emphasis was not on precision but on significance.

4.5.8 Applications

Fuzzy logic is a multivalued logic (Zadeh, 1984), which allows intermediate values to be defined between conventional evaluations like true/false, yes/no, high/low, etc. Notions like rather tall or very fast can be expressed mathematically and processed by computers, to facilitate a more human-like way of thinking in the programming of computers (Zadeh, 1984).

This approach to set theory was not applied to control systems until the 70's due to insufficient small-computer capability prior to that time. Fuzzy logic has emerged as a tool for the controlling complex industrial processes, for household and entertainment electronics, as well as for other expert systems and applications. It is used to make computers more intelligent. All the elements were coded with 0 or 1. A way to apply fuzzy logic concept, is to allow more values between 0 and 1. Instead of limited ourselves on the crisp (Hellmann, 2001) decision, such as Yes/No, or High/Low, this can be done by allowing more flexible rules like “fairly low”, etc. A fuzzy set allows us to define such a notion (Hellmann, 2001).

The applications that may be generated from fuzzy logic are extensive, and provide the possibility for modeling systems that are inherently imprecisely defined. Many systems may be modeled, simulated, and even replicated with the help of fuzzy systems. Some areas, which have benefited through the use of fuzzy systems theory have been information retrieval systems, a navigation system for automatic cars, a predicative fuzzy-logic controller for automatic operation of trains, controllers for robot arc-welders, feature-definition controllers for robot vision, graphics controllers for automated police sketchers, and more.

Further, expert systems have been the most apparent recipients of the benefits of fuzzy logic, since their domain is often inherently fuzzy (Brule, 1985). Examples of expert systems with fuzzy logic vital to their control are decision-support systems, financial planners, diagnostic systems in pathology, and a meteorological expert system, i.e., in China for determining areas in which to establish rubber tree orchards (Zadeh, 1984). Another area of application, similar to expert systems, is that of information retrieval (Radecki, 1982).

There are two reasons for using fuzzy logic in this research. The first reason is that one cannot objectively allocate a value to a firm's absorptive capacity due to its core complexity and ambiguity. Despite the extant literature covering this construct, absorptive capacity cannot be defined clearly. Second, when the areas of business strength in firms had been identified, fuzzy-logic design facilitated transition between zones such as high, medium and low, allowing for a gradual transition between them. This illustrates real-world situations more accurately. Further, this thesis sees fuzzy logic theory as valuable and functional in determining the areas in firms based on the absorptive capacity measurement which should be more developed or maintained, or areas which should be advisable to divest. Thus, fuzzy logic could be used to any real world company with arbitrary factor variables.

4.5.9 Summary

Fuzzy systems, including fuzzy logic and fuzzy set theory, provide a powerful and meaningful addition to standard logic. The mathematics generated by these theories is consistent and fuzzy logic may be a generalization of classic logic (Brule, 1985).

In general, the employment of fuzzy logic might be helpful for very complex processes when there is no simple mathematical model, for highly nonlinear processes or if the processing of linguistically formulated expert knowledge is to be executed. According to the literature, the employment of fuzzy logic is not

recommended if a conventional approach yields a satisfying result and an easily solvable and adequate mathematical model already exists.

This research employed three approaches/techniques to measure absorptive capacity in the case companies: first, after a *multiple linear regression* identified the relationships between variables, these variables were implemented in the extended *Karnaugh map* to define areas of business strength in firms; next, *fuzzy logic* refined the Karnaugh map into a non-linear model allowing a gradual transition between zones of business strength and graphically presenting areas of business companies might choose to pursue.

Fuzzy concepts play a role in the creative process of forming new concepts to understand something. However, fuzzy concepts may also occur in scientific, journalistic and scholarly activity when a researcher makes an attempt of clarifying and/or defining a new emerging concept or phenomenon, which for one reason or another, cannot (yet) be more exactly specified (Hellmann, 2001).

The lack of clarity of the absorptive capacity concept and the vagueness of prior definitions which increases concerns about the sphere of its influence requires the method that would remedy this situation and to accept absorptive capacity as a building block of the dynamic capability of a firm in the increasingly competitive business environment.

4.6 Conclusions

This chapter has explained and justified the motivation for the various decisions associated with the research design, selection of the research instruments, data collection procedures and analytical techniques used for the investigation. The fundamental research objective of building theory explaining factors associated with absorptive capacity development and its influence on the internationalization process formed the basis upon which the methodological decisions were made.

The chapter has given justification for using mixed methods in this research, which refers to studies that combine quantitative and qualitative elements in the data collection and/or analysis. The choice of mixed methods has been based on the fact that the research problem would remain unsolved if only one method were used. Particularly in the field of international business, the justification arises from the subject matter itself - international business in a multi-faceted area of research, crossing national, cultural, organizational and personal boundaries, and inspiring quite complicated research questions, so the mixed methods could facilitate better understanding of the research problem, which could in turn lead to unexpected qualitative interpretations of reality.

The use of mixed methods in this thesis has been based on the belief that a deeper understanding of the research subject would be acquired by utilizing this research strategy, because the analysis of complex issues, such as the internationalization process and particularly absorptive capacity, requires methodological variety in order to show the complexity of the phenomenon as completely as possible and to succeed in knowledge creation.

To facilitate the generation of the reliable findings, particular care was taken in selecting the methodology, research method and research tools for the study, focusing on the research objectives. Phenomenology as a methodology was identified as the most suitable, which allowed a focus on the depth of understanding that the research questions required. Moreover, phenomenology's ability to draw on existing theory has allowed the utilization of the preconceived research model to structure the study. This has facilitated a grounding of the findings in existing accepted thinking.

The case study method is a reliable vehicle to deploy a range of research instruments, within a phenomenological framework providing the high level of insight that the research questions demanded. The pre-structured framework identified in the study's design process and incorporated in the case study protocol has afforded the

consistency in the analysis process and provided a framework for reporting the findings.

The case companies were chosen from the sample of the high-tech innovative SMEs in New Zealand. The research procedure has been explained concerning the research setting and methods of examination, and supported on the basis of methodological theory. Clarification for the various methodological aspects has also been made with reference to the literature and previous relevant research.

To facilitate meeting the research objective which was to measure absorptive capacity, the empirical, objectivist epistemological paradigm was adopted which required using a quantitative method to establish generalizability of the research findings. First, seven variables were developed to measure absorptive capacity; second, a multiple linear regression was applied to identify the fundamental relationships between each of the dependent variables and their constituting factors; third, these dependent variables were implemented in the extended Karnaugh map to identify areas of business strength; fourth, fuzzy logic was implemented to refine Karnaugh map into a more robust, non-linear absorptive capacity model.

The design and execution of the study has endeavored to provide a clear picture of the phenomenon. The validity and reliability of the study's findings are reinforced by the inclusion of specific research design features to address such concerns. The description of the study's research vehicle in this chapter shows how the study was conducted and how this thesis aligns with other international management research findings.

5 Chapter Case Descriptions

This chapter presents the sample firms' characteristics. The aim of the chapter is to introduce the companies involved in the research, to facilitate further analysis presented in Chapter 6. The case firms are portrayed in the relation to the three major research areas (internationalization process, technology transfer and absorptive capacity).

After a brief introduction in Section 5.1, the sample firms' descriptive characteristics are explained in Section 5.2. This is followed by Section 5.3 where the cases reports are provided that explain firm characteristics, their internationalization processes, absorptive capacity and technology transfer. Finally, Section 5.4 concludes the chapter.

5.1 Introduction

This chapter introduces the firms¹ involved in the study and then presents the findings of 'within case' analysis in each firm. Firms' characteristics are presented to set the context for the study while informant characteristics confirm their position in that context. Understanding of individual cases drawn from within case analysis provided the basis for across case analysis and the findings of the research. Analysis for each case was carried out concomitantly with data collection for subsequent cases using the research tools discussed in Chapter 4.

'Within case' findings are framed using the concepts and propositions proposed in the conceptual model in Chapter 2 before focusing on international activities of the firms and their application in international strategy process.

The chapter begins with a descriptive summary of the case companies and informant characteristics. First it outlines each firm, business and international experience, followed by the findings of each individual case analysis in Section

¹ See Appendix F – Interview Timeframe

5.3. These results are then examined in Chapter 6 in the context of the internationalization process, absorptive capacity and firm's superior technology, being the main research areas in this research.

5.2 Case Firms' Characteristics

Eight case firms from the general agro-technology industry participated in the field research. The firms in the sample are homogeneous along the key dimensions of core-competence, which is scientific discovery and technical development; they collect and intend to use scientific and technical knowledge to decide which research options to pursue; and they are for-profit high technology ventures. Firms within the same industry share a technical language, facilitating the transfer of complex, tacit information.

In the following sections the description of case firms are presented. A complete summary of descriptive characteristics for the sample is provided in Appendix D.

5.2.1 The Case Firms

The firms in this study were all New Zealand based agro-technology innovative firms. Innovation and technology were used to add value to their primary agricultural production and processing base needs, as shown in Table 5.1.

Table 5.1: Firms' Products and Positioning

Product description:	Number assigned to firm:	Products aimed for a foreign market
Fruit-based food and food components; sustainable food bioproduction and biomanufacturing	C1	yes
Computer software and collaborative tools	C2	yes
Formal cluster	C3	yes
On-farm research, development, extension and education	C4	no
On-line measurement (developing sensors) of biological components in animal and human fluids	C5	yes
Applicators for delivering medication to cattle	C6	yes
Animal management	C7	yes
Agro-tech intellectual property	C8	

This range of products indicates that the firms are specialized and focused on niche markets, in terms of high value market segments and international markets as well. While all the firms may be described as small or medium size enterprises compared to both New Zealand and world measures (see Section 1.5, p. 19), their size varied significantly within the sample frame. This diversity of size is illustrated by their staff numbers in Table 5.2.

Table 5.2: Staff Number

Number of employees:	Number of firms:
Less than 10	-
10-30	2
31-50	-
51-100	1
100 +	5

All the case firms which operate internationally do this from New Zealand but they have a variety of ownership arrangements ranging from private New Zealand limited liability firm to a foreign owned firm, as shown in Table 5.3.

Table 5.3: Firms' Ownership Format

Ownership structure:	Number of firms:
Private NZ company	3
Private foreign-owned NZ company	2
Farmers' owned co-operative	1
NZ public company	1
Crown research organization	1

Given the small to medium size of the firms, firms' ownership is predominantly private. In addition, the presence of one farmer owned co-operative and a Crown Research agency (see Section 3.2 for more details) indicates that some of these traditional New Zealand agro-technology firms have made a transition from commodity processing to specialized niche production (see Table 5.1).

The firms' business experience is shown in Table 5.4.

Table 5.4: Firms' Business Experience

	Years of Business Experience
1-5 years	2
6-10 years	1
11-15 years	3
16+ years	2

The majority of firms have international experience. The following Table identifies the length of time case firms have been involved in international activities.

Table 5.5: Firms' International Experience

	Years of International Experience
Less than 1 year (no experience)	2
1-5 years	4
6-10 years	-
11-15 years	1
16+ years	1

The international experience of the case firms was also reflected in the percentage of their total production sold internationally (international intensity) and in the diversity of their foreign markets. This information is shown in Table 5.6 and 5.7.

Table 5.6: Firms' International Intensity

Firms' international intensity % of production sold internationally:	Number of firms:
Less than 10%	1
10-25%	2
26-50%	1
51-75%	3
75-100%	1

Table 5.7 indicates the geographic market focus of the eight case companies.

Table 5.7: Firms' Foreign Markets

Firms' foreign markets	Number of firms:
Main foreign markets:	
Australia, UK, USA	6
Europe (without CEEC)	3
CEEC	2
Asia (China)	2
South America	3
Note: Multiple responses	

For case firms, the main geographical emphasis is on psychically similar markets such as Australia, the United Kingdom and the USA regions. The emerging markets of Asia, predominantly China, and CEEC do not seem to be very attractive to the case companies. Three firms reported their presence in the South American markets, primarily due to the similarity of climatic conditions environment to those of New Zealand.

The following Table identifies that only two case firms reported their presence in the CEECs' market, and even these were only small-scale business operations. Only one firm, apart from the previous two, expressed its intention to explore the market in the future, but still without any firm plan related to the time and the strategy intended to use in the region. For more information, see Appendix E.

Table 5.8: Firms' Presence in the CEEC Market

CEEC market:	Number of firms:
Presence in the CEEC market	2
Plan to enter the CEEC market	1
No plan to enter the CEEC market	-

5.2.2 The Informants

Within each case, senior executives with a responsible role for the firm's foreign activities were interviewed. Of the eight interviews, six were with the CEO or General Manager and Marketing Manager, and the remaining two were with a senior scientist responsible for R&D activities. Of the informants, seven were male and one was female. They were all mature, well educated and experienced in business/international activities. These informant characteristics are shown in Table 5.9, 5.10 and 5.11.

Table 5.9: Informant Position in the Firm

Informant position in the firm:	Number of firms:
CEO	3
General Manager	1
Marketing Manager	2
Senior Scientist	1
Principal Senior Scientist	1

Table 5.10: Informant Educational Achievement

Informant Education	Number of Informants
PhD	4
Masters Degree	2
Bachelors Degree	-
University Diploma	2

Table 5.11: Informant International Experience

Years of International Experience	Number of Informants
1-5 years	5
6-10 years	2
11-15 years	-
16+	-

The previous case firm data and the informant data confirms the appropriateness of these firms as an example of literal replication (Yin, 1994) among New Zealand agro-technology innovative firms and the credibility of the informants as experienced business people. These qualities indicate that this group of firms was suitable for the application of the research methods discussed in Chapter 4 and provided an understanding of the context for the within case analysis process.

In summarizing this data, the majority of firms have international experience and the significant percentage of their total production was sold internationally. Although these firm characteristics confirmed their suitability as a sample for this research, they do not provide the insightfulness of understanding required to examine the internationalization process of firms and relationship to absorptive capacity and technology transfer. For this, the richer material provided by informants was used, which is explained in the next sections. For a summary of the characteristics of the case firms see Appendix D. These descriptive characteristics are derived from the data provided in interviews with each participant, which provided the foundation for further comparative analysis and theory building about internationalization process, technology transfer and absorptive capacity. These elements constitute the remaining sections of the chapter.

5.3 Within Case Reports

The process of analyzing interview transcripts and other case data employed the methods and tools were identified in Chapter 4. The analysis process was carried out along with fieldwork allowing early analysis to inform later data gathering,

resulting in a dense data set and research findings. While the cases were analyzed, findings were summarized in individual temporary case firm reports from which the reports in this section were derived.

Both the data gathering and analysis processes were framed using the conceptual model and case study protocol discussed in Chapter 4. The conceptual model used to frame the study was developed from past research and observed firm characteristics and understanding of the international environment deployed through an international strategy process.

In addition, this conceptualization from the literature suggests that the firm's superior technology and absorptive capacity may affect internationalization process. The concepts of the transfer of superior technology, and a firm's absorptive capacity, as well as foreign market and international strategy were used to frame evidence gathering and subsequent analysis. The central propositions are shown in Figure 5.1, indicating the association between a firm's internationalization activities, absorptive capacity and its technology.

Figure 5.1: Central Propositions

- | |
|--|
| <p>P1: Technology transfer and knowledge management are positively related to a firm's degree of international activities.</p> <p>P2: A firm's absorptive capacity is positively related to a firm's degree of international activities.</p> |
|--|

As the analysis proceeded, the link anticipated in the conceptual model between a firm's technology and international strategy on one hand, and firm's absorptive capacity and international strategy on the other hand, revealed itself as a stream of indicators. For instance, a possession of superior technology, innovative activities, knowledge management process, prior international experience, foreign business and institutional knowledge, R&D intensity and organizational structure all affect

the firms' international strategy process. A more detailed explanation of these relationships is presented in Chapter 6.

In the following sections of this chapter, the results and analysis of the main study include a summary of the sample characteristics concerning the case firms and their international approach adopted by case participants towards market development. Thus, the findings from the case studies were used to examine the three main areas for research outlined in Chapter 2: **(1) internationalization process, (2) superior technology transfer, and (3) absorptive capacity** for New Zealand agro-technology high-tech firms planning to extend their foreign activities. From this analysis, the preliminary conceptual framework was further developed and refined. Each of the three areas relates to a series of guiding interview questions which, in addition to those seeking general company characteristics form the basis of the analysis (refer to Appendix A).

The case reports are presented in the sequence in which field work was undertaken and consequently reflect the increasing intensity in that process. Each case study considers the firm in terms of the concepts of the internationalization process, technology transfer and absorptive capacity. Each report contains the indicators of relationship between the firm's international strategy and formal strategy formulation, discovered in the study, and each firm's ongoing international strategy process.

5.3.1 Case Company #1 (C1)

Firm Characteristics

This firm produces a range of diverse products (from developing new products to saving the environment).

“We sell products, rights, licensing, royalties, research...”
(Interviewee, C1).

The firm is dedicated to producing fruit-based food and food components linked to health and performance, and sustainable food production, bioproduction and biomanufacturing.

Internationalization process

The firm is fully engaged in the most exciting period of change in the organization since it was formed in 1992. After many years of exploratory missions, the company now has a clear idea of its future direction, and is making fast progress.

“By building on our research and unique resources in fruit, plants and environmentally sustainable production systems, we provide world-leading science, novel technologies and innovative products with high consumer appeal, while generating world-leading, cutting edge science,” (Interviewee, C1).

This deliberate change of a strategy has seen management and operational functions become more sharply defined and control become focused on the Managing Director and the Board with equivalent number of science and business leaders in the Board.

Even though the firm tries to balance business and science,

“it’s still a heavily scientist based [company]. Innovation and science come first, technology and commercial opportunity second. Scientists are running the firm. Science is firmly in the driving seat,” (Interviewee, C1).

In understanding its environment, the firm distinguishes between its domestic and international markets. It has capability to extend beyond the capacity of the New Zealand market. The firm is determined to grow, and is aware of needs to develop markets offshore. The business development team works closely with scientists to identify market needs. The firm’s staff is increasingly involved in transferring production systems to other fruit producing regions including Washington, California in the United States, Italy.

“We have carried out extensive research in each market to develop out entry strategies. Focus has been on Australia, North America, Europe and Asia,” (Interviewee, C1).

Strong and robust partnerships with outside organizations, both commercial and in research and development are critical for the future. They are establishing international collaborations with food and industrial companies (joint programs) in Holland, Spain, France, China, United States, and Vietnam.

They regard climate and exchange of personnel and cultural similarities as being the most critical key requirements for success in doing business from New Zealand.

“Climatically similar countries such as Australia, Southern hemisphere (Chile, Argentina, Brazil, South Africa), Spain, France, USA; if people do not grow fruit – there is no interest for the firm,” (Interviewee, C1).

In established foreign markets, even where it has its own dedicated staff on the ground, its understanding of markets and competitors comes from its distributors. The firm has currently one person based in Spain to cover all of Europe and provide market research.

“[The strategic direction is set by focusing on] adding world class business development people to our new science program areas, who are expected to find the most effective path to market and help refocus research into areas with the most potential” (Interviewee, C1),

which provides a potential for development prospects.

“We have planned investment of \$5 million to implement the new science programs and develop globalization initiatives. We are also investing in our globalization program through appointments in Australia, Spain and the United States,” (Interviewee, C1).

“We have made significant progress in developing and implementing the project management initiative and our new idea-to-commercialization process, which began with embedding business development in the science teams,” (Interviewee, C1),

which was not the case before new global strategy is formulated,

“turning science into appropriate income is always a challenge for a research organization – even more so in our case, where we need to make the leap into new markets. In the past, around 60% of our revenue has come from government funded research grants. The aim is to reduce that to 40% within five years.”

There is awareness of increasing value to customers through revenue-generating arrangements that include patenting and licensing, contractual arrangements, equity stakes, partnerships and other collaborations, fee for service, in-house product commercialization and outright sale of intellectual property.

“The challenge now is to develop more collaboration with global partners that will in turn provide a stable platform for future growth and strong partnerships with both research and commercial entities,”
(Interviewee, C1).

These all suggest awareness of the need for multi-sector collaboration.

Absorptive Capacity

Having these strategic directions, operational objectives and strategies are formulated and articulated within the staff, addressing business functions and immediate actions to be done.

“To ensure that we do great science and maximize our commercial opportunities, we have organized our science into 21 individual, but interconnected targeted areas. We are appointing science leaders to these areas with the drive and scientific credibility to ensure that we will perform in our existing programs and reach into new research areas,” (Interviewee, C1).

The firm’s success is driven by science. Some changes are underway, such as consolidating, as research effort was spread too widely and thinly; improving integration; and cutting the number of science areas from around 60 to 21 programs. Obviously, in this firm the focus is still on science programs and developing the organization’s core scientific strengths. Emphasis is still on science and less on commercialization. Where commercialization of their products

is concerned they rely on national and international partners and the partnership agreements, and commercialization of ‘near to market’ technologies.

Further, there is evidence of development and implementation of a new, international best practice leadership program for staff. There is a program to incorporate science and business, however, the focus is still to a great extent on science.

“I have seen a new energy about HR that is very gratifying. Scientists are understandably good at taking a long-term view, and they have been quick to appreciate the logic of the strategic pathway. People are the strategic elements of success related to R&D performance,” (Interviewee, C1).

“We have also made significant progress in the organizational capability element of the enterprise model,” (Interviewee, C1).

The requirements to retain science capability and integrate with business are evident.

“Our scientists have to be world class leaders. We have developed a leadership programs based on successful overseas models and started the implementation. The program takes input from participants’ direct reports, peers and managers to help individuals build on their strengths. We will roll this program out across the whole organization,” (Interviewee, C1).

Technology Transfer

In order to ‘safely’ transfer technology, knowledge and practice to a foreign country the firm relies on a legal firm relating to intellectual property protection and also on the feedback from the distributors.

“[There are] people on the ground to guarantee the success. Wouldn’t deal with an overseas partner unless we knew what the IP (intellectual property) landscape was,” (Interviewee, C1).

This relatively young firm is not a single technology company. Since dealing with know-how and innovations that change almost on a daily basis, the foreign strategy is left to adjust to the changes in technology.

“We provide know-how, a way of processing, a way of managing. I don’t think we expect them [scientist and R&D department] to change. This is still newish to us – to fit in to what everyone else wants us to do.

Even though, the interviewee admits,

“We are pretty hungry to win [in] the international market,”

Technology adjustments are present, not in the sense of fitting the foreign strategy, but to match the needs of the target country.

“[The goal is] to suit the country and the occasion and the product. Yes, it is a market pull (example US and England). We have a consumer scientist in the firm asking consumers for their opinion. We are a consumer science company.”

There is strong market awareness in the organization but still as the interviewee said:

“[It is] more like having a product and then thinking where to go. Historically we’ve been funded by government. It is changing – we will be going to partners and saying what do you want (need)?”

No evidence was found to show that technology development process was part of the future internationalization strategy of the firm.

Summary

Creating wealth by adding value and focusing on profitable growth markets and developing strong research platforms and collaborations is a part of the business platform in the firm. The collated evidence indicates that the firm has developed research skills and capabilities beyond the capacity of the New Zealand market,

however there is still long way to go before these capabilities are fully utilized in foreign markets.

5.3.2 Case Company #2 (C2)

Firm Characteristics

This firm is a private company developing and commercializing collaborative learning, video conferencing and video streaming technologies emerging from the University of Waikato. The firm was created to support the university in its aim to be a global leader in personalized online education, which is a rapidly growing area. After receiving a national Information Computer Technology award for excellence in software development, it was purchased by a global leader in interactive video communication in 2005².

The firm consists of a team of learning and collaboration specialists, computer graphic designers, programmers, researchers and experts in video conferencing, streaming, and digital audio/video. It works with clients to transform face-to-face teaching and learning to online teaching and learning.

“Our development focuses on video conferencing and streaming media technologies as well as learner-centered education in online learning communities. Our main business focuses on integrating synchronous and asynchronous collaboration technology, the theory of online communities, learning and best practice. We work to apply theory, best practice and technology to provide interactive, stimulating and supportive working environments,” (Interviewee, C2).

Internationalization Process

The firm’s business strategy revolves around developing innovative, on-demand, rich media solutions. The firm’s understanding of its environment is drawn directly from its markets.

² Interview material preceded this event.

“Presence in the market is really critical, and the key requirement for success in doing business, particularly from New Zealand. Then there is knowledge and networking,” (Interviewee, C2).

The size of the market and its profitability are criteria that company uses when selecting a market for their international activities. In prospective markets, specific research and reliance on networking provides a basis for partner/agent selection and initial operational strategies. In established markets, perceptions are drawn from communication with partners and observations while visiting the potential markets.

“[From the very beginning the company] was set up to be an international business, it was deliberately set up as a global business, that’s because the technology is a global technology, and so the whole approach was to look at it as a global opportunity,” (Interviewee, C2).

A key resource, apart of the shared knowledge and innovative spirit, is the firm’s marketing partners located in other countries.

“We started off in New Zealand; it was to establish a New Zealand distributor. Then we looked at which were the largest markets for these sorts of technologies that we were operating in, and they are in order – the US, followed by China, followed by Europe, followed by Asia/Pacific, in those....So our first moves have been into the US market and we have a distributor signed in the US,” (Interviewee, C2).

They plan jointly in terms of new products and consider partner/distributor relationships being the vehicle for high value-added products sales because the firm’s product range is very much at the top end of the market.

When asked about the prospects of entering CEEC, the informant showed openness and enthusiasm:

“We’re very excited by the amount of opportunity in those countries because they are rapidly adopting technology, so for us it’s a real opportunity, a real advantage,” (Interviewee, C2)

Absorptive Capacity

This firm delivers innovation in collaborative electronic education and has partnerships with a variety of institutions and organizations at local, national, and international levels. This firm is characterized by the diversity and adjustability of their product line, and eagerness of the staff to listen to their prospective clients in order to fulfill their needs.

The firm's concept of itself is held in terms of its management design and its people, which are considered the main foundation of the firm's success. Management is structured functionally and communications are formal, however flexibility underlies those communications.

“We report to the Board monthly. The management team get together weekly. We have a formality of process with that, so each of the teams report to the management meeting each week. Those minutes are kept of those meetings, and formally circulated,” (Interviewee, C2).

However, informal communication and

“a sense of excitement within the team about what we're doing, and that people want to share and hand on information,” (Interviewee, C2)

are considered to be the main factors that encourage and facilitate transfer of knowledge within the firm.

In October 2005 the firm was purchased by a MNC, which is global leader in the similar technology that the company has been developing. “The sale is an excellent example of how science and technology is being developed in the Waikato ... and then spun out into the commercial world with benefits accruing to all,” (Media release, 5 October 2005).

The global MNC has been able to attract well-educated, highly motivated staff that is a resource in local community. “We would very much like to stay here and

want to attract more talent down to the Waikato region,” (Vice-president, Media release, 12 April 2007).

Further, the work coming out of the MNC is world-leading, which involved the company in developing streaming technology for, for example, Microsoft’s new products.

“What it has allowed us to do ... is to acquire the best technology on the planet, ... in Hamilton, New Zealand, which is actually as far as you can get on the planet from where I live,” (Vice-president, Media release, 12 April 2007).

Technology Transfer

This firm organizes the transfer of knowledge and practice in a unique way. The company believes that since their main product is software and as such, it has its own protection.

“The software itself is well protected by a patent perspective, from a copyright perspective, and from a know-how perspective. This is just not a simple physical [structure]. So, we’re reasonably safe,” (Interviewee, C2).

The firm foreign strategy adjusts for changes in the firm’s technology. International operations change but its broad strategy remains.

“An overall strategy being to find people in the marketplace that want to sell what we’re doing. So the broad strategy doesn’t change, but the way it’s implemented does,” (Interviewee, C2).

The technology development process is part of future internationalization strategy of the firm. From the very beginning this firm’s intention has been to internationalize, but only to the extent of finding the distributors and agents interested in this sort of technology.

“We have a license arrangement with the distributors and we do manage those. So in a sense our customers are distributors. We’re also happy to sell to their customers. But, our customer is a strange

combination of the distributor and the distributor's customer,"
(Interviewee, C2).

Summary

This is a young, 'born global' firm, whose intentions from the very beginning has been to go international. Aiming at accomplishing "the sky is limit" vision, the firm has developed research skills and capabilities beyond the capacity of the New Zealand market. "A global [MNC's] foray into New Zealand seems a useful example of how New Zealand can play the international technology enterprise game" (Media release, 12 April 2007).

"As part of New Zealand's quest to sell itself on the global stage as an exporter of high-margin technological innovation, scratching away at a growing international niche market are encouraging," (Media release, 12 April 2007).

5.3.3 Case Company #3 (C3)

Firm Characteristics

This is an organization formed to manage a cluster of group of firms and the New Zealand's growth hub for Ag-Biotech businesses. This is where leading primary sector science, technology and research meet a catalyst for entrepreneurship and the growth accelerants of resourcing, collaboration, and a global channel of opportunities.

"The region is already the country's leading location for science research, with approximately 1000 research scientist within it giving the region one of the highest ratios of scientists per capita in the world and accounting for a quarter of the research undertaken in New Zealand," (Interviewee, C3).

It was set up to enhance economic growth within the region by encouraging the further development of its existing agri-tech base. It was formed to be the vehicle for further growth and development under the leadership of local businesspersons.

Internationalization Process

There is no collective plan to help the companies' access international markets. They see the international environment in terms of its current markets, where it seeks to expand existing sales rather than seeking new customers.

“Probably our easiest relationship at the moment has been into America, into mid Western America, where there’s a lot of cultural similarities both in the way, the language, the culture, the way they do business, which is essentially around relationship cells, rather than transactional cells, you know, which is what you get on the East or West Coast,” (Interviewee, C3).

International business information gathered in these markets,

“there’s a lot of synergies with New Zealand in terms of producing a lot of food”, [this has led to a perception that is changing to suit the cluster’s products in general] **“so, there’s good similarities there, and our products fit into that,”** (Interviewee, C3).

Global international strategy, or strategy related to a particular country does not follow by any predetermined plan.

“We run a cluster which is characterised by a few very strong firms and a lot of small technology firms and go-to-market sort of strategy is a pretty sensible way to help everyone go faster. So, as we’ve sort of realised that there’s some real economies of scale in a collective approach to chasing offshore markets, we’ve started to step into that role,” (Interviewee, C3).

The organization has a very little knowledge of foreign markets.

“Into Europe, we’ve haven’t focused there at all yet. I think we’re probably slightly guilty of not having done much... So maybe it’s just ignorance ... if we were going to go anywhere, I think it’s going to be more South America ... and the pastoral environment in South America is a better environment for our technologies anyway,” (Interviewee, C3), **“China, there’s work being done through New Zealand Trade and Enterprise, but again, there’s a lot of risks in doing business in China.”**

Feedback from markets provides understanding of market needs. Being present in the chosen markets has become a crucial point in the cluster strategy,

“People won’t buy, they won’t come to you to buy things, you’ve got to go to them, so you’ve actually....you’ve got to have a significant presence in the market,” (Interviewee, C3).

However, there is still no formally developed international strategy, which would help companies go overseas to foreign markets.

“A lot of our smaller firms, I think they go....they don’t focus on the sweetest market first. They do a bit of a scattergun and then they end up putting distributor relationships in place that are a bit hard to undo, and push them into different alliances that they may not have done if they’d thought about it long and hard. They’ve got to be able to put scarce resources into the sales effort and then the supply chain,” (Interviewee, C3).

To grow and stay ahead of the competition, the firms in the cluster continue to innovate, but it seems that they are not quite prepared to change their direction,

“What we’d like to see more is where they actually leverage from those companies with a global supply chain already, like Gallaghers. Just plug it in, rather than reinventing the whole process,” (Interviewee, C3).

The flexibility in the cluster to help firms to react quickly and adjust their technology and products in order to grasp potential opportunities is not evident, rather to find markets that would accept and use them without adaptations. Perhaps because there is no formal policy and reached agreement on the international strategy of the cluster as a whole.

Absorptive Capacity

The University of Waikato is a strategic partner with the cluster. This relationship gives the companies within the cluster ready access to specialist resources such as laboratories, IT systems, research capabilities, student support, and university programs.

The cluster's technology incubator gives high potential businesses the best possible environment for growth. Businesses receive intensive growth treatment, supported by mentors and advisory services, access to capital, as well as excellent operational support.

By combining their experiences in ways they were unable to do by their individual efforts alone, the parties in the cluster manage to produce some new and innovative ideas that are retrieved as particular interorganizational experiences in the form of collective rules for behavior. This generates interorganizational exploration, which results in a process of translating organization-specific experiences into common rules for action between different organizations that would form a template for their concomitant interorganizational learning.

“We have different perspectives: in such a situation you get impressions from more channels than you would if you had been in the same building and had been recruited by the same system,” (Interviewee, C3).

This was an ultimate goal, but in reality the firm has to deal with many constraints.

The atmosphere and communications between firms on site are informal because of physical proximity and entire layout of the building.

“The environment, it's designed so that everyone has access to photocopiers, coffee, meeting rooms, everything, you've all got to get out and talk to other people out in the street. There's street numbers within the buildings, so there's that physical aspect of getting together. That's how we kind of connect on a day to day basis,” and, **“the other thing is we do those cluster events, and bring in guest speakers. Sometimes it's sort of like a tradeshow, so we get six companies in here, and show off what your projects are, and look for how other companies in the cluster can help them,”** (Interviewee, C3).

The entire idea of having a cluster is based on people and relationships.

Technology Transfer

The most recent strategic activity is setting up a R(earch), a D(evelopment) and a C(ommericalization) farm with a goal to identifying each of the technologies provided by each of the companies, and implementing it on those farms.

“So, if it’s a fully commercialised product, then it goes in on the most profitable dairy farm in the world,” (Interviewee, C3).

However, developing new technologies and implementation of the firm’s knowledge is still a priority.

“We’re still technology push, it would be fair to say. It may be a little bit harsh, but I think that’s actually most of it,” (Interviewee, C3).

There is still a tendency in the cluster that, once, technology is developed, firms try to sell it targeting only markets where the technology/products would be suitable. In general, new products/technologies are not a part of the future internationalization strategy of the firms in the cluster.

“The key thing, we try to grow our big companies and we don’t want more companies, we just want to grow what we’ve already got. It’s not a bad place to start. So, we’d look for patents and licenses that we can add to our existing companies, to make them multi-product. So some of our companies are single product. We want to get, bring other licence opportunities into them, so that they can become multi product,” (Interviewee, C3).

The philosophy behind the safety of transferring knowledge and technology is very unusual one because of relying on business ethics.

“The best thing we’ve got is that the Waikato is actually a relatively small business community, and if you do the dirty on anyone, everyone finds out about it very quickly. So, you tend to find there’s quite a bit of ethics, business ethics in a smaller agricultural economy. Everyone knows everyone,” (Interviewee, C3).

However, this is different story when foreign markets are in question. Patenting is quite a regular process of protecting the ownership of technology. The legal firm, which does patent protection, is located at the cluster.

Summary

The cluster is a group of firms which is the New Zealand's growth hub for Ag-Biotech businesses. It was established to boost economic growth within the region by encouraging the further development of its existing agri-tech firms. It was formed to be the vehicle for further growth and development under the leadership of local businesspersons.

The cluster's technology incubator gives high potential businesses the best possible physical environment for development. The cluster sees its international environment in terms of its current markets, where it seeks to expand existing sales rather than seeking new customers. Although the cluster acts as the management agent for firms there is still no collective plan to help the firms' access to the international markets.

5.3.4 Case Company #4 (C4)

Firm Characteristics

The firm undertakes on-farm research, development, extension and education for the New Zealand dairy industry. The firm was established in 2001 and owned by New Zealand dairy farmers; currently has 180 staff, with 70 located in the Hamilton region. Its principal goal is to:

- Help dairy farmers create profitable and sustainable dairy farm businesses.
- Improve the competitive advantage of the New Zealand dairy industry and achieve on-farm productivity targets.

The strategic intent of the firm is,

“to be the lead motivator and provider of on farm research and extension for the creation of value and delivery of innovation for New Zealand dairy farmers,” (Interviewee, C4).

The formation of the firm allows the New Zealand Dairy Industry to own and control a capability in farm systems and provides an influence over farmer adoption of new technology.

New Zealand dairy farmers provide 58% of the firm’s funding via the levy on milksolids. The funding must generate value and benefits for farmers, and be seen as a worthwhile investment. The firm was set up to lead and co-ordinate research, extension and education – to ensure that the right work is getting done for the dairy industry. This does not mean the company undertakes all the work itself, but rather engages with the right organizations and develops close strategic relationships.

Internationalization Process

The firm sees its environment principally in terms of needs of the New Zealand dairy farmers. They monitor the changes in the external environment that may have potential impact on the farmers.

“As scientists become more senior in the organisation, so their responsibilities increase to sense what the problems and issues are out in the market amongst farmers,” (Interviewee, C4).

Moreover, decision-making is around this notion as well,

“the more senior scientists are expected to direct policy, research policy in certain areas, and provide feedback on what the issues are. So we have a group, we have three science leaders and we each have a different area which we oversee, and we try and get a picture of what’s happening outside in that field, and try and make sure that what’s happening inside is aligned with it,” (Interviewee, C4).

“Ensuring we have world-class people, capabilities and facilities within the firm allows us to leverage farmer investment through attracting funding from other sources,” (Interviewee, C4).

This results in returns to farmers, far greater than the value of their original investment. The firm was established to deliver productivity improvement so New Zealand dairy farmers continue to be the most efficient producers of high quality milk for the world market.

However, there is still no international policy in the company. Even though, R&D is highly emphasized, the firm produces exclusively for the domestic market demands. However, there is no international activities so far.

“Potentially there is if Fonterra decides that it’s going to resource a lot of its milk supply offshore, and they want to produce that in South America in an efficient fashion. Then, if they still have significant influence over the firm in terms of management, we could end up in that position, yes. But currently we don’t,” (Interviewee, C4).

Further, he admits that

“probably a lack of knowledge of the infrastructure and probably lack of knowledge of attitude to farming systems, customer perceptions, thinking about milk products and things like that,” (Interviewee, C4).

would be the main obstacles for the company in operating in a foreign market.

Absorptive Capacity

The firm holds over 3200 events each year including geographic and specialist discussion groups, field days, conferences, road shows, monitor farm visits and event for rural professionals, fulfilling its role to be a knowledge centre, transferring knowledge to dairy farmers and other interested parties. The staff made presentations at science and dairy industry conferences nationally and internationally. Further, the firm’s five research farms are important industry resources that provide “real farm” platforms with associated science resources that

enable larger scale pasture and animal trials to be carried out. The farms effectively get research from the laboratory to the farm.

It has developed a strong performance culture through competency-based performance management and objective setting processes. This enables the firm to reward high performers and recognize actions and behaviors that align with their values, goals and mission.

“We have developed a number of new relationships as well as building and strengthening our existing partnerships with key stakeholders and research, extension and education providers, with some exciting joint projects and initiatives as a result,” (Interviewee, C4).

The firm drives innovation by building a stimulating and enjoyable work environment, providing opportunities and encouraging personal development and growth of its people. Over the past year, the firm has provided extensive training in project management, presentation skills, business writing, sales and negotiation, leadership and team development. This ensures that the firm continues to be effective in a constantly changing environment. However, the firm’s satisfaction with their overall R&D is,

“one of the things that’s limiting to the firm in this respect is the fact that within the dairy industry there’s a particular mindset, which makes it very resistant to change. So it makes it difficult to do effective/satisfactory research and development in that environment,” (Interviewee, C4).

The atmosphere and communications on site are informal and knowledge sharing is present in everyday life within the company.

“There’s knowledge sharing within the market or farmers and within the company; we have both scientists and extension specialists, all housed in the same building over there. So there’s some interaction between those people go out and talk to farmers and those people that do the research,” (Interviewee, C4).

Internally, there are seminars and a lot of publications circulating around, including a lot of peer reviewing of journals. Although, strategic directions in the firm is decided by the Board, research strategy and strategic discussions as to

research directions and topics, and what the problems are in the industry are freely communicated among staff.

“And in terms of sharing information with farmers, we have farmer meetings, and we have Popular Farmer Press. We make fairly comprehensive use of the media, “(Interviewee, C4).

The decision-making, particularly where the R&D projects are concerned, is quite bureaucratic. There are two major funders, Foundation of Research, Science and Technology and Dairy Insight. Dairy Insight is the corporate group of Fonterra Cooperative Ltd, which distributes the money for research from a levy on every kilogram of dairy milk solids paid by farmers.

“So, coming up to the application times for those two sources of funds, we internally have strategy meetings involving the scientists to decide what research areas and topics we’re going to put up for funding to those two bodies. It’s a very strategic session. Unfortunately what actually gets funded is decided at a...quite a fine level, at a low level by those two bodies, Dairy Insight in particular. And Dairy Insight funds things at the project level,” (Interviewee, C4).

The overall direction of R&D funding and spending,

“is to some extent out of our control, because people who distribute the funding dictate the R&D direction and the vision,” (Interviewee, C4).

The firm’s greatest resource is their strong relationship and collaboration among the staff.

“It’s all about having the structure which encourages people to work together and not be scared of approaching other people with ideas or questions. That’s really the most important thing. It’s about human relationships. It’s all about the culture. So, it is all about creating an innovative culture and a common purpose towards achieving a common mission, really. That happens to a certain extent, largely among the technicians,” (Interviewee, C4).

The strength and value of these collaborations has grown to a point where they generate new ideas and inventions.

“Although firm’s management related to the R&D decisions, is quite bureaucratic, generally it is a reasonably flat structure. It still does contain a hierarchical sort of aspect to it overall. It’s basically divided separately into research and extension, although the Board of Directors likes to think that everyone works together seamlessly, it actually doesn’t. We actually have two different cultures, one in the extension area of the business, and the other in the research business. So there’s some historical baggage there in that respect,” (Interviewee, C4).

Technology Transfer

It is very challenging to protect technology, knowledge and practice in the firm for several reasons.

“This is difficult. With embargoes placed on a thesis for a short period a lot of the knowledge in the company is unable to be protected, and so you have no real control over it. And in fact some people do leave the company and set up as consultants, advisors or farmers, and they take some of the company’s [knowledge] with them. You can’t avoid that. And in a sense though, it is assisting the industry by doing that,” (Interviewee, C4).

The main goal of this firm is to help New Zealand farmers and it does not have an explicit foreign strategy. Even though the firm is open to new possibilities, it still revolves around the needs of New Zealand agriculture. However, the firm’s strategy is indirectly related to the international strategy of Fonterra through increasing productivity and on farm efficiency.

“There’s no conscious international strategy at the present time,” (Interviewee, C4).

Summary

The firm was established to facilitate and undertake on-farm research, development and education for farmers and the New Zealand dairy industry. Since it is owned by New Zealand dairy farmers, its principal goal is to help dairy

farmers create profitable and sustainable dairy farm businesses. R&D and technology development process are not a part of the future internationalization strategy of the firm, but this is indirectly related to the international strategy of Fonterra³ through increasing productivity and on farm activities.

5.3.5 Case Company #5 (C5)

Firm Characteristics

The firm was established in 2001 and is a subsidiary of two international companies. This firm specializes in the development of technology platforms for on-line measurement of biological components in animal and human fluids. It is currently focusing in the area of on-farm, on-line solutions for the dairy industry, targeting components in milk capable of providing information on animal health, milk quality, reproduction and nutrition. The firm develops the Technology Platforms to a manufacturable stage, providing its customers with innovative, ready-to-market packages including manufacturing specifications and full documentation.

It is a young and enthusiastic New Zealand-based research and technology firm, whose heart and soul are firmly established in science and innovation. The firm sees its environment principally in terms of research, development, science and innovation. In understanding its environment, the firm does not distinguish between its domestic and international markets. Strategic direction is set by an overall global strategy.

A pioneer in its specialist field, it is the first company in the world to specialize in the commercial development of intellectual property and product platform technology for on-line sensing of biological components in animal and human fluids. Its initial focus was in the field of on-line sensing of milk components on the dairy farm. This research was driven by the objective of empowering dairy farmers to improve their on-farm herd management, lower their production costs

³ The role of Fonterra in New Zealand dairy industry was presented in Chapter 3.

and add more value to their milk before it leaves the farm, thus re-engineering the milk value chain to bring about a paradigm shift in the milk income equation. The firm's unique R&D program is currently concentrating on providing tools for managing four main areas: animal health and well-being, milk quality and composition, fertility and nutrition.

Internationalization Process

Comprising an R&D team of some 14 scientists and engineers, along with several graduate students, the firm is supported by a highly specialized international management team, based in four countries in Australasia and Europe.

The firm's international strategy heavily relies on the two parent companies.

“We do a lot of market research. My director of business development is based in the U.K. So, he looks after all of the Northern Hemisphere countries, and he's constantly staying in touch with potential licensees and customers. Our director of R&D is based in Australia. So we have two key management people that are remote from Hamilton. So, I wouldn't say we target any specific country, but we try to maintain a relationship with all the potential customers, which in our business is quite small,” (Interviewee, C5).

Absorptive Capacity

The firm's business model leverages its own in-house expertise with strategic collaborations with universities and research centers world-wide. Projects have included collaborations with more than ten such organizations in over seven countries. This firm's core capabilities are based in the following fields: biological sensor development, optics, electronics engineering, automation, dairy physiology, milk harvesting, and research collaborations.

In order to achieve their strategic decisions, the firm uses collaborations with acknowledged international research experts in varying scientific disciplines around the world, together with partnerships with key academic and research institutes, to leverage its own considerable expertise in the fields of biochemistry,

optics, animal and human physiology, electronics engineering, mechanical engineering, dairy engineering and automation. This unique strategic architecture gives the firm a significant competitive advantage by creating a specialist knowledge base that enables it to devise customized sensing solutions for a broad range of biological problems.

“I would say knowledge in our business comes from two primary sources. One is the wide diversity in the knowledge that the people we hire, and the second is filling the gaps with collaborations, external collaborations with organisations and research institutions that we are missing,” (Interviewee, C5).

The firm has a very flat management structure in place. There is a management team that comprises four people – a director of R&D, a director of Marketing operations, a director of Business Development and CEO. And there are four teams within the company – a research team, a development team, a marketing team, an operations team.

“We have what we call a Portfolio Management process, PMP, that we stick everything we’re doing into that process,” (Interviewee, C5).

There are usually four stages in a process of approving somebody’s idea into the final project, and,

“there are four criteria that we apply; one is strategic, does it fit strategically with our company’s vision and where we’re heading; the second area is financial, what kind of returns can we expect to get from it; the third area is related to the probability of commercial success. So that’s basically a market risk category, and the fourth one is the probability of technical achievement,” (Interviewee, C5).

Business strategy process is unusually informal,

“...employees were encouraged to learn to act informally toward each other. We do not want a strict hierarchy or a strict line of reporting,”

Knowledge and information is shared in formal training programs for the employees through written documents, but also,

“Usually while playing cards, we talk about the future directions of the firm... I’ve got a great team, we’ve got a bunch of really open minded people, and they’re the kind of people, somebody throws an idea out on the table, everybody else starts beating it around and punching holes in it. And there’s no ownership, it’s not my idea, it’s a very open sort of approach.” (Interviewee, C5),

This “unordinary” approach had been a core rule of the firm that has been successfully exploited over the years, while the company continuously refined its ability to produce products that are the leading edge of technology. The firm takes very proactive approach

“We’re always looking to find areas where our expertise can be applied, where there’s no solutions yet, so we’re constantly looking for technological advancements in foreign markets,” (Interviewee, C5).

Technology Transfer

The firm believes that there is no real protection for its technology and it deals with this issue on a daily basis. Even potential customers are able to steal their ideas and apply them to their own products. Financially the firm is not in a position to fight this.

“There is none [protection], it’s a total risk. When we find somebody that’s interested in one of our technologies, we obviously sign all the non-disclosure agreements and everything, but my opinion is that they’re not worth very much. I mean if somebody has your idea, they’re going to use it, and frankly you can’t do anything to stop them,” (Interviewee, C5).

However, the firm tries to maintain trade secrets because they regard the products they develop to be complex in nature and not easy to replicate.

“There’s a lot more to our technologies than just replicating the physical design, so we have a little bit of protection in say the software or the chemistries involved, we try to keep that a trade secret as much as possible,” (Interviewee, C5).

The technology development process is a part of their future internationalization strategy because they continuously look to find areas where their expertise can be applied, where there are no solutions yet, particularly in technological advancements in foreign markets.

Summary

This New Zealand-based research and technology subsidiary of two international firms has its main capabilities in science and innovation. The firm does not distinguish between its domestic and international markets and is open to new challenges. A pioneer in its specialist field, it is one of the first firms in the world to specialize in the commercial development of intellectual property in the field.

5.3.6 Case Company #6 (C6)

Firm Characteristics

The firm is privately owned and exports 90% of its products worldwide to over 50 countries and 6 continents.

“We were approached 22 years ago by a company, which was specialising in manufacturing of metal componentry for the veterinarian market. And we are part of a larger group, which is primarily into engineering,” (Interviewee, C6).

Since 1982, the firm has delivered high quality, reliable and durable animal health applicators to leading animal health providers. Today, the firm continues to lead the industry through design, materials and manufacture in a unique clean room environment for distribution around the globe. Production flexibility allows a high level of product customization for the market, and promotional requirements. The firm’s unique plant and production facilities are still the only one in the world to have clean, dust-free facilities to assemble their products. The firm aligns with consumer demand for a clean environment and quality assurance requirements.

Internationalization Process

The firm's business activity heavily relies on an effort of their people to continually looking at refining and upgrading their products.

“That’s certainly been the philosophy of this company here, is that we do have a very ‘can do’ [attitude] and a willingness to try and explore different opportunities,” (Interviewee, C6).

They continually introduce new products to the extensive range of high quality, reliable and user friendly applicators designed with the user in mind and the diverse conditions used throughout the world. Product and manufacturing flexibility allows the firm to highly customize product in recognition to the customer's individual requirements as well as individual markets.

Research and development is vital to the firm's success. Their sales team travel extensively to markets to gain first hand experience and gather ideas from customers incorporating these into the developing programs. With the 'Clean Room' facility, and using state of the art design and production techniques, the firm is committed to supplying products that will serve their customers needs now and in the future. As the world leader in animal health delivery systems,

“we’re dealing with large pharmaceutical companies,” (Interviewee, C6),

and with its international network of agents provides customers with seamless response to any enquiry, linking local knowledge with their specific expertise.

The philosophy that underline all their business activities and what is regarded as being the key requirements for success in doing business from New Zealand, is

“Preparedness to travel. You must have a willingness to visit markets. Having very good understanding of your costs, and your structure, and being able to minimise your costs, while also being able to deliver innovation. Again I think it really comes back to just a real ‘can do’ attitude and preparedness to listen to what the customers require and

adapt,” (Interviewee, C6). [He further admits] **“I think that we do have a very strong market presence, and we have some very good product in the marketplace which would be testament to the fact that we do have some very good R&D. But again, it could be a lot better.”**

In understanding its environment (domestic and international),

“we rely very heavily on our people, our agents and our distributors to keep us abreast of what are the local conditions. Then we do get some direction from the Board. They obviously have some ideas about what they would like to do, and that may influence how our business will operate as well,” (Interviewee, C6).

Absorptive Capacity

The firm’s perception of itself is held in terms of its management design and resources. Management is structured functionally and communications are formal, however, flexibility underlies those communications ...

“We’ve got a very young organisation, it’s very youthful, it’s got a very healthy balance in gender, it’s a 50/50 gender ratio, so there’s a lot of youth, and there’s a lot of enthusiasm here. And very flexible in decision-making, and also we are very, very open to listening to the sales and marketing team. Sales and marketing who are different to our technical people, but there has to be a real balance.” (Interviewee, C6),

The firm recently established a program for rotation and training of R&D personnel.

“Skill matrix I’ve written up there. And that is, very, very simple, very, very crude, but very effective; is just really looking at each department, and saying what are the critical tasks that need to be performed in each department, and who are the current incumbents that can perform those. And then what we do is that if we do that department by department, and we amalgamate them, it will be very surprising to see where the holes are, and where there’s been an overlap.” (Interviewee, C6).

Technology Transfer

Before any product is sent to the customer or distributor, the confidentiality agreement is signed. Further, the service of a legal firm is regularly used for the patent matters.

“and non disclosure agreements, when we’re working with other companies, and also we’re very, very strict about which personnel from each of those companies receive that information,” (Interviewee, C6).

The firm avoids markets where they feel there is a higher threat of a product being copied. The firm tends either not to go there, or not to put the latest designs into the market.

The technology development process is a part of future internationalization strategy of the firm to the extent that the firm has been moving away from their basic concept. Staying still in the same industry, and still going to the same market, the firm tries to be a step ahead and anticipate the future needs of the market.

Summary

This firm fits into a category ‘traditional’ firm, which has developed its domestic market first, and then explored and expanded into the foreign markets. The firm currently exports 90% of its products worldwide to over 50 countries and 6 continents.

Research and development is essential to the firm’s success coupled with their sales and marketing team efforts to travel extensively to gain first hand experience and gather ideas from customers integrating these into the developing programs.

5.3.7 Case Company #7 (C7)

Firm Characteristics

The firm manufactures a range of animal management and business security systems and has over 65 years of experience. What began in the 1930's as one man's ingenious mechanical solution to the practical challenges he faced on his farm in New Zealand has since grown into a multi-faceted, multi-million dollar business that currently distributes products to over 130 countries worldwide. It is still a family owned firm.

The firm continues to build on its world-class standing with product innovations that reflect an emphasis on quality and reliability, backed by practical 'how to' customer advice. The firm's success is attributed to their expertise in product innovation, astute business practices and adherence to their core values of ingenuity. Strong brand management is a core role of marketing in the firm, and it is achieved through active participation in trade shows and conferences through a good presence in electronic and print media.

Internationalization Process

The firm is aware that farming is undergoing significant and continuous change, brought on in part by the ongoing drive for improved profitability. Amongst these changes is the demand for timely, relevant on-farm information. The firm has responded to these needs with the development of 'Smart' products that incorporate advanced communication technologies. Advanced remote communications technology has been integrated into the products with the introduction of the SmartPac remote. Further, the demand for reliable livestock management information has cumulated in the development of a unique range of weighing systems.

The firm continues to draw on its proven skills in research and development and manufacturing to deliver superior systems and products. They use their extensive and successful international distribution network in more than 130 countries to

deliver those systems and products to the world. Distribution channels primarily consist of networks of regional offices, joint ventures and independent third party distributors.

“It [international presence] started in the ‘60s and some networks are still being set up today in other parts, but for animal management our networks are very well established. There is still work being done in eastern Europe, starting to be done now, and also in South America. So there are some parts of the world where we haven’t got a great presence.” (Interviewee, C7).

The firm has a very proactive approach to the international activities.

“We are actively pursuing new markets, and they are made, the priorities are made on a number of things such as the environment, the people that we can partner with, and how compatible they are with us, and how likely they are to succeed. So there’s a number of factors, not just about the size of the market, but how difficult it is to establish that market, and what linkages that we have that we can take advantage of,” (Interviewee, C7).

The key success factor in their international activities was in establishing and maintaining a distribution network.

”The key elements to our success have been setting up a loyal distribution network, ones where they are committed to us, and we are committed to them. What’s worked very well in the past is that, the people in the distribution channel have had ownership of that channel, we have joint ownership, so there is total commitment in the market, and total commitment here to deliver,” (Interviewee, C7).

Strategic direction is set by

“clear global direction. So, R&D needs to market led, and I think the linkages between R&D and the market need to be well established,” (Interviewee, C7).

Absorptive Capacity

Management is structured functionally and communications are formal, however, flexibility underlies those communications. Generating and gathering new ideas could come from any part of the firm and would be given full attention and discussed.

”We have a database system for managing ideas, so new product ideas can come from R&D, they can come from marketing, and they can come from wherever. In addition, they go into the system, and then once a month we have a meeting where we review those ideas, and review our priorities. And I think that’s very important [to have] internal communication and engaging as many people as possible in a new direction. And having them see...we say, right, we want a new product,” (Interviewee, C7).

Feedback from markets provides understanding of market and customer requirement and a basis for product adaptation.

“And our distributor network is a very major source, because our people in the field in the different countries, they are sending information to us all the time. Hey, you guys, you need to do this, or this is happening,” (Interviewee, C7).

They are very proud of the efficiency of their market intelligence.

“We look at what the market needs, and we build it to suit the market. we let the market...we customise or choose the products that best suit that market, and in other areas where we’ve got new things happening, we will look to those markets that are leaders in that particular field, and let them drive the development activities,” (Interviewee, C7).

Sharing and transferring knowledge has become an important part of the firm’s strategic direction.

“We rotate people within project teams for sure, and people get their chance to work with other more senior people. And that’s done on purpose, so you have a senior person overseeing the project, not the project manager, a technical person. We have peer reviews, we have formal processes around our R&D, we have four or five peer reviews of designs before they’re committed to,” (Interviewee, C7).

Technology Transfer

The firm has developed very fruitful relationships with sales networks in foreign countries. They are trained and knowledgeable about the products they sell on behalf of the firm.

“Those people are trained about our technologies, and their job is to train the store staff who sell our products, and to train farmers themselves on how to use our products,” (Interviewee, C7).

For some of the products they use the patent system but for some of them no special system of protection is in place because the knowledge, which is in those products, is hard to replicate. With patents there is apparent risk of revealing all the significant information and specifications.

“For some of our products we don’t use patents because it’s know-how that’s locked inside the product, you can’t get it out, it’s software. Algorithms. If it’s an algorithm, and it’s in code, how can you prove he actually uses it, he might have something else. That’s where software patents, haven’t done much,” (Interviewee, C7).

It was not always easy to adjust the foreign strategy to fit the changes in the technology. The firm is aware of this and consciously tries to modify present way of operating.

“And so we’re having to re-establish some of those skills, and maybe even look for alternative channels,” (Interviewee, C7).

The firm’s technology development process is not a part of future internationalization strategy of the firm because their approach to internationalization is atypical to the other case firms in this research in sense that it is more market pull strategy.

“We look at what the market needs, and we build it to suit the market. Not totally true in all instances. Sometimes we know that there are some moves around the world for electronic identification of animals in Europe. And some of the technologies around that, we and other companies will lead what those products will look like. So there the

market doesn't know, or we're looking to other markets to lead us, which will then help us put products into these markets. So, most...an established product range, we let the market...we customise or choose the products that best suit that market, and in other areas where we've got new things happening, we will look to those markets that are leaders in that particular field, and let them drive the development activities," (Interviewee, C7).

Summary

This well established firm has a long business history in the New Zealand and foreign markets. The firm strives at building its world-class product innovations, supported by practical 'how to' customer advice. The firm's success is attributed to their expertise in product innovation, adherence to their core values of ingenuity and strong brand management.

5.3.8 Case Company #8 (C8)

Firm Characteristics

This firm has a great deal of science and research 'horsepower' in agriculture. From basic research through to the applied end of the spectrum, there are scientists and technicians who contribute to the effectiveness and efficiency of farming in New Zealand. The firm works more closely and openly with the farming industry so that the wealth creating potential of the research-based findings can be more quickly and effectively realized on New Zealand farms.

The firm is focused on the discovery, development and commercialization of new and leading-edge technologies for the benefit of New Zealand's pastoral sector. They provide innovative solutions for on-farm problems and for generating a return from science via its commercialization.

"Bringing the scientific labs and white coats of science and research in through the farm gate and fitting them with gumboots and swanni's has gone a long way," (Interviewee, C8).

The ultimate shareholder of the company is the Crown⁴. The firm undertakes many transactions with other Crown Research Institutes, State Owned Enterprises and Government Departments, which are carried out upon a commercial and arms length basis.

During 2004/05 there was a period of intensive restructuring and development both onshore and offshore. During the first half of the last financial year, the firm reorganized itself from top to bottom, an exceptionally large task. Three new Science and Technology Groups were created with 15 sections within them: Agriculture & Environment (three sections); Applied Biotechnologies (seven sections); Food & Health (five sections).

Internationalization Process

Most if not all, of the technologies likely to arise from science targeting the “Five Big Ideas” decided by the firm and this will ultimately need to be delivered on farm to benefit the pastoral sector. The organization would work with the appropriate local and international agritech companies to transfer these technologies from the laboratory to the farm.

“Our international competitive advantage is being secured by a fantastic team effort led by science providers, our best farmers, vets, geneticists, consultants and trade negotiators. Our infrastructure also contributes in a major way towards this advantage,” (Interviewee, C8).

Partners will be sought in high-technology agribusinesses, human health and environmental biotechnological industries to leverage the organization’s unique capabilities and understanding of agriculture-based animals and pastoral ecosystems. This will aim to progress new knowledge, generate intellectual property and create valuable opportunities realized either through strategic research or serendipitous discovery. They seek to promote the development of:

- understanding of human diseases and conditions using large animal models

⁴ Explained in Chapter 3.

- advanced delivery sensor and detection diagnostic systems based on physics-based technologies
- environmental remediation technologies.

The criteria firm uses when selecting a market for the international activities,

“could be climatic, or it could be related to the technology itself,”
(Interviewee, C8).

There is awareness that

“the key success in doing business from New Zealand is actually understanding the market you’re going into. You must understand the company that you’re dealing with, and you must understand the customs and the way that they deal with,”(Interviewee, C8).

“Probably we have licensing at the moment with 25 countries, I suppose but with companies operating in...yes, because those companies take our technology could be global for all we know. We only go part way down the process, we very rarely take a product ourselves. We’ve concentrated on the Australia, New Zealand, US and UK market I guess,” (Interviewee, C8).

Absorptive Capacity

All business activity is managed by the Commercial Services Group, which has been restructured in the last year to include three commercial teams, each focusing on a specific science group. Under this structure, each team is charged with two main functions:

- working closely with science to generate revenue flow from commercial contract R&D,
- generating a financial return from the science undertaken in the science group via intellectual property licensing, the sale of research outcomes or partnerships with other organizations and businesses.

The Group is also responsible for the management of customer relationships, intellectual property, an internal pre-seed investment fund, and mergers, acquisitions and divestments.

Currently, 23 projects are being funded from all science groups across the firm. Of these, three are expected to be sold, seven are licensing opportunities and 13 are expected to be commercialized through joint venture partnership with nine New Zealand and four overseas partners.

“We are moving forward on a wave of knowledge. Much of this is science. Understanding our soils, our plants, our animals, our human resources and our environment has got everything to do with the complex biological natural resource we live and work in. No other industry requires the level of knowledge and know-how of its manager,” (Interviewee, C8).

Information Services supports the organization’s core business by providing technical and professional services in Information Technology and Information Management. The high-speed network is enabling the firm to implement its vision of a “virtual library”. Utilizing the increasing availability of online journals, it is centralizing its collection of books and periodicals and employing electronic document delivery to provide a virtual library on every scientist’s desktop.

The firm prepared a significant strategic plan called 2020 Science that seeks some self-determination of scientific and technological focus, rather than being almost entirely directed by external parties. For the next fifteen years the firm intends to focus on Five Big Ideas: the future dairy industry, the future meat and wool industries, pestilence-free agriculture, integrating agriculture with the environment and society, and the use of knowledge and technologies in non-pastoral areas. The firm is consulting stakeholders on its scientific and technological targets for each area.

“By 2020 we will be quite different from the organization we know now,” (Interviewee, C8).

It has a requirement to look ahead and develop long-term science goals of immense value to New Zealand's pastoral and free-standing biotechnology sectors. The strategy itself has been known as 2020 Science. "Five Big Ideas" reflect how the organization, together with its many end-users, investors, and collaborators, will create a more valuable future for New Zealand through science and technology. It will require new practices, approaches and technologies generated through an understanding of how the system works, as well as the integration of appropriate new knowledge and technologies at all levels.

International business management is structured functionally and communications are formal. The entire process of transfer and sharing knowledge within the firm is well developed.

"We have the whole thing called best practice, which is enormous, and it's on our intranet, so that's how all our polices are, and how they devolve and flow. And science is, which I call science engine room," (Interviewee, C8).

Apart from this, there are

"lots of seminars, internal seminars here which everybody can go to, and there's lots of electronic communication in this organisation. And people are out and about a lot at conferences, presenting papers and all sorts of things, it's a real academic environment actually. They're trying to work on a method now of how can we introduce other campuses, because we're here, Palmerston North, Wellington, Lincoln and Dunedin. We use video conferencing a lot," (Interviewee, C8).

Technology Transfer

The main product of this company is selling the knowledge through licensing and different modes and dealing with patents is the usual way of protecting the intellectual property of the firm.

"We would think of new countries, new markets when we had a technology that we felt was ready to take out, we would then have a look to see where to go in the world, and that's how we would look to those countries," (Interviewee, C8).

Concern for New Zealand rather than just profit is what motivates the firm.

“We would have to balance the benefit to New Zealand versus the benefit to there, so our prime objective is to benefit New Zealand, and we can do that in two ways. We can do that either by increasing the return to New Zealand through agricultural methods and products etc., or by licensing, not to our detriment, but licensing to a global company and getting the return, and reinvesting that return in royalties back into science to then help New Zealand again,”
(Interviewee, C8).

The firm is very determined to find out new technological invention globally with the aim of being one step ahead. The strategy that is utilized is technology push, rather than market pull on most occasions. The firm’s technology is taken to the foreign environment and then it is adjusted to fit the environment.

“We do technical tracks on what’s occurring globally in the areas of interest, [in] science to us, so we would keep quite an eye on that,”
(Interviewee, C8).

The technology development process is not a part of the future internationalization strategy of the firm for the reason that the development of technology is a very long process. In some cases it could take even ten years, so it is hard to say whether the internationalization process has an influence over the advancement in technology of the firm.

Summary

This is a firm that put its emphasis to help improve the effectiveness and efficiency of farming in New Zealand by providing innovative solutions for on-farm problems. It is focused on the discovery, development and commercialization of new and leading-edge technologies for the benefit of New Zealand’s pastoral sector.

A significant long-term strategic plan called 2020 Science indicate the firm that seeks some self-determination of scientific and technological focus, rather than being almost entirely directed by external parties and market.

5.4 Conclusions

This chapter discussed the results of the empirical research conducted for the study. The analysis looked at the data from the field research, gathered using interviews and additional information, in relation to the three major research areas (internationalization process, technology transfer and absorptive capacity), and initial propositions.

The firms' characteristics were presented to set the context for the study while informant characteristics confirm their position in that context. Understanding of individual cases drawn from within case analysis provided the basis for further case analysis and the findings of the research, which are examined and presented in the next chapter in the context of the internationalization process, absorptive capacity and firm's technology, being the main research areas in this research. Within the case analysis, findings were framed using the concepts and propositions proposed in the conceptual model, before focusing on international activities of the real firms and their application in international strategy process. The complete interview results are listed in Appendices D and E.

The data collection and analysis process described in this chapter was a journey of discovery in which the variety of the case firms played the main role. However, informants' eagerness and passion for their undertakings, as well as enthusiasm, innovative and supportive culture of the case firms are all common characteristics shared by all case companies, which highlights entrepreneurial ability of individuals in developing and building these firms.

Despite the individuality of each firm, they shared common features and practices. All firms could be described in terms of the concepts of the firm, environment, particularly corporate culture, and international strategy process. In addition, all the case firms employ experience from their past business activities to shape their further foreign strategy and activities. The repetition and consistency of these characteristics across firms became apparent as the fieldwork and analysis proceeded, indicating the accomplishment of theoretical saturation in turn, which provided the rationale to cease data collection. While the focus in this chapter is

on the individual nature of each firm, those features that case firms shared provided a basis to continue the analysis. In order to gain an understanding of common features across the cases a process of across case analysis was undertaken, as explained in the next chapter of this study.

6 Chapter Revisiting the Conceptual Model Using Across Case Analysis

This chapter analyses and presents the results of the empirical research conducted for the study. The aim of the analysis is to examine the meaning and implications of the results in order to generate substantial theory and compare a proposed conceptual framework with the field results. After a brief introduction in Section 6.1, Section 6.2 presents across case analysis in relation to the three major research elements proposed in the conceptual framework, namely, internationalization process, absorptive capacity and technology transfer, and initial propositions put forward in Chapter 2. Next, the discussions developed in previous sections facilitated the development of a revised model of the internationalization process presented in Section 6.3. Section 6.4 concludes the chapter.

6.1 Introduction

The data generated by the interviews was summarized by the way in which firms varied in their internationalization strategies. From within-case and across-case comparisons the various factors associated with the main research areas are firstly categorized according to the key themes which have been identified during the analysis process. The relationship between each main category and the various sub-categories are then identified. Finally, at the third level of analysis categories are integrated to shape the theory around the central phenomena: the relationship between firm's technology and international strategy, on one hand, and the firm's absorptive capacity and international strategy, on the other hand, which led to the development of the revised model.

The general incremental character of the internationalization process and strategies and procedures engaged in that process is a fundamental assumption of the proposed conceptual model (explained in Section 2.5.3, p. 94). In order to capture the process,

the study is designed to focus on an incremental internationalization commitment, having a focal point on the firms with leading-edge technology and pioneering and ‘revolutionary’ undertakings.

This chapter describes the across case qualitative analysis undertaken in the study and the understanding that it generated of the internationalization process among the participating firms which led to the development of the revised model. In the undertaken analytical process the disparity between that, which is specific to individual firms, the idiographic, and those qualities that are shared across firms, the nomothetic, were reconciled (Cronbach, 1975). In keeping with the phenomenological methodology fundamental to this study, informant experience, expressed in their own terminology, provided basis for the understanding of the internationalization process that is common across firms.

The preliminary propositions put forward in Section 2.5.3 (p. 90) are based on the premises that (1) the current firm’s technology influences the internationalization process and that it drives future internationalization strategy of the firm, and (2) the more experience the firm has of acquiring foreign market knowledge, the more absorptive capacity it will develop. Having increased absorptive capacity enables the firm to develop an ability to recognize new opportunities.

6.2 Across Case Analysis

6.2.1 Internationalization Process

It was noticed that informants perceive the business environment in terms of their markets or their products and understand the requirements of their prospective clients. In some firms, these perceptions were drawn from the relationships with, and by the input and suggestions of the distributors, agents and partners in a particular market. Other firms appear distanced from their environments by the management procedures

and contractual arrangements, with their opinion filtered through these channels. However, whether in close relationships in the markets or distanced from them, all firms have a grasp of changing the market needs and see this change as an opportunity to grow their sales in the *existing* markets.

The general incremental character of the internationalization process and strategies and procedures engaged in that process is a fundamental assumption of this research. Respondents actually engaged in foreign operations and R&D activities in the firms were asked questions related to their international experience. Informant experience expressed in their own terminology provided the basis for the understanding of the internationalization process that is common across firms.

International Strategies

Since all the management decisions with long-term effects are defined as strategic, Ansoff's Matrix was used as the theoretical base for categorizing the case-firms' market growth strategies. This section derives from the focus on strategies for growth relative to the four quadrants of Ansoff's matrix (Ansoff, 1965): market penetration, market development, product development and diversification strategy, which is a result of the combination of two criteria: product and market, shown in Table 6.1. This framework was used to categorize growth strategies and then relate them to the internationalization process because 'product' is ultimately related to the firm's superior technology, and 'market', in which case firms operate could be considered to be specialized, again in relation to the technology used for producing the particular products.

Table 6.1: Ansoff's Matrix

	Current Product	New Product
Current Market	<u>Market Penetration</u> No change in product No change in market potential	<u>Product Development</u> Product modification No change in market potential
New Market	<u>Market Development</u> No change in product Change in market potential	<u>Product Diversification</u> Product modification Change in market potential

Source: Adapted from Ansoff (1965)

An essential requirement of survival and further growth of any business is “successful” adaptation to the environment (Watts, Cope and Hulme, 1998). In contrast, failure in business is more likely to be the result of inability to learn about the changes in the environment and ultimately to adapt to them. The questions interwoven in this research are “Do New Zealand high-tech SMEs have an ability to successfully adapt in the new business context? And how does that influence their international strategy?” In this context, strategy might be proactive in nature, or reactive. SME strategy is often characterized as primarily “reactive” (Fullert, 1994) because of limitations of strategic alternatives available to the small firm primarily of such factors as small market share and limitations of resources and skills.

When asked about the strategies used in their firms, all respondents placed a high priority on finding new customers for their existing product range in a current market, **market penetration strategy**; the second preferred option, **product development strategy**, was the offering of new products to existing customers (C1, C3, C4, C6, C8). Three of the firms (C2, C5, and C7) gave a priority to the offering of current products in new geographic/demographic segments, **market development strategy**, and none of them gave a priority to **product diversification strategy**, which seemed not to be a favored strategy by the case firms. However, when market growth strategies are concerned, the case firms acknowledged following strategies in the order of priority:

- 1. Product development strategy** – change the products and sell in the existing markets
- 2. Market development strategy** – sell a current product in new demographic and/or geographic segments.
- 3. Market penetration strategy** - sell a current product in a current market.
- 4. Diversification strategy** – modify the current products and expand to the new markets.

Some participants believed that there is no reason why a strategy of market penetration should not yield significant growth. A further explanation might be that at least some of the case firms did not have an articulated international business strategy in the conventional sense (C3 and C4). Yet there is a convergence between firms on the second most preferred strategic option – product development/existing market – indicating their solid commitment on product innovation as a main strategic thrust.

Some firms placed an emphasis on finding new markets/customers without doing any modification on their products, motivated purely by climatic and cultural similarity using a market development strategy (existing products to new markets) as a preferred strategic option. This could be explained by the nature of the market in which these firms operate and by the nature of the technology they possess. No case firm placed its main emphasis on diversification (new products in new markets). Their strategic choice appeared to remain focused in their core specialization.

Six of the eight firms in the sample favored a market penetration strategy, indicating the restricted growth potential within their initial core markets because potentially they are reaching a saturation point in the existing markets. A common element of all companies is their consistent innovative market approach when they enter new market segments or develop new product/services. In the specific language of Ansoff's Matrix, it is suggested that for firms in this research the most common international strategies might be product development and market development. This claim might be justified by the finding that firms with the available technology are

able to change/modify products and sell in the existing markets, as well as to sell a current product range in new demographic/geographic segments. The findings of the study suggest that firms increase their chances of success if they combine future orientation with organizational adaptability and flexibility.

After analyzing the case companies what became clear was the frequent occurring of “chance” events causing changes in business direction (see Table 6.2). “Chance” is one of the elements that Porter (1990) included in his ‘diamond’ of competitive advantage of nations. On the other hand, there was clear evidence among some firms (Case C2, C7 and C8) of a consistent strategy with relatively long-term horizons. All of the case firms are examples of successful “adaptation” products and/or strategy. However, some of these are clear examples of “strategy that happened” (Porter, 1990), rather than the deliberate, logically planned strategy.

In addition, the term “scatter-gun” was identified by some respondents when they referred to their firms’ strategic approach. This means unplanned activities when firms take the opportunities (Enderwick and Akoorie, 1996). Further, “herd behaviour” is a term suggested by some respondents as well. Knickerbocker (1973) identified the same approach and named it “follow-the-leader” behavior. Furthermore, “climate/culture considerations” and “market intelligence” are terms used by the respondents to describe their firms approach to international strategies.

Table 6.2 shows the themes that emerged from the analysis in the findings.

Table 6.2: Cross-Case Characteristics and Strategies

Case	Understanding the Environment	International Strategy			
		Opportunistic practice (“scattergun”)	Follow-the-leader behavior (“herd behavior”)	Climate/culture consideration	Market intelligence
C1	Relies on distributors			“Climate; if people do not grow fruit – there is no interest for the firm.”	“Achieving adequate market intelligence and setting up sales network.”
C2	Partners and observations	“If they pay...”			“To learn more about those countries. We know next to nothing about them, so the market demographics of those countries would be the first step.”
C3	Relies on markets’ feedback	“They do a bit of a scattergun”			“Key is to find the right people.”
C4	Through the farmers’ needs		“Then, if they still have significant influence over ... in terms of management, we could end up in that position to follow them.”	“Climate and exchange of personnel (to understand a culture and determine if there is a relationship).”	“Maintaining effective information on the market and communication with the sales out there. Market feedback on products or information is extremely important.”
C5	Relies on the two parent firms	“Are they willing to buy?”		“Cultural similarities both in the way, the language, the culture, the way they do business.”	“Distributors with similar vision and goals.”
C6	Relies on international network of agents	“We end up putting distributor in place and push them into different alliances that they may not have done if they’d thought	“if they want to resource a lots of milk supply offshore and to produce that in South America in an efficient		“Knowledge and networking, finding contacts that you can work with, so very much a network approach.”

		about it long and hard.”	fashion. This would give us a reason to re-think our strategy.”		
C7	Relies on distributors, partners			“Business relationship with the similar companies.”	“The key is understanding the market.”
C8	Relies on partners			“The way they do the business, and climate, of course.”	“Investigating the market: our own experience with going into the market and we’ve used firms who’ve been advising us on a go-to-market strategy.”

Discussion of these characteristics and concepts across cases was a necessary stage in understanding the data collection as a whole. All firms sought to deploy their resources in the environment through international operations using a strategy process which is founded on some form of ‘vision’. In some firms, the vision is formally developed and communicated, while in others it is held in the minds of proprietors and management teams. In all firms, this vision provides the framework for the formulation and review of objectives and operational strategies.

Across the case firms, international strategy processes range from regular planned procedures for strategy planning and review, to those which are irregular, informal and prospective, allowing them to quickly respond to opportunities and threats. As suggested by Enderwick and Akoorie (1996, p. 338) “international development [in New Zealand] had been the result of formal planning and opportunistic practice.” Some respondents referred to the strategies used by their firms “herd behavior” strategies. The same approach was identified by Knickerbocker (1973) who called it the “follow-the-leader” behavior.

In all firms, implementation of strategy in international activities is integrated with the firm’s distributors/agents/partners suggestions. Commitment from agents and the

firms' relationships with them was perceived as a critical success factor in the foreign process. Undeniably, for some firms the building and sustaining personal relationships and networks of relationships were a strategy in themselves.

6.2.2 Absorptive Capacity vs. Foreign Strategy

This section discusses the themes that emerged from the analysis in the findings and links them to the extant literature in an attempt to offer new theoretical explanations of the relationship between absorptive capacity and a firm's strategy. The objective is to investigate the relevance of previous knowledge to the formation of absorptive capacity in a firm and ultimately its impact on the firm's internationalization process and foreign strategy. More specifically, do firms initially internationalize, gain knowledge, build absorptive capacity and then become more successful at internationalization, or do they build absorptive capacity in the domestic market, gain information about external markets and then internationalize?

As discussed in Chapter 5, the Table in Appendix D summarizes the characteristics of the case firms. These descriptive characteristics are derived directly from the data provided in interviews with each participant. This provides the foundation for further comparative analysis and theory building about internationalization process and absorptive capacity. Examination of firm characteristics indicates that the majority of firms have international experience and that the significant percentage of their total production is sold internationally. Although these firm characteristics confirm their suitability as a sample for the research, they do not provide the depth and insightfulness of understanding required to examine the internationalization process of firms. For this, the richer material provided by informants were used and identified emergent themes which are explained in the next sections: firm's R&D intensity, market knowledge, and organizational structure and communication in the case firms.

Firm's R&D Intensity

Cohen and Levinthal (1990) claim that the ability of a firm to recognize the value of new, external information, to assimilate it and then apply it to commercial ends is critical for its innovative capabilities. Building on Cohen and Levinthal's (1990) claim that investment in internal R&D contributes to absorptive capacity, this research posits that there is a positive relationship between investment in internal R&D and output based on new technical developments. This is due to technical benchmarking against other successful products, leading to a better understanding of the firm's external environment and to developing the ability to identify and value new information.

Research shows that firms that conduct their own R&D are better able to use externally available information (e.g., Tilton, 1971; Mowery, 1983). There is a high degree of satisfaction with the R&D investment across the case companies for several reasons: according to the annual reports, the firms regularly make profits, they possess a number of important technologies and an exceptional knowledge, and the protection of valuable knowledge is a central issue. There is a clear awareness of the limitations of being a small firm and the recognition that relying on government support from time to time is necessary. However, this is only related to how to promote and foster R&D rather than how to develop the mechanisms and means to detect new opportunities. All case firms emphasize the importance of human resources, which is comparable to the investment in the R&D projects they undertake.

“Our company is based on R&D, so I always say that my intellectual property walks out the door every night, in the heads of my scientists and engineers,” (Interviewee, C5).

“We're a R&D company, so that's what we do, we use people's intellect; our product is the outcome of intellect,” (Interviewee, C8).

All of the case firms were SMEs by New Zealand and OECD definition (see Section 1.5, p. 19); the lack of people with a focus on the areas other than R&D and with diverse knowledge is an acute issue.

“My biggest hindrance is human resource. I don’t have people to spend the time on crossing the t’s and dotting the i’s, [We need to] get the assistance that’s required,” (Interviewee, C6).

As one of interviewee said, the dairy industry participants are very conservative and resistant to change.

“Within the dairy industry there’s a particular mindset, which makes it very resistant to change,” (Interviewee, C4).

Clear direction and getting people (scientists and engineers) to know where the firm is heading is part of this firm’s strategy.

“R&D needs to be market led, and the linkages between R&D and the market need to be well established, so that you can engage as many of the technical minds as possible. There aren’t people that are used to going into the market,” (Interviewee, C5).

In contrast to the small firms, this medium sized firm utilizes in full its ability to take advantage of the marketing department.

“We have regular market visits for sales and marketing people, we are just in the process of setting up a roadmap of where we want to go in the future with products. And then that’s communicated to R&D. Occasionally we take R&D people into the market with us, to help the communication and knowledge sharing,” (Interviewee, C7).

Working as a marketing manager, this mechanical engineer was the only informant demonstrating interest in developing knowledge about the markets’ needs which could potentially lead to building functional resources and non-core capabilities in the firm.

In conclusion, the empirical analysis of R&D intensity suggests that firms are sensitive to the characteristics of the learning environment in which they operate. Absorptive capacity appears to be part of a firm’s decision in allocating resources for

innovative activity because their focus on R&D lets them absorb related external knowledge and information, assimilate it and apply it to their products successfully. However, having a focus on merely R&D the majority of firms do not have well developed marketing and sales means, which puts the commercialization of their products at risk.

International knowledge

The results confirm an apparent risk associated with the experiential knowledge and experimental mode in the process of internationalization of the high-tech SMEs.

“Probably our easiest relationship at the moment has been into America where there’s a lot of cultural similarities: the language, the culture, the business,” (Interviewee, C3).

The analysis shows that in the process of internationalizing, the key requirements are maintaining effective information on the market and maintaining effective communication with the international networks and the relevant groups in New Zealand in order to gain experiential knowledge on individual clients and markets. This means that some firms constantly develop and expand their knowledge base, although indirectly, through networking.

“We’ve got quite deep networks ourselves that have come from years of experience, and there are the networks that the distributor has given us access,” (Interviewee, C2).

“We have been setting up a loyal distribution network. They are committed to us, and we are committed to them. The people in the distribution channel have had ownership of that channel. We have joint ownership, so there is total commitment,” (Interviewee, C7).

However, activities and presence abroad entail costs because the majority of case firms rely on agents and distributors. These costs are related to collecting, encoding, transferring and decoding knowledge, as well as changing processes and routines in

the organization. Transferring a firm's business goals and culture and finding a distributor whose aspirations correspond to the firm's, is even more difficult and more costly. Balancing available resources and the firms' goals might be a constraint when expanding knowledge and long-term goals are concerned.

“Nurturing the relationship with our distributor has become an essence [sic] in our existence abroad. And this costs,” (Interviewee, C8).

It is evident that learning takes place to varying degrees within the firms. Some firms have learnt from earlier decisions and developed strategies to help build future competitiveness. The 'stages' models of internationalization indicated the presence of a forward-moving process for firms with increasing levels of overseas commitment. Some firms took a more gradual approach to exploring and exploiting new markets. On the other hand, the findings demonstrate that other firms focussed on foreign markets from the very beginning because

“...it was deliberately set up as a global business, that's because the technology is a global technology, and the whole approach was to look at it as a global opportunity,” (Interviewee, C2).

Some firms set out to exploit new markets quickly by developing new products before the competitors moved in. However, some follow others showing a 'herd behavior'.

“I think potentially, if “X” firm decides that it's going to resource offshore and to produce there, then, we could end up in that position to follow them,” (Interviewee, C4).

The findings from the study indicate that the 'stages' models may not adequately address the dynamic nature of internationalization processes whereby firms are faced with varying degrees of risks and opportunities on a continuing basis.

“It can be a bit of minefield. We do not know much. We haven't really investigated this ourselves, because resources have not allowed us to do this,” (Interviewee, C5).

Internally, managerial perceptions of risk, available resources, both human and financial, and commitment to accessible international activities as opposed to opportunities domestically was one of the key issues in this study. Further, even though there is a general decision of the international expansion, the majority of the case firms had expressed a concern about numerous factors related to the foreign markets.

“When pursuing new markets, the priorities are made on a number of things such as the environment, the people that we can partner with, how compatible they are with us. It is not just about the size of the market, but how difficult it is to establish that market,” (Interviewee, C8).

It appears from the results of the study that firms internationalize at different rates, through different routes and because of different learning experiences. Some firms may well have a forward momentum from the pre export stage to a more committed approach. Even though they understand the need to commercialize their products, some firms have not done much about it, particularly from an international perspective. It would be perhaps more difficult to model internationalization strategy than the existing ‘stage’ models may have suggested. This finding justifies the purpose of the research to extend the existing literature on internationalization process by analyzing the effect of the accumulation of knowledge in firms on the formation of foreign strategy.

Knowledge about the emerging markets of CEEC

The informants were asked a set of questions about their knowledge, involvement and experience in the emerging markets of CEEC with the main objective to learn about their foreign market knowledge beyond the markets where they are actively involved and beyond everyday activities related to R&D process. The purpose was to determine whether the firms have an ability to acquire, assimilate and exploit new knowledge outside the area of expertise. The results indicate that the informants’

perception of the region is quite limited, based only on the assumptions and not sufficient to be of any workable value. In majority of cases, no knowledge at all is evident about the needs and demands in the CEEC's market. Some firms leave an open likelihood in the future for new developments which might involve the CEEC region.

“[There is] not much knowledge about the CEEC market – mainly toward Western Europe,” (Interviewee, C1).

Most firms not having adequate knowledge about the market ignore the fact that there might be a potential for expansion; they are not even curious about exploring new prospective markets.

“We haven't focused there [CEEK market] at all yet. We're probably slightly guilty of not having done a thing... So, maybe it's just ignorance,” (Interviewee, C3).

Allowing that there is very limited understanding of the markets in the region, one informant acknowledges that,

“one of the first criteria would be to learn more about those countries. We know next to nothing about the countries in the region,” (Interviewee, C5).

The finding that the majority of case companies would rather leave foreign companies to initiate first contacts is discouraging. A vague and ambiguous interpretation of what is known about the region is shown in the following citation which confirms the previous claim that unsatisfactory and poor knowledge about the market is dominant and widespread among the case firms.

“Some parts of that haven't settled back down politically, so I guess you would have to be very cautious that you went into a country that was relatively politically unstable. And then make sure that you weren't selling something that was really hi-tech when somebody might still be ploughing with a horse,” (Interviewee, C3).

When asked about the perception of the main obstacles or difficulties for their company when operating in CEECs, several informants admitted their unawareness of the situation in the region. Following are some citations:

“Gee, I don’t know how to answer that question. I’ve just not thought much about those markets and I don’t know much about them,” (Interviewee, C5).

Assuming that specialized R&D companies have outstanding knowledge about laws on technology, patents and quality standards, including those in the CEEC, the answers given by the informants were quite surprising because they either relied on the specialized agency to investigate this issue for them, or had some supposition.

“We would just go straight to our patent attorney to find out. We do technical tracks on what’s occurring globally in the areas of interest, science, we don’t understand necessarily how we protect ourselves into those countries,” (Interviewee, C8).

The findings indicate that accumulated international experience that affects both business knowledge and institutional knowledge is not related to specific country markets. It is a firm-specific experience relevant to all markets. Furthermore, the results illustrate that New Zealand managers feel that a lack in knowledge of language and/or culture might be a problem in the internationalization process. Examples drawn from the interviews with informants range from a deficiency in knowledge of language, culture and markets, to the total misunderstanding of the state of the economy and even to assumptions that the CEEC market could be a threat to New Zealand agriculture. However, the lack of knowledge of a particular market does not necessarily indicate low absorptive capacity. Firms cannot have extensive knowledge about every market. This is more about having an ability to recognize new opportunities and the ability to exploit them, rather than deliberately filling in the gaps in knowledge to develop the absorptive capacity.

Organizational Structure and Communication Systems

A final theme emerging from this data relate to organizational structure and communication systems in the case companies. Some experiential knowledge is located in the firm in its decision-making routines and structures. Firm success or failure is a function of the resources and capabilities in the firm, deployed by managers, developed and executed by the organization, based on the perception and experience of all employees. However, whether employees have their say in a decision-making process and whether they willingly share their experience and knowledge depends on an organizational culture in the firm. Outcome-based knowledge is invested in the organizational routines and processes but there is also a reason to assume that organizational structure which facilitate the knowledge and experience sharing 'embodied' in the employees might influence the internationalization process of a firm.

The firm's organizational structure in several cases had several clearly identifiable layers of management and formal communication processes between the layers and across the firm. This formality has resulted from specific strategies adopted by the firms to improve control and manage growth. Even though they might have a very formal decision-making process, some firms have a very informal way of sharing knowledge/information when R&D is involved. In other cases, there are few layers of management and their decision-making process is informal. In all cases, this relative formality of organizational structure appeared to extend into the international strategy process and the communications underlying international perceptions. In the companies where investment in R&D is relatively high, scientists are usually involved in marketing.

“It's heavily scientist based culture. Innovation/science first, technology and commercial opportunity second. Scientists are running the firm,”
(Interviewee, C1).

However, some firms, while having formal organizational structures with layers of management were able to operate using flexible strategy processes and appeared

responsive to formal and informal, and external and internal elements of R&D and international activity outcomes. In all case firms, innovation is very encouraged.

“We have what I call science engine room. Scientists are rewarded on the number of publications...the more eminent you are in science, the more money you’re able to pull,” (Interviewee, C8).

A company that encourages suggesting new ideas has a very transparent communication.

“Anyone with an idea can do this [approach and suggest]. Communication is transparent,” (Interviewee, C6).

The importance of sharing information and interactions between people is evident in all case firms and there is no feeling of competition between R&D people, rather a feeling of support and enthusiasm about sharing the ideas.

“The environment is designed so that everyone has to meet other people and talk,” (Interviewee, C3). And **“Intranet is a starting point; there are a lot of publications, peer reviewing of journals; seminar series; an internal library. There are strategic discussions as to research directions and what the problems are in the industry,”** (Interviewee, C4).

In the other example, a lot of informal kind of discussion is evident, which form a foundation for a very open communicative environment. The main factor that encourages and facilitates transfer of knowledge in the firm is:

“[There is] a sense of excitement within the team about what we’re doing, and that people want to share and hand on information,” (Interviewee, C5).

The changes in the external environment, which may have potential impact on the firm, are monitored very closely.

“Scientists watch. Regular journal prescriptions, a very good library, a key word, many automated processes there. Journals for light reading, sitting around on our coffee tables,” (Interviewee, C1).

In conclusion, the empirical analysis of communication systems in the firms suggests that all firms have built the learning environment in which they share information related to R&D, which help develop firm’s absorptive capacity. On the other hand, having a strong focus on their core specialization and the lack of people with specialty in market research and marketing were identified as the main constraints when exploring new foreign markets. This challenge fostering the firms’ abilities to recognize, assimilate and exploit/commercialize new opportunities and increasing the absorptive capacity in the high-tech SMEs. This research found that current foreign activities result in a stream of factors related to the firm’s absorptive capacity which are instrumental in shaping and driving future international strategy.

6.2.3 Technology Transfer vs. Foreign Strategy

R&D-based technologies, technology transfer, the knowledge and experience necessary for planning, establishment and operation of production is increasingly becoming a fundamental element of a strategy of the firm. Since technology transfer involves the whole range of activities, its effective management is increasingly associated with continuously acquiring and mobilizing knowledge and technological advances. Success depends on creating new knowledge and on having the capabilities to react quickly and effectively to change in the environment and to respond to new opportunities promptly. Similar to innovation, technology transfer is an extensive, complex and dynamic process which is affected by interactions between various factors deriving from many different sources. Equally important or even more important is the issue of protecting technology particularly in the international environment which was explained in more detail in Section 2.3.2 (p. 51).

In the process of technology transfer the emphasis is on the acquisition of knowledge where intellectual property protection plays a vital role. This means that technology

transfer is not the same as exporting goods. Transfer can take place through a number of different channels and mechanisms including licensing, franchising, subcontracting, joint ventures, co-operative research arrangements, sale of turn-key plants, exchange of scientific and technical personnel, science and technology conferences and trade shows.

Table 6.3: Technology Transfer Distribution by Mode

Modes for technology transfer	Main objective	Case companies
Licensing	Transfer of intangibles or property rights	C2, C1, C5, C2
Franchising	Licensing of an entire business system as well as offer of property rights	-
Contractual agreements - subcontracting	Types of agreement ranging from the purchase of components to the complete production of specific products.	C5, C1
Turnkey	Rapid transfer of complete sets of equipment and machinery	-
Exchange of scientific and technical personnel	Transferring personal experience and knowledge	C4, C1, C5
Joint ventures	Joint interests in the projects	C7, C6
Co-operative research arrangements/joint programs	Project specific complementary resource sharing	C5, C1, C4
Exports of equipment (including know-how related to its setting up)	Profit	C7
FDI	More extensive control over know-how	-

The evidence presented in Table 6.3 above shows the relevance of contractual modes in transfer of technology. The evidence shows, first, the importance of the agreements in terms of the variety of the businesses involved as well as their priorities in the economies of the target countries; second, a strong preference for non-equity forms of technology transfer such as licensing and various contractual agreements, rather than FDI or export; third, the only two cases of an equity joint venture (JV) were with a minority interest on the part of the transferor; fourth, all case firms concentrate their investments more in other advanced countries rather than in less developed countries (see Appendix D). This may be a result of limited horizons, risk aversion, the influence of ‘psychic distance’, and specific to the sector being studied.

Typically, internationally oriented SMEs have problems in terms of resource acquisition, especially in relation to capital and management skills. Two key issues here were shortages of capital and managerial skills. Small firms typically do not have specialist executives to manage their international operations, nor do they possess a hierarchy of managers through which complex decisions can be filtered. Patel and Pavitt (1997) claim that influencing factors on the internationalization process include *management attitude towards internationalization* strategy and dispersion of technological capabilities. Decision-making process in internationally oriented SMEs is likely to be personalized involving ad hoc, based on individual perception, short-term horizons and prejudice. A shortage of management time means that firms will take short cuts rather than properly evaluating alternatives. The horizons of small firms are limited by managerial constraints and there is little 'global scanning' of opportunities.

Moreover, all case companies produce specialized high-technology know-how which takes a relatively long time to develop. As one of the case firms commented:

“It’s almost 10 years from the idea to when it comes out the other end. Science is a very long process,” (Interviewee, C8).

The majority of the firms face a general problem of capitalizing on in-house knowledge. They need external funding to develop their ability to commercialize their innovative capabilities. Since going to market can be risky, firm-to-firm deals are often chosen to extend their range. Equity (joint ventures) and non-equity (licensing deals, alliances) routes are often used as a means of leveraging technology in a way that may be less risky.

The key technologies transferred are efficient small-scale technology, specialized custom built or small lot production technologies and 'opportunistic transfer' of technologies. Even though the case firms are SMEs which because of their small size are flexible and able to make rapid strategic moves, they often lack specialized staff

which constraints their ability to make efficient international technology transfers. The findings show that the means of technology transfer in these case companies was very informal with one exception. Case firm C8 has a more formalized process of technology transfer which may be attributed to that company's management style. Most of the companies made limited use of written instructions partly because they have a limited number of people who are capable of codifying the technology. In addition, many of the skills in the case companies have been acquired through personal experience. Sending technical experts abroad to aid in technology transfer is much more difficult and written instructions are used much less frequently, relying on the outside agents and distributors to research market and suggest the appropriate strategy as well as to train the buyers of firms' technology.

The case firms in this research deal with the technology protection issues on a daily basis because of the specific technology and product range they develop. *Technology transfer is a part of the business strategy of the firm* since they protect the valuable knowledge which is embodied in their products. When asked how technology transfer and knowledge management are organized and what techniques or strategies are used by a firm to 'safely' transfer technology, informants offered a variety of answers.

"A lot of the knowledge in the company is unable to be protected, and so you have no real control over it. In fact some people do leave the company and set up as consultants, advisors or farmers, and they take some of the company's [knowledge] with them. You can't avoid that. In a sense though, it is assisting the industry by doing that," (Interviewee, C4).

"There is none (protection), it's a total risk. When we find somebody that's interested in one of our technologies, we sign all the non-disclosure agreements, but my opinion is that they're not worth very much. If somebody has your idea, they'll steal it, and apply it to their own things, and frankly, we're probably not going to have enough money to fight them," (Interviewee, C5).

However, there are firms that feel safe because of the nature of their products and/or having available resources to protect their technology.

“There’s a lot more to our technologies than just replicating the physical design, so we have a little bit of protection in say the software or the chemistries involved, we try to keep that a trade secret as much as possible,” (Interviewee, C2). In addition, “licensing, patents and product....or sell on the knowledge,” (Interviewee, C8).

“We go straight to our patent attorney to find out (about patent protection). We do technical tracks on what’s occurring globally in the areas of interest to us (science),” (Interviewee, C7).

Table 6.4 shows the relationship between the firm’s technology and international strategy. It is evident that *not much effort was made to adapt technology to a foreign country conditions*. The majority of case firms apply a ‘technology push’ strategy when targeting a foreign country where market selection criteria are employed, such as technology suitability, climatic similarity, risk perception and whether a particular market is deemed to be ‘difficult’ (refer to Appendix E). In general, environments that were similar to that of New Zealand were chosen to avoid the need for technology adaptation. In these cases a broad business strategy was not changed. Since the technology development did not change, there was no impact on the future internationalization strategy. Table 6.4 reveals the relationship between firm’s technology and its international strategy and gives an indication whether firm’s technology changes to adjust for changes in the firm’s foreign strategy and/or how international operations change to fit changes in technology.

Table 6.4: Technology vs. International Strategy

International Strategy	Case Companies
P1a ‘Technology push’ technique (strategy fits technology)	C1, C3, C5, C6, C7, C8
P1b ‘Market pull’ technique (technology fits strategy)	C1, C2
P1c Broad business strategy – no change	C1, C2, C3, C4, C5, C6, C7, C8
P1c Technology development process affects the future foreign strategy	C1, C2
No foreign strategy	C4

These propositions (see Chapter 2) are supported by evidence from the case firms as shown below.

“Broad strategy won’t change much. An overall strategy being to find people in the marketplace that want to sell what we’re doing. So the broad strategy doesn’t change, but the way it’s implemented does,” (Interviewee, C5). Further, **“from a marketing perspective, yes, we change our strategy in that some markets where we feel there is a higher threat of a product being copied for instance, we don’t tend to go and put our latest designs into there,”** (Interviewee, C6).

“It’s technology push rather than market pull on most occasions. Or we may identify market need and then come back and do the science, although not often,” (Interviewee, C8). In addition, **“we take our technology as is to the foreign environment, rather than adjust it,”** (Interviewee, C1).

“We would look to how to do with each of the different countries that we were dealing with, but our strategy would be, we would evaluate the technology for the foreign environment we were taking it to, to see the effects of taking that technology there,” (Interviewee, C8).

Further, **“more like having a product and then thinking where to go,”** (Interviewee, C1).

“Yes, except that there’s no conscious international strategy really under active [consideration]” (Interviewee, C4).

There is not much willingness in changing the technology to adjust to a particular market. Even though New Zealand agro-technology firms could potentially benefit from moving into ‘new’ foreign markets, there is little evidence to suggest that they are willing to change the technology to adapt to the needs of a particular market. The scientists dominate the strategy decision-making process and decisions regarding technology adaptation as suggested below by one interviewee.

“The climate in some parts of the world is a lot colder than it is here. There’s not the same emphasis on pastoral agriculture, whereas in New Zealand cows are out there grazing on grass, 365 days a year. So that enables us to feed cows grass as the main feed source, which is the cheapest way of producing milk. So our technology is around this,” (Interviewee, C4).

The findings here show that the current technology drives the broad business strategy used in the case firms rather than influencing future foreign strategy.

From the individual experience and perceptions of the case firms the following conclusions can be offered. Overall the strategic decision making process was highly idiosyncratic. In some cases, commitment to international activities was reduced to allow the firm to concentrate on the domestic market while the effort in serving individual overseas markets also varied depending on a variety of conditions. For example, in a firm joint ventures were set up to serve key markets while in a majority of cases firms would use licensing, contractual agreements or even co-operative research arrangements to serve chosen markets.

Some managers were found to concentrate on key markets while others not willing to spread efforts over a number of markets considering them to be 'risky' for one reason or another. Furthermore, these findings support the findings of other recent studies that have suggested a mimetic effect as firms tend to be influenced by the entry decisions made by other firms targeting the same country or industry (Lu, 2002; Yiu and Makino, 2002). As Arregle et al. (2006) have pointed out institutional environment factors also have a significant effect on the chosen type of entry mode.

This research found that current foreign activities result in a stream of indicators closely related to the firm's technology which were instrumental in shaping the future international strategy. Having focus on the specialized technology did not allow firms to recognize new opportunities.

6.2.4 Three Main Themes

This section further analyzes and summarizes the findings by putting them into three main themes discussed in the research. Then it links them to the extant literature to develop new theoretical explanations for the alternative paths of the

internationalization process of high-tech SMEs from New Zealand, which serves as a foundation for revisiting the conceptual model in Section 6.3.

Managerial Approach to Internationalization

In the majority of the case firms, the level and diversity of international activity by management and the organization as a whole supports the findings of previous literature (Johnson, 2004; Leiblein and Reuer, 2004; Dimitratos and Plakoyiannaki, 2003; Busenitz, Gomez and Spencer, 2000; Mitchell, Smith, Seawright and Morse, 2000) as to the primary importance of the owner/manager/board member influencing the pace of internationalization of small to medium-size high-tech firms. All case firms, except one, were owned and/or managed by an individual with considerable prior international experience. This experience helped them to understand the risks and demands of internationalization and the importance of effective networks. The necessary determination to succeed was also present. Their experience gave the firm the “international motivation” (Dimitratos and Plakoyiannaki, 2003) needed to accelerate the internationalization.

Pace of Internationalization

The pace of internationalization identified in literature is either ‘traditional’, ‘born global’ or ‘born again global’. Bell, McNaughton, Young, and Crick’s (2003) define ‘traditional’ firms as firms which are slow to internationalize and can be present in domestic markets for years before moving ahead on to the next stage and going international. This is exactly what the firms C1, C3, C4, C6 and C8 have been doing. The firms progressed through a number of stages to the point they are now. Nevertheless, ‘Born global’ firms such as the companies C2, C5, and C7 were quick to internationalize (Bell et al, 2003) and develop several markets at the same time, which lead to a faster ‘pace of internationalization’. Each of these firms had been in business for less than five years and had internationalized within two years. However,

no evidence was found for ‘born again global’ path of internationalization in the sample firms.

Since each case experienced their internationalization at the pace suggested in the definitions supplied by extant literature, this supports the previous literature (Johnson, 2004; Bell et al, 2003; Autio, Sapeinza and Almeida, 2000; Knight and Cavusgil, 1996; Oviatt and McDougall, 1994; 2005) on the pace of internationalization of ‘traditional’, and ‘born global’, since the sample includes both born globals and more traditionally internationalizing firms.

Networks in the Process of Internationalization

Networking plays an important part in the internationalization of high-tech SMEs, influencing decisions and market choice (e.g., Sharma and Keller, 1993). Firms within the same industry share a technical language and facilitate the transfer of complex, tacit information. Accordingly, networks can provide an alternative to a local presence giving firms the ability to rely on a local partner to accomplish information gathering and delivery activities while maintaining the production function in the home market. An extension of this concept would be full cooperative relationship with a local partner in which both partners cooperate on all aspects of the process with a joint approach to facilitating sales and producing output. This strategy has been observed among some service firms, especially in the earlier stages of their internationalization (Spar, 1997) and market research firms (O’Farrell, Wood and Zheng, 1998).

This research adds to the existing literature on the Network Perspective (Oviatt and McDougall, 1994, 2005; Knight and Cavusgil, 1996; Autio et al, 2000; Bell et al, 2003; Johnson, 2004) by finding that network is a crucial factor in the success of the internationalization of small ‘born global’ firms at all stages of their internationalization process, not only at the start (Oviatt and McDougall, 1994; 2005; Autio et al, 2000; Coviello, 2006). All case companies relied on networks and

emphasized relationships as being important, not simply at the beginning of their move into international markets but later as they progressed further into new foreign markets.

Summary

In the findings and discussion, three main themes emerged. The first was the managerial approach to internationalization which depends on the level of international experience gained by the manager. The second was the pace of internationalization which supports Bell et al's (2003) study. The final theme was the importance of networks and different relationships in a process of internationalization. Previous literature clearly outlines the importance of networks in the initial stages of internationalization (Oviatt and McDougall, 1994; 2005; Knight and Cavusgil, 1996; Autio et al, 2000; Johnson, 2004) but this research extends the previous literature by identifying the importance of networks throughout the whole process of internationalization and for the long-term survival of a firm. Each of the cases found that networks were, in fact, very important at all stages of the internationalization process, as was the importance of actively creating new networks to support internationalization across other markets. Rather than developing their own commercial abilities, the majority of case firms rely on the networks which ultimately question building their own absorptive capacity abilities.

6.3 Revisiting the Conceptual Model

The purpose of this study was to understand the internationalization of high-tech SMEs as a dynamic process by considering the influence of absorptive capacity of the firm and possession of the leading-edge technology on the future foreign strategy. Drawing on the international business literature, the research question and research model were developed. In asking "*How does absorptive capacity and firm's technology effect the internationalization process?*" the research question anticipated

that (1) the current firm's technology influences internationalization process and that it drives cognition of future internationalization strategy, and (2) the more experience the firm has of acquiring foreign market knowledge, the more absorptive capacity it will develop. Having increased absorptive capacity the firm develops the ability to recognize new opportunities and to exploit them. This understanding provided the basis for the development of the research model in Section 2.5 (p. 94) which framed the research process.

The findings of this study led to the development of a revised model of the internationalization process in high-tech companies, which consisted of three separate models (see Figures: 6.1, 6.2 and 6.3). The initial research model was used to frame the study facilitated the research process and to provide a foundation to anchor the research findings in the context of New Zealand high-tech SMEs with core capabilities built mainly on agro-technology and link it to the international business literature. These linkages facilitated an understanding of the contribution that this study made to international business literature as a whole. The following sections discuss the absorptive capacity and technology transfer in relation to the internationalization process separately in the light of the revised model.

6.3.1 Absorptive Capacity vs. Foreign Strategy

One of the objectives of this research was to identify which aspects of prior knowledge and routines play an important role in conducting international operations. Two propositions developed in the research and presented in Chapter 2 are based on the influence of three types of international experiential knowledge which Eriksson et al. (1997) categorize as 'foreign business knowledge', 'foreign institutional knowledge' and 'internationalization knowledge'. Further, firms that conduct their own R&D are better able to use externally available information (Tilton, 1971). Investment in internal R&D contributes to absorptive capacity (Cohen and Levinthal, 1990).

Building on previous research, this study posits that there is a positive relationship between investment in internal R&D and absorptive capacity leading to better understanding a firm's external environment and to developing the ability to identify and value new information. Organizational flexibility promotes absorptive capacity and the knowledge transfer process by encouraging greater openness of organization members to new stimuli from the outside, by promoting collaboration and exchanges of information within the organization (Fiol and Lyles, 1985). A firm's absorptive capacity refers not only to the acquisition or assimilation of information by a firm, but also the firm's ability to exploit the information. Therefore a firm's absorptive capacity does not simply depend on the organization's direct interface with the external environment but it is also affected by the transfer of knowledge across and within the firm.

This research found that high-tech SMEs might possess absorptive capacity that consists of two simultaneous subsets: **technological absorptive capacity (AC)** and **non-core absorptive capacity¹ (AC)**, although they might be of dissimilar intensity. *Technological AC* comprises the accumulated knowledge acquired in relation to R&D activities in high-tech SMEs, while *non-core AC* centers on knowledge acquired outside the R&D activities and the area of expertise in high-tech firms, such as marketing and sales operations. The two absorptive capacities' processes impact differently on the daily activities of firms and in a different way influence their strategies, particularly foreign strategy. Reviewing prior research, it was noticed that most empirical studies show a significant relationship between absorptive capacity and innovative output (Zahra and George, 2002) and absorptive capacity and the internationalization process (Cohen and Levinthal, 1990). However, it was not found a single study researching the possible subsets of absorptive capacity. By the findings that the two phenomena, technological AC and non-core AC are present in the high-

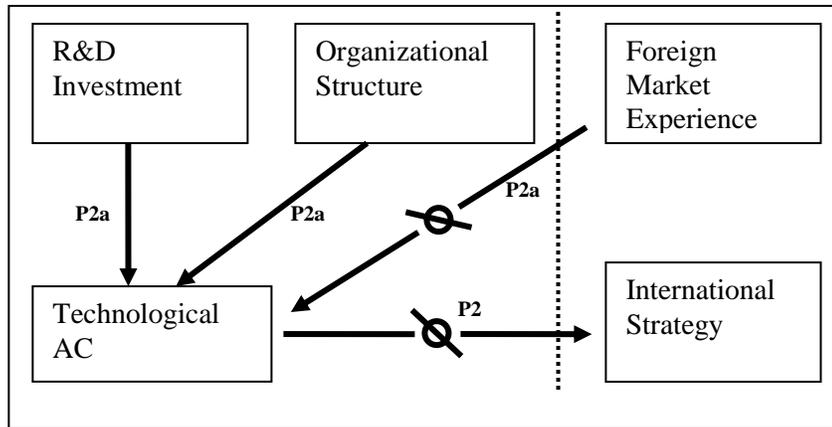
¹ The terms 'technological AC' and 'non-core AC' were accepted after discussions with scientists in several companies (see Section 4.4.3). Based on their understanding of the phenomena they suggested following terms: R&D AC or technological AC (for the knowledge acquired in relation to R&D activities) and non-core AC (for activities outside R&D, such as marketing, sales and market research).

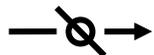
tech companies and that they influence daily operations and strategic directions, this study extends the existing literature.

A firm's technological AC is highly associated with its prior related knowledge, organizational communication and the R&D activities. In practice, R&D and technology is related to R&D, cannot be easily applied or commercialized immediately. This is due to the length of the developmental process. Moreover, Cohen and Levinthal (1990) claim that in an uncertain environment, absorptive capacity facilitates the formation of expectations, permitting the firm to predict more accurately the nature and commercial potential of technological advances. Consequently, absorptive capacity is a key factor of the firm's business activities and overall performance. However, this research shows that there is a disparity between technological AC and non-core AC's influence on the international strategy. As such, the proposed conceptual model was revisited and refined based on the empirical results.

Figure 6.1 shows a 'broken link' or no positive relationship between foreign market experience and technological AC. At the same time, the results suggest that even though having outstanding technological AC, this does not necessarily impact on firms' international strategy. The results confirm that in order to develop technological AC, there is a great deal of influence of R&D investment and organizational structure on the process, which partially confirms Cohen and Levinthal's (1990) work on the implications of innovative activities on absorptive capacity. Firms that conduct their own R&D are better able to use externally available information (Tilton, 1971). Mowery, Oxley and Silverman (1996) believed that higher levels of absorptive capacity improve a firm's ability to exploit sources of technical knowledge outside its boundaries. These findings support the above authors but only to the extent that in this process technological AC could be developed, not necessarily non-core AC.

Figure 6.1: Relationship between Technological AC and International Strategy



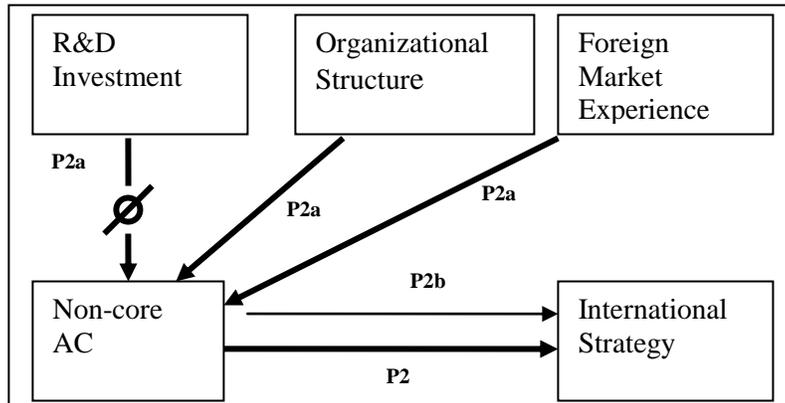
AC – absorptive capacity
 **Broken Link**

Further, investment in R&D and knowledge accumulated related to R&D does not have an impact on non-core AC, as shown in Figure 6.2. However, this type of absorptive capacity (non-core AC) may have an influence on the international strategy of a firm because the focus is more on other capabilities in a firm such as marketing and management, not merely on R&D. The findings suggest that organizational structure (communication channels and decision-making process) as well as foreign market experience may have an impact on non-core AC and at the same time on a foreign strategy. This confirms the findings of previous literature that accumulated knowledge drives internationalization by influencing the entry mode selection (Johanson and Wiedersheim-Paul, 1975; Kogut and Singh, 1988), the country-market selection (Kogut and Singh, 1988; Vernon, 1966; Erramilli and Rao, 1993) and captures the firm’s absorptive capacity in the internationalization process.

Eriksson et al. (1997) capture the full extent of relevant experiential knowledge in the internationalization process and influence on firm’s strategy, which the findings fully

support. Lack of experiential international knowledge contributes to increasing risk and costs of doing business.

Figure 6.2: Relationship between Non-Core AC and International Strategy



AC – absorptive capacity

 **Broken Link**

The proposed framework (Figure 6.1 and 6.2) conceptualizes the process of how and why small- to medium-size high-tech firms’ absorptive capacity influences their internationalization process based upon the internal and external environment of the firm. The framework addresses two types of AC: technological AC and non-core AC. These two different types of AC help to determine *the type of knowledge* prevalent in an alternative path to internationalization that a firm takes. However, having found that high-tech firms might possess technological AC and non-core AC at the same time but of dissimilar intensity, leaves open the question for further research: “*How does the proportional disparity of technological AC and non-core AC affect the ability of high-tech SMEs to detect and exploit new emerging information outside their area of expertise?*”

Most small firms have limited prior international experience. As they expand internationally, they have to invest a great deal of effort toward building the supply

and distribution channels. International expansion provides new market opportunities in which a firm can sell its product innovations. As the firm enters more countries, it can leverage its skills and products over a broader range of markets, thus increasing prospects for growth and profitability, which increases non-core AC. However, when firms focus only on their technological AC, they unconsciously do not leave much space for developing knowledge outside their area of expertise. Thus, the higher the diversity of foreign markets entered, the greater the opportunity for organizational learning.

As firms focus to develop expertise in using information in specific ways to cope with a well-defined set of organizational problems, they also develop a limited ability to manage effectively other types of projects and problems. The evidence that a firm's dominant logic determines how it applies knowledge has implications for the commercialization of new external knowledge. The more familiar the firm is with the types of problems and projects that the other firm prefers, the more readily it will be able to commercially apply new knowledge.

Firms must continuously improve by building their core capabilities and by applying capabilities to new products and markets (Teece, Rumelt, Dosi and Winter, 1994). However, firms are able to grow only by continuously recombining their knowledge and applying it to new market opportunities (Kogut and Zander, 1992). By recombining knowledge, which Kogut and Zander (1992) call the 'combinative capability', a firm exploits its current knowledge for expansion into new markets (Kogut and Zander, 1992). "One important case of such recombining of knowledge is the expansion of the organizational boundaries of the firm into foreign markets" (Kogut and Zander, 2003, p. 523).

Summary

The aim of this study was to develop further the field of international business literature by examining the internationalization process of small/medium size high-

tech companies, specifically, how the firm's absorptive capacity influences the internationalization process. The focus was on the determining the type of knowledge necessary to develop and possess by the companies in order to be able to exploit new emerging information.

This research identified a new phenomenon – high-tech firms possess technological AC and non-core AC at the same time, although of dissimilar intensity. The two ACs impact differently daily activities of the firms and in a different way influence their strategies, particularly foreign strategy. The findings of the research suggest that the non-core AC may help explain why, despite New Zealand's preeminence in agrotechnology R&D, companies are failing to capitalize on this resource, probably due to the size of firm constraints (SMEs) and inability to commercialize R&D to create revenue streams.

6.3.2 Technology Transfer vs. Foreign Strategy

The growth and international expansion of technological capabilities in firms is closely associated with accumulating international experience and increasing commitments to foreign markets (Johanson and Wiedersheim-Paul, 1975; Johanson and Vahlne, 1990), and balanced development of technological AC and non-core AC as found in this research. This is not to suggest that there is uniform internationalization of technological capabilities across all firms. Underlying the general path of expansion determined by product characteristics or industry affiliation, the development of foreign technological capabilities depends on market conditions at the critical time of foreign expansion and firm-specific events like unexpected merger and acquisition opportunities (Zander, 1998). Additional influencing factors include management attitudes towards internationalization, strategy and dispersion of technological capabilities (Patel and Pavitt, 1997), as well as the effects caused by firms' non-core AC (explained in Section 6.3.1). As a result,

the international dispersion of technological capabilities may involve significant variation even across firms engaged in similar lines of business.

Table 6.4 (see Section 6.2.3) shows the relationship between the firm's technology and international strategy. It is evident that *limited effort was made to adapt technology to a foreign country conditions*. This finding means that proposition P1b was not supported. The majority of the case firms applied a 'technology push' strategy when targeting a foreign country, with the market selection criteria such as technology suitability and similar climate where the existing technology could be employed. This finding supports proposition P1a.

Further, risk perception and the degree of difficulty in establishing in the particular market were found to be significant market selection criteria as well (refer to Appendix E). In general, markets which had a similar environment to New Zealand were chosen, thus limiting the need for technology adaptation. In relation to proposition P1c, the broad business strategy including the technology development would not then need to be changed. This means that the future internationalization strategy would not be affected so proposition P1c is not supported.

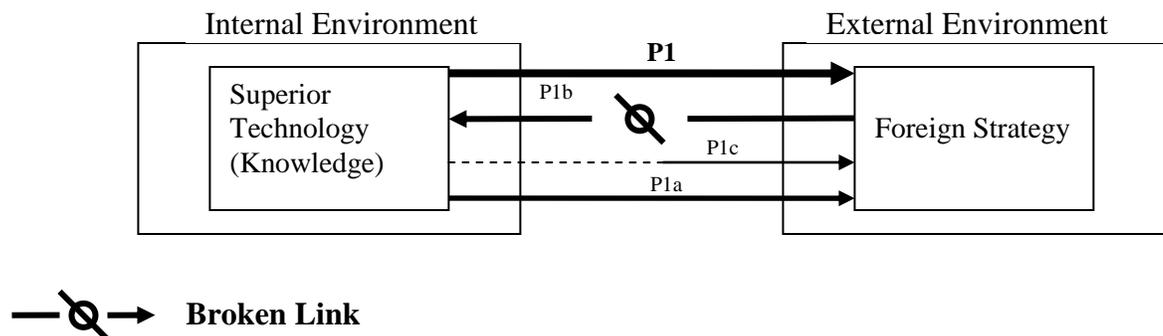
As the conceptual model in Chapter 2 suggests, a firm's international strategy may be positively related to technology transfer and knowledge management, as well as to a firm's absorptive capacity. Its relative value is the result of the execution of strategy in the international environment. In practice, the outcome of the international operations can be expected to vary depending on change in the environment and immediate response to those changes resulting in the appropriateness of the applied strategy. The research question draws on these suggestions to propose that where there are variations in environment and international strategy of a firm, they will influence the transfer of technology, knowledge management and generally absorptive capacity of a firm. Change in the environment is a constant and continuous process. In the face of such change, the activities of firms require ongoing adjustment and revision if their operations are to continue to be effective.

The situation when current strategic decisions have long-term implications for technology accumulation was not found in our case firms. However, the effects of current technology and future strategy of the firm where technology lets the firm recognize which strategy it should take is clearly evident in the case firms.

The firms in this research having underdeveloped non-core AC were not able to utilize fully their technological capabilities and failed to capitalize on this exceptional resource, possibly due to the firm size constraints (SMEs) and consequent inability to exploit new emerging information and market potential. This thesis confirms the findings of Kogut and Zander (1993) that the nature of technology plays a critical role in the choice of the internationalization strategy of the firm. Without a doubt, it was found that ‘codifiability’ features of technology encourages licensing (see Table 6.3 in Section 6.2.3). Generally, by contrast, technologies that are more complex tend to be transferred through internal rather than market-based transactions.

Since only one sub-proposition (P1a), and (P1c) only in part, were confirmed by the results the conclusion is that there is a one-way relationship between the firm’s technology and its international strategy (Figure 6.3). The firm’s international activities are influenced by the firm’s technology, but not the other way around – the firm’s technology is not affected by the foreign strategy it pursues.

Figure 6.3: Relationship between Technology and International Strategy



The view developed in this research is that firms are the means for the creation and conversion of knowledge into commercially feasible products and services. The relevant point of reference for whether a firm will convert technology/knowledge into economically viable products and services is the level of development of the firm's non-core AC. This means that when firms are able to commercialize their products, particularly across the border, it depends largely on the development of firm's non-core AC, on knowledge acquired outside the R&D activities and the area of expertise.

The research has examined the New Zealand SME's ability to transfer their knowledge/technology to other countries. The finding supports Kogut and Zander's (2003) research on MNEs which suggested that "the MNE arises out its superior efficiency as an organizational vehicle by which knowledge can be transferred across borders" (p. 516). The research on high tech SMEs in the New Zealand context tested the suggestion that firms specialize in the internal transfer of tacit knowledge, by empirically examining the decision to transfer the capability to manufacture new products to other parties. In the case firms it is not an issue of deciding how to service a foreign market (by license, export, direct investment, or any other mode), but how to identify new possibilities for current technology and how to expand their foreign operations.

Contradictorily, firms' technological capabilities and the advantages of specialized knowledge act as constraints in the development of the firms' future internationalization strategy. However, at some point in time, firms will have to decide if and how they are going to expand into new, less familiar markets. When such a decision is to be made, the extent to which a firm has already developed relationship with and knowledge of collaborating through external networks, as suggested by Coviello (2006), will be an important determinant of the future prospects.

What a firm does depends on its efficiency in the process of knowledge transfer relative to other firms (Kogut and Zander, 2003, p. 519). The findings of this research

support Kogut and Zander' (2003) statement by claiming that the firm's efficiency could be affected by the lack of absorptive capacity, or achieving only a low level of absorptive capacity, which defines the future directions of the firm. Competence and future strategy are determined by knowledge, experience and embedded capabilities of the firm, "which determine the firm boundary, not market failure itself" (Kogut and Zander, 2003, p. 520). However, the findings of this research indicate that the current and past strategy directions over time shape absorptive capacity of the firm, and indirectly affect the future internationalization process of the firm.

Kogut and Zander's (2003) suggest that there is the difference between information and know-how. The results revealed that the reason why the firms are not able to capitalize on their superior technology is based on the fact that information is not converted into knowledge when the information has come from the area outside the area of expertise. The case firms do not have the ability to exploit that kind of information.

Knowledge is often experiential in nature and has the attribute of being accumulated incrementally over time (Kogut and Zander, 2003). This research clearly supports empirical studies of technology transfer that the characteristics of knowledge and the characteristics of upcoming information determine the utilization and mode of technology transfer. One of the most persistent findings in work of technology transfer is the importance of prior experience (Teece, 1977).

Competition among firms is based upon their capabilities to expand by the creation and utilization of new knowledge and transfer it faster than the competitors. The particular significance is put on the development of the abilities of firms to expand their knowledge beyond the area of expertise. If cognizant of that, some firms may decide to carry out activities internally even if they are not especially competent in them, which explain why the boundaries of firms may extend beyond firm's clear competencies to its advantage.

Summary

This research found that the case firms having underdeveloped non-core AC were not able to utilize fully their technological capabilities and failed to capitalize on this exceptional resource, probably due to the size of firm constraints (SMEs) and inability to exploit new emerging information and markets potential and in turn, inability to commercialize R&D to get it to revenue streams stage.

Since the only one sub- proposition (P1a) and P1c (in part) were confirmed by the findings, this research suggests that there is one-way relationship between the firm's technology and its international strategy. The firm's international activities are driven by the firm's technology but not the other way around – the firm's technology is not influenced by prospects uncovered by scanning new potential foreign markets.

While findings support the effect of absorptive capacity and technology on the internationalization process posed in the research question, the reasons why the case firms are not able to exploit new information outside of area of expertise remains elusive. On these grounds the absorptive capacity measurement was proposed to determine the type of knowledge necessary to develop to facilitate the exploitation of new emerging information and to identify the area of business strengths in firms. A reason for absorptive capacity measurement is to help firms to better understand international environment, to enhance their presence in the world market, which may result in improved business activities and ultimately lead to better performance. In order to do so, a quantitative absorptive capacity measurement was undertaken (explained in Chapter 7).

6.4 Conclusions

This chapter presented and analyzed the results of the empirical research conducted for the study. The aim of the analysis was to examine the meaning and implications

of the results in order to generate substantial theory and compare a proposed conceptual framework with the field results. The analysis examined the data from the field research in relation to the literature, the three major research areas, namely, internationalization process, absorptive capacity and technology transfer, and initial propositions. From across-case comparisons the various factors associated with the main research areas are firstly categorized according to the key themes which have been identified during the interview analysis process. Relationships between each main category and the various sub-categories were then identified. Finally, at the third level of analysis categories are integrated to shape the theory around the central phenomenon: relationship between firm's technology and international strategy, on one hand, and firm's absorptive capacity and international strategy, on the other hand.

The chapter described the across case analysis undertaken in the study and the understanding that it generated of the internationalization process among the participating firms. This analysis across cases synthesized the findings of within case analysis to convey a wider level of understanding. Intensity of understanding of the common characteristics across cases was developed to the point where a conceptual model of the internationalization process across case firms was developed. This model suggests that current foreign activities result in a stream of indicators closely related to the firm's technology and absorptive capacity which are instrumental in shaping and driving future international strategy and activity.

Case study research was used to identify the factors that may have an impact on high-tech SMEs in their process of internationalization. In-depth interviews have provided a rich account of the particular factors applying to a range of small and medium sized agro-technology firms in New Zealand.

From the individual experience and perceptions of the case firms the following conclusions were reached. Sometimes commitment to international activities was reduced to concentrate on the domestic market while the effort in serving individual overseas markets also varied, depending on a variety of conditions. For example, in

some cases, joint ventures were set up to serve key markets while the majority of cases firms would use licensing, contractual agreements or even co-operative research arrangements to serve the chosen markets. In other words, some managers were found to concentrate on key markets while others were not willing to spread efforts over a number of markets considering them to be 'risky' for one reason or another. Three main themes emerged from the analysis: the managerial approach to internationalization, the pace of internationalization and the importance of networks and different relationships in a process of internationalization.

The findings of this study led to the development of a revised model of the internationalization process which was different from the initial one. Since that this research identified a new phenomenon – high-tech SMEs possess at the same time two subsets of absorptive capacity which are dissimilar in intensity: technological AC and non-core AC, this may help explain why, despite New Zealand's preeminence in agro-technology R&D, companies are failing to capitalize on this resource. This research found that the case firms having underdeveloped non-core AC were not able to utilize fully their technological capabilities and failed to capitalize on this exceptional resource. Further, the research suggests that there is one-way relationship between the firm's technology and its international strategy. The firm's international activities are driven by the firm's technology but not the other way around – the firm's technology is not influenced by prospects uncovered by scanning new potential foreign markets. The findings of this study extend the existing literature on the internationalization process and knowledge accumulation.

7 Chapter Refinement of the Model Using Quantitative Measurements

Through the process of analysis, the conceptual model presented in its preliminary form in Chapter 2 is further developed and refined in order to explain the underlying nature and impact of the firm's technology and absorptive capacity on its foreign strategy. The conclusions are derived from the experiences and perceptions of the case companies. Likewise, from these experiences and perceptions, the main pitfalls and barriers and practical issues for New Zealand SMEs when planning international activities are reported and analyzed.

This chapter begins with a short introduction, while Section 7.2 focuses on the absorptive capacity measurement which includes the variables implementation and the development of an absorptive capacity model. Section 7.3 concludes Chapter 7.

7.1 Introduction

The present study concerns the impact of technology transfer and absorptive capacity on the internationalization process of the New Zealand high-tech SMEs with core-competencies in agro-technology. The framework suggested by the revised model of the internationalization process (see Section 6.3) was seen as better representing reality and understanding the internationalization process of high-tech SMEs. However, having determined, first, that there is one-way relationship between the firm's technology and its international strategy, where the firm's international activities are driven by the firm's technology, and second, that the case firms having underdeveloped non-core absorptive capacity were not able to utilize fully their technological capabilities, this demonstrated firms' inability to exploit new emerging information outside of their area of expertise.

The reasons why the case firms were not able to exploit new information outside of their area of expertise remained obscure and the question posed in Chapter 1 (p. 7) which initiated the study: “*What kind of knowledge should New Zealand high-tech SMEs possess in order to develop the ability to successfully adapt in a new business context?*” remained unanswered.

This was the rationale to propose the absorptive capacity measurement. The goals were, first, to determine the type of knowledge that facilitates the exploitation of new emerging information and to help SMEs to better understand international environment and, second, to identify the area of business strengths in firms which may result in overall improved business activities. In order to achieve the above goals, a quantitative research was undertaken by developing variables for absorptive capacity measurement (see Section 4.5.2, p. 215) which helped in generation of an absorptive capacity model. The absorptive capacity model’s principles could be used by any firm for self-evaluation and gaining insight toward further growth. At this stage, the thesis has come to the point to address and complete the requirements of the research objective #3.

7.2 Absorptive Capacity Measurement

7.2.1 Introduction

As firms increase the share of their operations abroad, thus increasing the degree of internationalization, they gain more knowledge and they build higher absorptive capacity. The objective of this study was to investigate the relevance of current knowledge to the formation of absorptive capacity in a firm and ultimately its impact on the firm’s further internationalization and foreign strategies. More specifically, *do firms initially internationalize, gain knowledge, build absorptive capacity and then become more successful at internationalization, or do they build absorptive capacity*

in the domestic market, gain information about external markets and then internationalize?

This research argues that the idea about the direct and positive relationship between internationalization and absorptive capacity must be implemented carefully. The often used perspective (explained in Section 2.4, p. 60) implicitly assumes that internationalization is the “cause” of observed firm absorptive capacity – that is, that increasing internationalization activities has a direct impact on firm’s absorptive capacity. This notion concerns *non-core AC* found in this research (see Section 6.3.1, p. 319). Although it is true that, in part, the causality may move from internationalization to absorptive capacity, the abovementioned assumption ignores an important fact that firms go abroad to exploit and/or acquire firm-specific advantages. That is, firms develop techniques and products that give them some competitive advantage in domestic markets, which might be developed through strengths in firm’s absorptive capacity. Then firms move abroad to exploit the firm-specific advantage. In high-tech companies the most prominent capabilities are usually in form of technically advanced products or processes. They are usually outcome of the technological AC (see Section 6.3.1, p. 319). Therefore, *increasing absorptive capacity (technological AC) has a direct impact on firm’s internationalization activities.*

If it is believed that internationalization somehow improves firm’s absorptive capacity, then it should be accepted that expanding abroad will lead to improvements in firm’s business activities. On the other hand, to the extent that firm’s market presence is high because of firm-specific advantages, internationalization might be a reflection of underlying firm-specific advantages (capabilities) which consequently lead to the high market presence.

After analyzing the results, this research argues that, first, the internationalization in high-tech SMEs is a reflection of firm’s absorptive capacity, not the other way around as suggested in previous literature; second, it is not necessarily that non-core AC has

higher importance in the process of internationalization than technological AC (see discussion in Section 6.3); non-core AC usually is not considered by the firms to be part of a firm-specific advantage because it is outside of the area of expertise in high-tech SMEs; however, firms can improve their non-core AC by focusing on the development of specific areas of the business; third, the thesis suggests that there might be a fine interplay between internationalization activities and absorptive capacity, hinting at bidirectional reinforcement; and fourth, there is a need to measure absorptive capacity to determine which subset of absorptive capacity should be developed and reinforced.

The results suggest if firms decide to move abroad and improve absorptive capacity, and the decision is solely based on the positive relationship between internationalization and absorptive capacity, then such a strategy may not result in improved total AC and improved presence in the world market. However, if firms decide to develop non-core AC, then such a strategy may result in improved business operations.

For this reason a rigorous statistical methodology is used to test whether having well-developed absorptive capacity increases their internationalization activities, or whether it is internationalization that improves absorptive capacity. It is possible that both factors are in play: firms that are performing well move abroad to exploit their firm-specific advantages, which might be developed as a product of firm's absorptive capacity and the move abroad itself improves absorptive capacity.

This research suggests that current knowledge and current foreign activities result in a stream of indicators closely related to the firm's absorptive capacity which are instrumental in shaping and driving future international strategy and activity. Since the aim of this thesis is to examine the internationalization process of the high-tech SMEs and to determine how the firm's absorptive capacity influences the internationalization process, the focus is on the identifying the type of knowledge necessary to facilitate the exploitation of new emerging information. In order to do

so, a quantitative absorptive capacity measurement was developed as a “pioneering” attempt to reach this goal.

The significance of absorptive capacity becomes inevitable in the research of capability of high-tech SMEs. This research attempts to import this idea into absorptive capacity literature and it attempts to measure absorptive capacity. Nevertheless, the question to be expected is ‘how to measure absorptive capacity and how to define more clearly boundaries between different categories?’

This research aims to measure absorptive capacity to facilitate a deeper understanding of the relationship and implications that it has on business in general and on the international business in particular. The research suggests that if a firm is able to *measure* its absorptive capacity, this may result in improved business activities and ultimately lead to better performance. A reason for absorptive capacity measurement suggested by this research is to help firms better understand the international environment to achieve competitive advantage and to enhance their presence in the world market.

The international business literature offers a little assistance in measuring the internationalization process and absorptive capacity using multiple measures. Apart from survey-based measures of organizational learning, which have previously been used by Zander and Kogut (1995) and Zahra et al. (2000), a search of literature was unsuccessful in finding equivalent *multiple* measures to measure absorptive capacity. For this reason, in this thesis an existing degree of internationalization (DOI) was adapted (Sullivan, 1994). DOI was the only other prior research method found that used multiple measures instead of single measure. The choice of the variables was founded on the previous research (see Section 4.5.2, p. 215).

This study introduces absorptive capacity measurement to international business research using multiple measures. No established scales exist with proven ability to capture the effects in relationship between internationalization process and absorptive

capacity of a firm. However, the unique data set positions this research to test these propositions. Since the research used the information derived from the interviews with the informants from the case firms along with archival data, this limited the number of measures that could be estimated objectively.

Although there is no established scale or multiple measurements found in the prior literature, the approach for measuring the absorptive capacity of a firm is precise because, as a starting point, it is able to adapt the Degree of Internationalization (DOI) measures indicated by Sullivan (1994) and therefore better able to capture the phenomenon. Further, to address a measurement issue, the research attempts to measure the absorptive capacity of a firm by developing a novel index measure of absorptive capacity that captures the following attributes and their combinations: foreign sales, R&D, international experience, psychic distance (see Section 4.5.2, p. 215). For the reason that no current measurement of absorptive capacity has been found, it seems reasonable to believe that, *first, the extent of past exposure to foreign business operations, second, cultural similarity (or distance) with foreign interactions and, third, R&D intensity (with all of which absorptive capacity may be developed) would be important to include in the measure.*

The following sections focus on measuring absorptive capacity variables in the case firms and developing an absorptive capacity model.

7.2.2 Primary Analysis

The choice of the variables was based on previous research under the related topics (see Section 4.5.2, p. 215), while reliability and validity of the measurement process is addressed in sections 7.2.5 and 7.2.6 of this chapter.

Table 7.1 describes the measurement variables split into groups with the firm's corresponding allocation developed from case descriptions in Chapter 5. The complete interview results are listed in the Appendices D and E.

Table 7.1: Absolute Values Used for the Case Firms' Variables

Years of firm business experience	Number of firms:
1-5	C2, C3, C4, C5
6-10	-
11-15	C1, C8
16 +	C6, C7
Firm international experience: FIE	Number of firms:
Less than 1 year (no experience)	C3, C4
1-5	C2, C5, C8
6-10	C1
11-15	C6
16 +	C7
Firm international intensity FSTS	Number of firms:
% of production sold internationally:	
10-25%	C1, C3
26-50%	C8
51-75%	C2, C5, C7
75-100%	C6
Firm foreign markets PDIO	Number of firms:
Main foreign markets:	
Australia, UK, USA	C1, C2, C3, C5, C6, C7, C8
Europe (without CEEC)	C1, C2, C7
CEEC	C6, C7
Asia (China)	C2, C7
South America	C1, C5, C7
Informants' Years of International Experience MIE	Number of Informants
None	C4
1-5 years	C1, C2, C3, C5, C6
6-10 years	C7, C8
11-15 years	-
16+	-
% of Revenue Investment in R&D RDI	Number of Firms
Up to 10%	C3, C6, C7
11 – 20%	-
21-50%	C2
51-70%	-
71-100%	C1, C4, C5, C8
Firm's Age (years)	Number of Firms
3	C2
4	C5
5	C3, C4
15	C8
20	C6
55	C7

The results for the FSTS, MIE, FIE, RDI, PDIO and COMP variables were normalized (range 0–100%) prior to tabulation. This ensures a balance amongst the variables which is required for their comparability. The FSRD and FSRD/age variables are given as its calculated values rather than normalized. The list of the firms along with the individual variables is shown below (see Table 7.2). In order to balance out significant difference in business experience amongst younger and more established firms, age was a main factor in establishing comparability.

Table 7.2: Firms’ AC Variable Ratings

Firm	FSTS	MIE	FIE	RDI	FSRD	Age	FSRD/age	PDIO	COMP
C1	17.5%	0.40	0.50	100.0%	0.18	15.0	0.01	40.0%	33.3%
C2	63.0%	0.40	0.40	21.0%	3.00	3.0	1.00	30.0%	16.7%
C3	17.5%	0.40	0.20	10.0%	1.75	5.0	0.35	20.0%	25.0%
C4	0.0%	0.20	0.20	100.0%	0.00	5.0	0.00	0.0%	0.0%
C5	63.0%	0.40	0.40	100.0%	0.63	4.0	0.16	20.0%	16.7%
C6	87.0%	0.40	0.80	9.0%	10.88	20.0	0.54	20.0%	8.3%
C7	63.0%	0.60	1.00	5.0%	12.60	55.0	0.23	50.0%	25.0%
C8	38.0%	0.60	0.40	100.0%	0.38	15.0	0.03	10.0%	8.3%

Further, each variable was allocated a different weighting for Technological AC and Non-core AC depending on their importance for a total AC. The term ‘Relative’ was used for this purpose (i.e. relative non-core AC and relative tech AC). These were used for modeling the individual and total AC responses (see Table 7.3).

Table 7.3: Variable Contribution Weighting

Variables	Non-Core AC	Abs Error ±	Relative Non-Core AC	Rel Error ±	Tech AC	Abs Error ±	Relative Tech AC	Rel Error ±	Total AC
FSTS	0.9	0.1	0.23	11%	0.8	0.1	0.20	13%	0.43
MIE	0.8	0.1	0.20	13%	0.6	0.1	0.15	17%	0.35
FIE	0.9	0.1	0.23	11%	0.6	0.1	0.15	17%	0.38
RDI	0.1	0.1	0.03	100%	0.9	0.1	0.23	11%	0.25
FSRD/age	0.1	0.1	0.03	100%	0.9	0.1	0.23	11%	0.25
PDIO	0.6	0.1	0.15	17%	0.1	0.1	0.03	100%	0.18
COMP	0.6	0.1	0.15	17%	0.1	0.1	0.03	100%	0.18
TOTAL			1				1		

The starting point of the variable contribution weighting was Table 7.1, which described the variables with the firm’s corresponding allocation developed from information collected in the case firms (e.g. years of firms’ business/international experience, percentage of R&D investment, number of countries they operate in). The results for the FSTS, MIE, FIE, RDI, PDIO and COMP variables were normalized (range 0–100%) prior to tabulation (see Table 7.2).

Since there has been limited research addressing measurements of absorptive capacity, this study offers a contribution through its mixed method. The above variable contribution weightings were allocated based on a consensus of findings through the extended literature review. Literature such as Simonin (1999), Fiol and Lyles (1985), Levitt and March (1988), Miller and Chen (1996), Zahra, Ireland and Hitt (2000), Eriksson and Chetty (2003), Cohen and Levinthal (1990), Zahra and George (2002) provided this direction. Inter-rater reliability was used as an estimated method to correlate these authors’ observations to obtain the consensus of each variable weighting relative to each of the absorptive capacities. Inter-rater reliability measures the homogeneity of agreement, and administers the same form to the same people by two or more raters/interviewers, so as to establish the extent of consensus on use of the instrument by those who administer it (Shrout and Fleis, 1979). The major interest in this research was not to determine how the variables differ from each other but how they may impact on each of the individual absorptive capacities.

Inter-rater reliability helped in establishing a consensus in previous literature about the factors that influence absorptive capacity.

More specifically, Fleiss' kappa, a statistical measure for assessing the reliability of agreement between a fixed numbers of raters when assigning categorical ratings to a number of items was used (Landis and Koch, 1977). Agreement can be thought of as follows: if a fixed number of people assign numerical ratings to a number of items then the kappa will give a measure for how consistent the ratings are. The measure used in this research calculated the degree of agreement and was scored as a number between 0 and 1 for each absorptive capacity variable.

In addition, the research was not looking for the precision of a variable weighting, but its significance and the importance to the Non-core and Technological AC. For this reason it was allowed that true value lies between the boundaries of variation ± 0.1 (see Table 7.3, columns 3 and 7). These weightings were further normalized (relative non-core AC and relative technological AC) prior to being implemented by the absorptive capacity equation (Table 7.3, columns 4 and 8).

7.2.3 Method of Calculation

The seven variables constituting absorptive capacity (FSTS, MIE, FIE, RDI, FSRD, PDIO and COMP) are ratio variables. As such, absorptive capacity is defined by a range of values from 0.0 (none) to 1.0 (maximum defined AC), meaning no absorptive capacity and maximum AC respectively. A firm's score is calculated using the following AC General Equation, eq. (1). Doing so involved treating the variables as a linear combination and summing the value per attribute for each company following Sullivan (1994).

The absorptive capacity for each firm is calculated by multiplying each variable with its corresponding significance value (weighting). This is then followed by the summation of all the significance adjusted terms. See the equation (1):

$$AC = FSTS \cdot X_{FSTS} + MIE \cdot X_{MIE} + FIE \cdot X_{FIE} + RDI \cdot X_{RDI} + FSRD_{age} \cdot X_{FSRD,age} + PDIO \cdot X_{PDIO} + COMP \cdot X_{COMP}$$

(1)

For example, C1 firm's total AC value of 0.77, is the sum of its corresponding non-core AC and Tech AC (0.35 + 0.42). The equation below demonstrates a way of calculating C1 firm's non-core AC.

$$AC_{Non-Core,C1} = 0.25 * FSTS_{C1} + 0.2 * MIE_{C1} + 0.23 * FIE_{C1} + 0 * RDI_{C1} + 0.03 * FSRD_{age,C1} + 0.15 * PDIO_{C1} + 0.15 * COMP_{C1}$$

$$AC_{Non-Core,C1} = 0.25 * 0.18 + 0.2 * 0.40 + 0.23 * 0.50 + 0 * 1.0 + 0.03 * 0.01 + 0.15 * 0.40 + 0.15 * 0.33 = 0.35$$

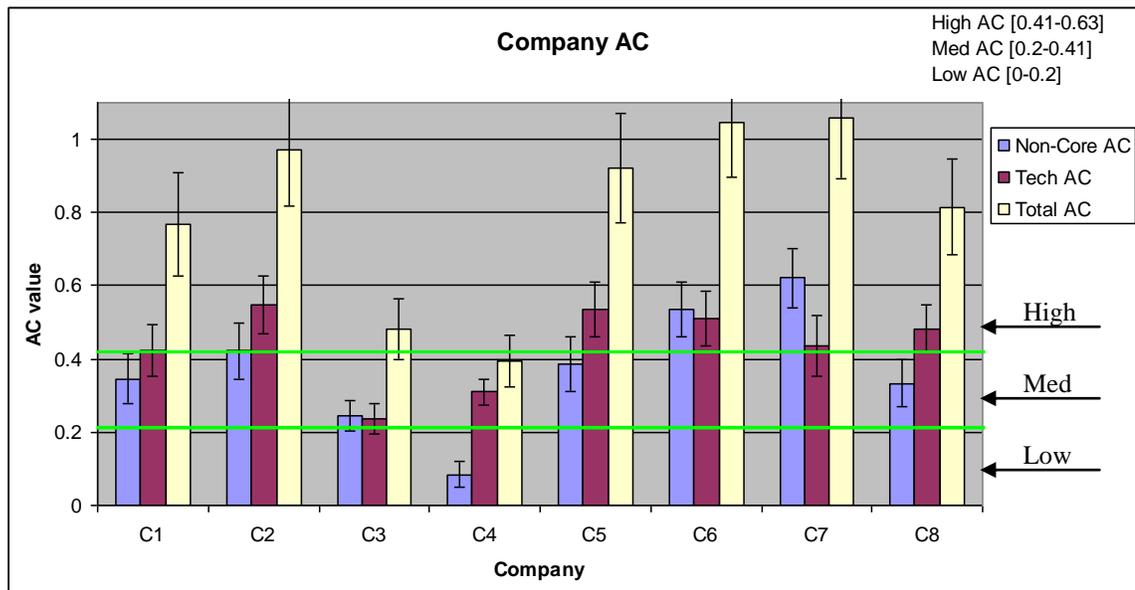
The above AC equations were applied to each company and tabulated in Table 7.4.

Table 7.4: Firms' AC Results

Firms	Non-Core AC	Abs Error ±	Rel Error ±	Tech AC	Abs Error ±	Rel Error ±	Total AC	Abs Error ±	Rel Error ±
C1	0.37	0.07	19%	0.42	0.07	17%	0.78	0.14	18%
C2	0.41	0.08	19%	0.53	0.08	15%	0.94	0.16	16%
C3	0.24	0.04	17%	0.24	0.04	18%	0.48	0.08	17%
C4	0.11	0.04	32%	0.29	0.04	12%	0.40	0.07	18%
C5	0.40	0.07	19%	0.52	0.07	14%	0.91	0.15	16%
C6	0.51	0.07	15%	0.50	0.07	15%	1.02	0.15	15%
C7	0.61	0.08	13%	0.45	0.08	18%	1.05	0.16	15%
C8	0.35	0.06	19%	0.46	0.06	14%	0.81	0.13	16%
C test	1.00	0.18	18%	1.00	0.18	18%	2.00	0.35	18%

The objective AC results seen in table 7.4 are depicted graphically in Figure 7.1.

Figure 7.1: Firms' AC Results



From the above graph, the values for absorptive capacity were subjectively divided into three regions: High, Medium and Low. In the above graph two boundary lines are depicted. The boundaries are based on the individual AC factors rather than the total AC. To allow for better sample comparability, the upper limit for the high region was taken as the maximum value of the AC factors from the company data (e.g. company C7 non-core AC → upper limit of the region 'High'). The main purpose for the above adjustment is to 'compensate' for the non-ideality of the 'real world' company where the 'clear-cut' boundaries can not be precisely defined. Accordingly, Medium and Low regions were defined to be the values in the mid-third and the bottom-third of the range respectively.

7.2.4 Regression Analysis

Regression analysis is accepted as a method for analyzing the effect of independent variables on each individual AC for the following reasons. First, regression enables the researcher to remain close to the data (Tabachnick and Fidell, 2001). Second, the ability to carry out exploratory analysis was considered important because the

absorptive capacity had not previously been subject to empirical testing and therefore would likely require modification during the analysis. Regression results in an equation that represents the best prediction of a dependent variable from several independent variables (Coakes and Stead, 1996), which is consistent with the aim of analyzing the effect on absorptive capacity.

Regression was selected as the most suitable form of analysis because the progressive relationship between the sub-components of the dependent variable suggested that they should be treated as single dependent variables in separate analysis. Consequently a multivariate approach to the treatment of the dependent variable was selected as being the most appropriate.

Two separate regression analyses were conducted for each of the dependent variables (technological AC and non-core AC) relative to seven independent variables (FSTS, MIE, FIE, RDI, FSRD/age, PDIO and COMP). The results of each of these analyses are reported separately in the graphs which are presented to illustrate effect of each variable on the dependent variable. The R-squared and the gradient values for each of the analyses were interpreted. The first stage of regression analysis involves observing the R-squared values. The higher the R-squared value, the more representative is the gradient value towards the real relationship between the variable and the individual AC. The higher positive gradient implies a more significant positive effect between the variable and the individual AC.

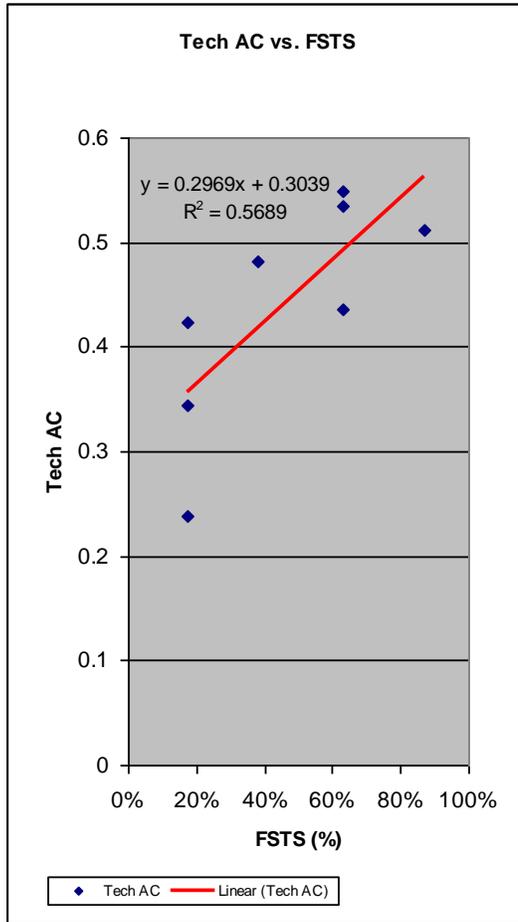


Figure 7.2: Tech AC vs. FSTS

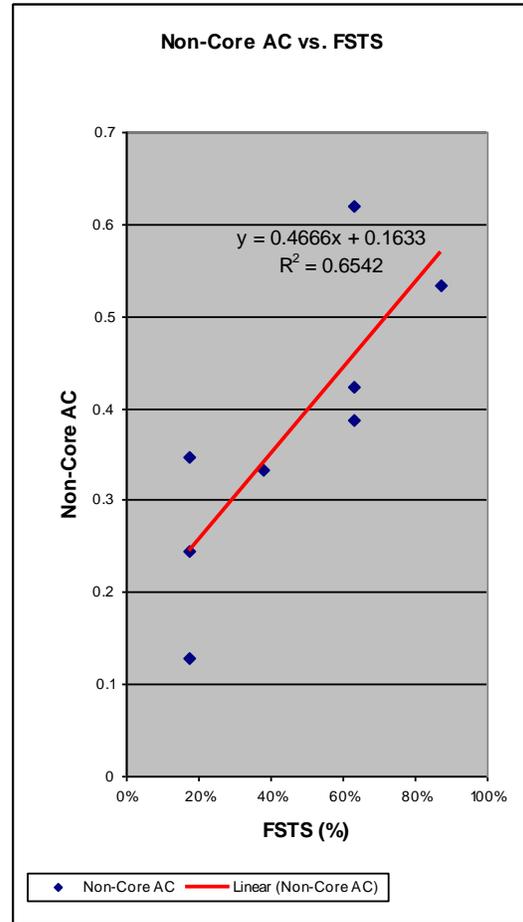


Figure 7.3: None-core AC vs. FSTS

In Figure 7.2, the higher R-squared value and the lower gradient value implies that FSTS has a significant positive effect on the Tech AC. In Figure 7.3, the higher R-squared value and the modest gradient value implies that FSTS has a significant positive effect on the Non-Core AC. Even though FSTS has a significant positive effect on both ACs, its influence is greater on Non-Core AC.

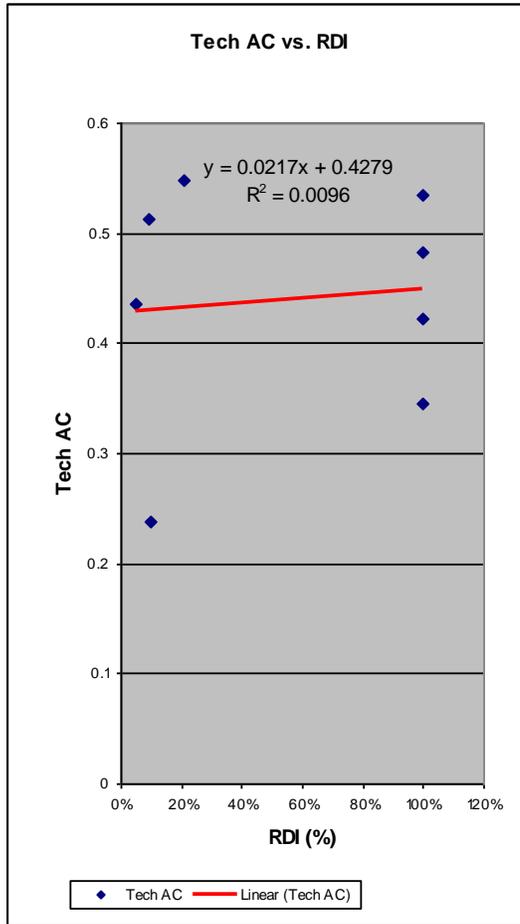


Figure 7.4: Tech AC vs. RDI

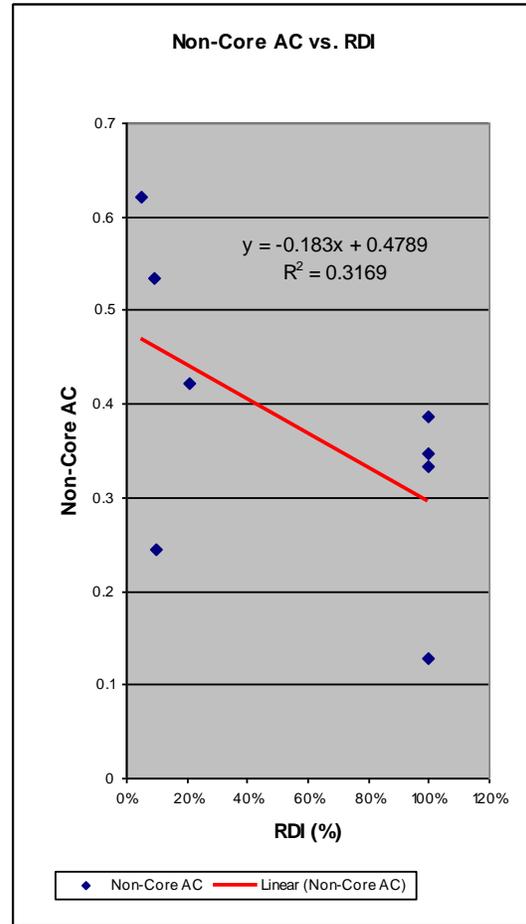


Figure 7.5: Non-Core AC vs. RDI

In Figure 7.4, the low R-squared value implies that RDI has an indeterminable effect on the Tech AC. The indeterminability means that there are more internal factors that have varying influence. This could be due to a focus towards a narrow field of technology (overspecialization). In Figure 7.5, the low to medium R-squared value and the low negative gradient value imply that RDI has an insignificant effect on the Non-Core AC. Therefore, RDI has no significance on any AC.

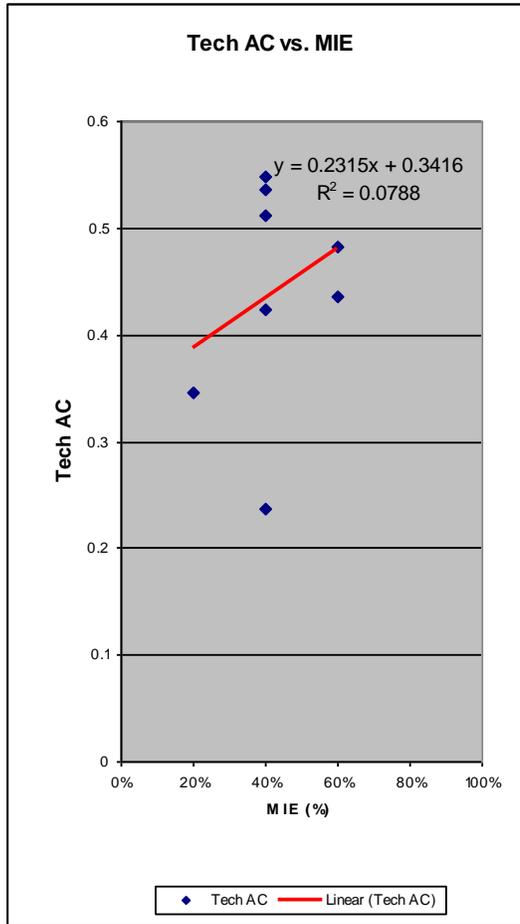


Figure 7.6: Tech AC vs. MIE

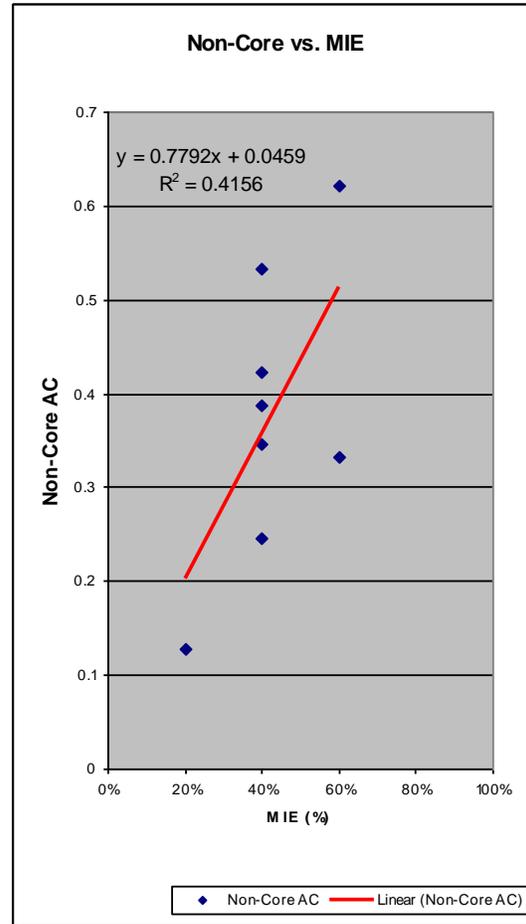


Figure 7.7: Non-Core AC vs. MIE

In Figure 7.6, the low R-squared value implies that MIE has an indeterminable effect on the Tech AC. In Figure 7.7, the higher R-squared value and the high gradient value implies that MIE has a significant positive effect on the Non-Core AC. Therefore, MIE has a significant positive effect only on Non-Core AC.

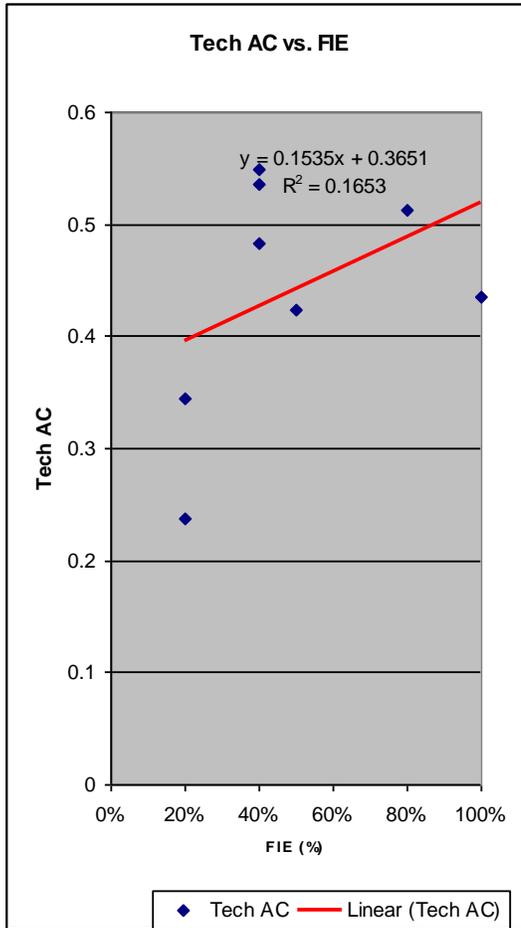


Figure 7.8: Tech AC vs. FIE

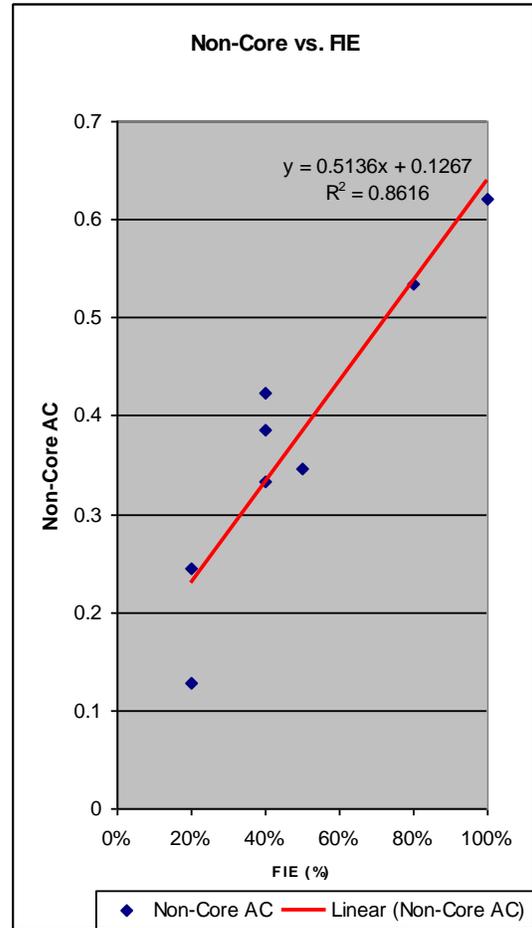


Figure 7.9: Non-Core AC vs. FIE

In Figure 7.8, the lower R-squared value implies that FIE has an insignificant effect on the Tech AC. In Figure 7.9, the high R-squared value and the modest gradient value implies that FIE has a significant positive effect on the Non-Core AC. Therefore, FIE has a significant positive effect only on Non-Core AC.

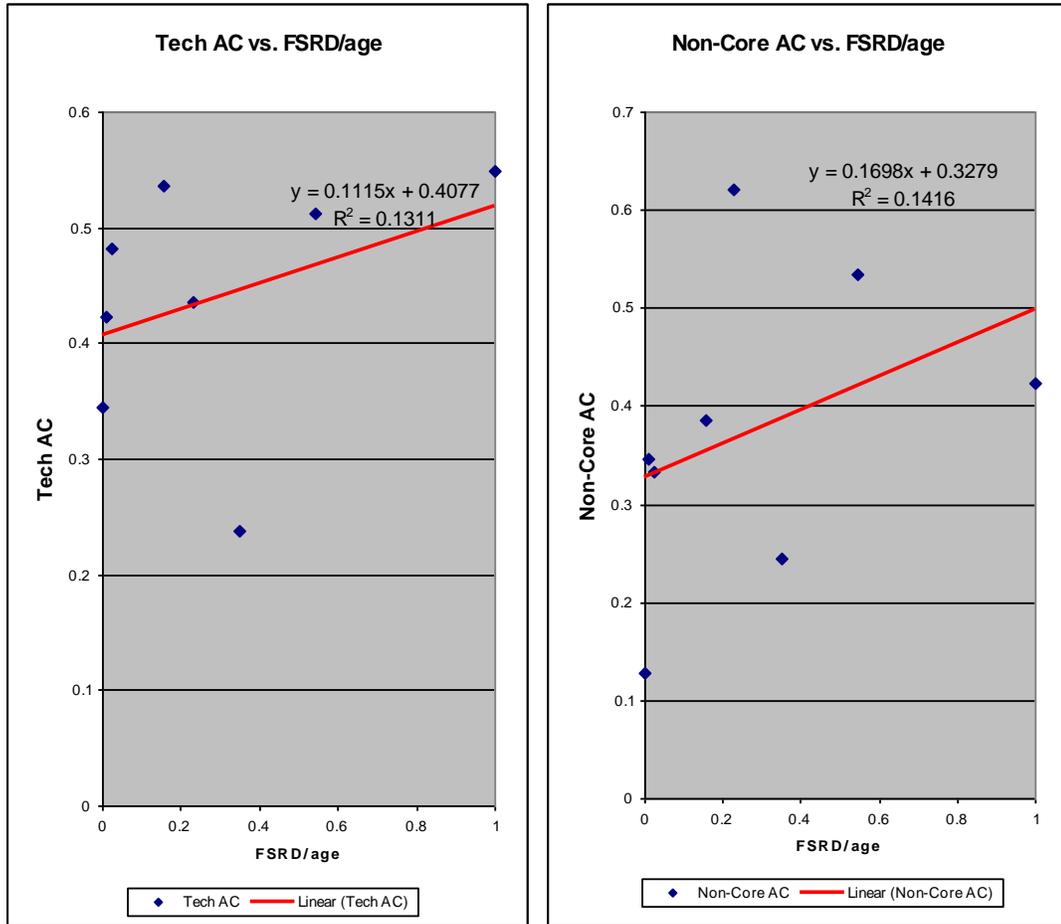


Figure 7.10: Tech AC vs. FSRD/Age **Figure 7.11: Non-Core AC vs. FSRD/Age**

In Figure 7.10, the low R-squared value implies that FSRD/age has an indeterminable effect on the Tech AC. The indeterminability means that there are more internal factors that have varying influence. This could be due to a focus towards a narrow field of technology (overspecialization). In Figure 7.11, the low R-squared value implies that FSRD/age has an insignificant effect on the Non-Core AC. Therefore, FSRD/age has no significance on any AC.

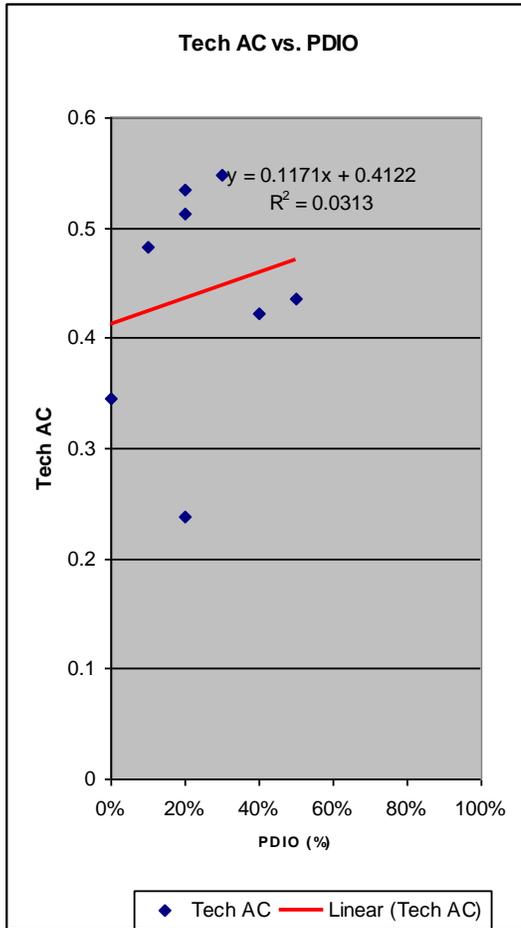


Figure 7.12: Tech AC vs. PDIO

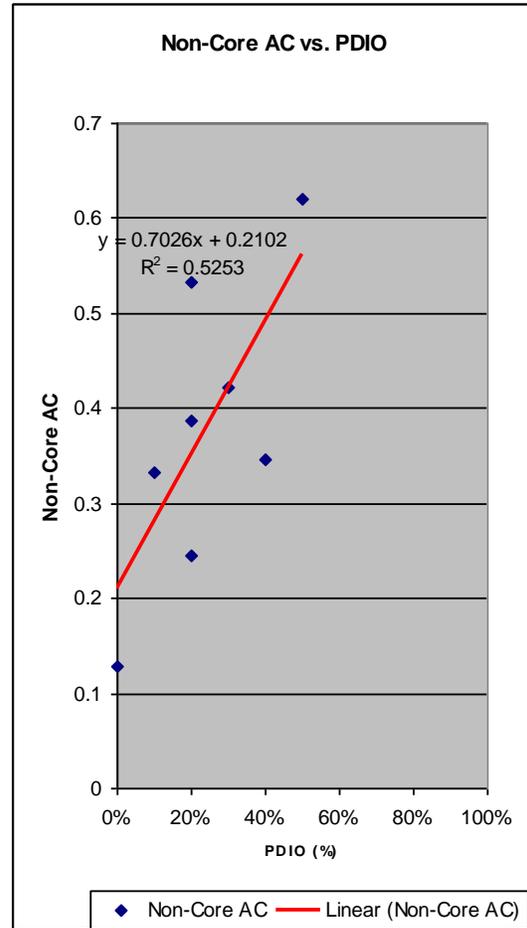


Figure 7.13: Non-Core AC vs. PDIO

In Figure 7.12, the low R-squared value implies that PDIO has an indeterminable effect on the Tech AC. In Figure 7.13, the high R-squared value and the high gradient value implies that PDIO has a significant positive effect on the Non-Core AC. Therefore, PDIO has a significant positive effect only on Non-Core AC.

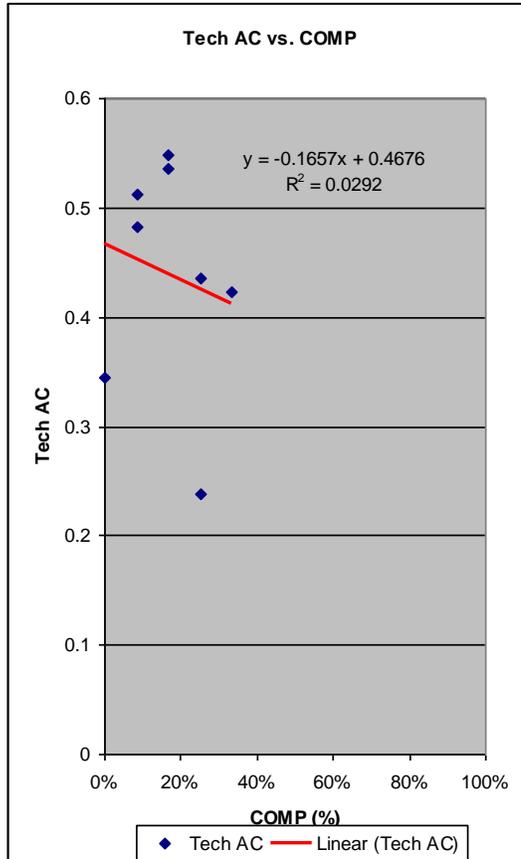


Figure 7.14: Tech AC vs. COMP

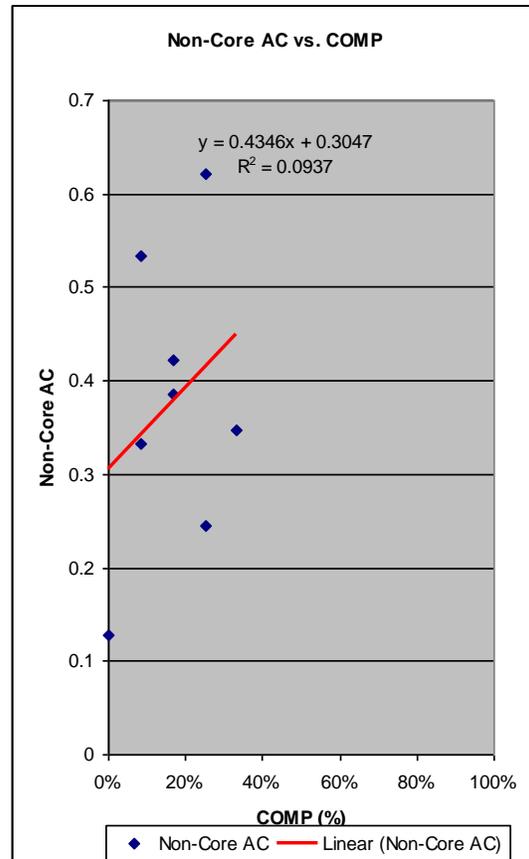


Figure 7.15: Non-Core AC vs. COMP

In Figure 7.14, the low R-squared value implies that COMP has an indeterminable effect on the Tech AC. In Figure 7.15, the low R-squared value implies that COMP has an insignificant effect on the Non-Core AC. Therefore, COMP has no significance on any AC.

The Section 4.5.3 (p. 219) addressed reliability and validity of the measurement process. The next section presents the re-evaluation of the significance of the absorptive capacity variables.

7.2.5 Verification of the Significance of Variables on AC

Due to the immense complexity of the absorptive capacity construct, a single analytical approach should be avoided. Therefore, one should seek multiple approaches to data analysis, since each will provide a result that tends towards the true result but may still deviate from it based on the individual subjectivity. Thus, if the results from multiple approaches are merged (compared), one approaches the true result based on their individual biases losing significance. This section considers and re-evaluates the AC variable contribution weighting based on the ranking method of analysis. The highest value within each variable was allocated a value of one (1), while the consecutive lower values received the values of two (2) and onwards.

Table 7.5: Rated AC Variables

Firm	Subjective			Objective								
	Total AC	AC Tech	Non-Core AC	FSTS	MIE	FIE	RDI	FSRD	Age	FSRD /age	PDIO	COMP
C1	6	4	5	4	2	3	1	7	3	7	2	1
C2	3	1	3	2	2	4	2	3	6	1	3	3
C3	5	6	6	4	2	5	3	4	4	3	4	2
C4	8	5	7	5	3	5	1	8	4	8	6	5
C5	4	1	4	2	2	4	1	5	5	5	4	3
C6	2	2	2	1	2	2	4	2	2	2	4	4
C7	1	4	1	2	1	1	5	1	1	4	1	2
C8	6	3	4	3	1	4	1	6	3	6	5	4

The firms' Subjective Tech AC and Non-Core AC were ranked based on the interpretation of the interviews and personal impression (see Appendix E and D), while Objective Tech AC and Non-Core AC were ranked based on the firms' absolute values used for the case firms' variables (see Table 7.1) and firms' AC variable ratings (Table 7.2).

Two separate regression analyses were conducted for the ranking of each dependent variable (Tech AC and non-core AC) relative to the rankings of the seven independent variables (FSTS, MIE, FIE, RDI, FSRD/age, PDIO and COMP). The results of each of these analyses are reported separately in the graphs of the statistically significant interactions which are presented to illustrate effect of each interaction variable on the dependent variable. The R-squared and the gradient values for each of the analyses were interpreted. The first stage of regression analysis involves observing the R-squared values. The higher the R-squared value, the more representative is the gradient value of the real relationship between the variable and the individual AC. The higher positive gradient implies a more significant positive effect between the variable and the individual AC.

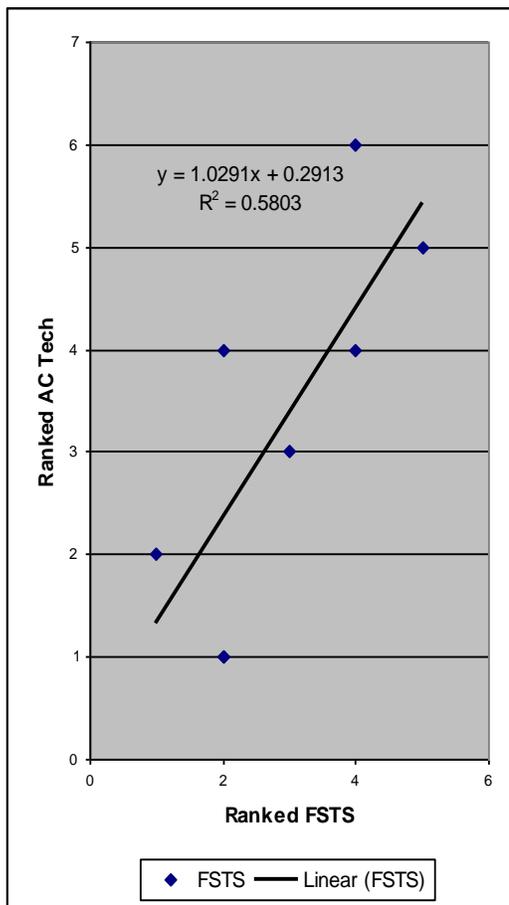


Figure 7.16: Tech AC vs. FSTS

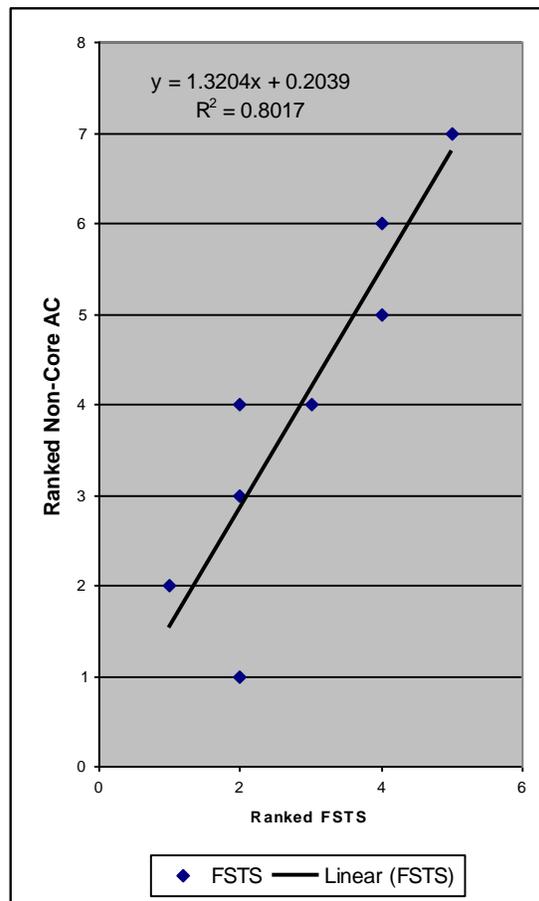


Figure 7.17: Non-Core AC vs. FSTS

In Figure 7.16, the higher R-squared value and the moderate gradient value implies that FSTS has a significant positive effect on the Tech AC. In Figure 7.17, the high R-squared value and the higher gradient value implies that FSTS has a significant positive effect on the Non-Core AC. Even though FSTS has a significant positive effect on both ACs, its influence is greater on Non-Core AC.

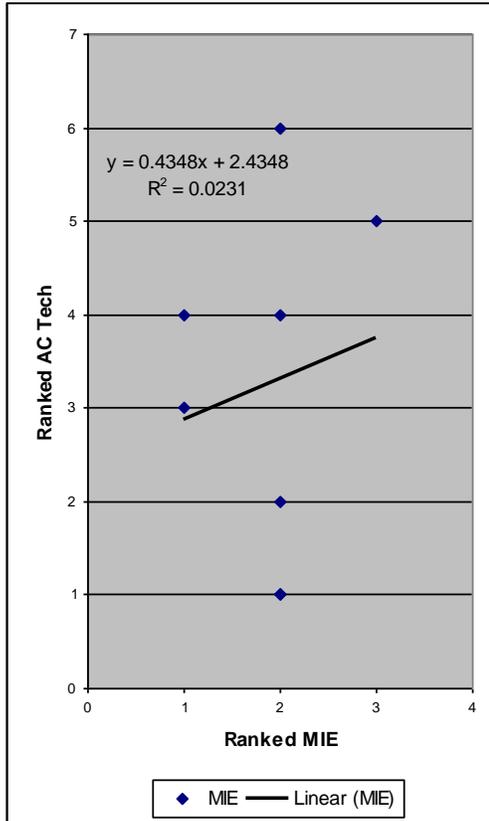


Figure 7.18: Tech AC vs. MIE

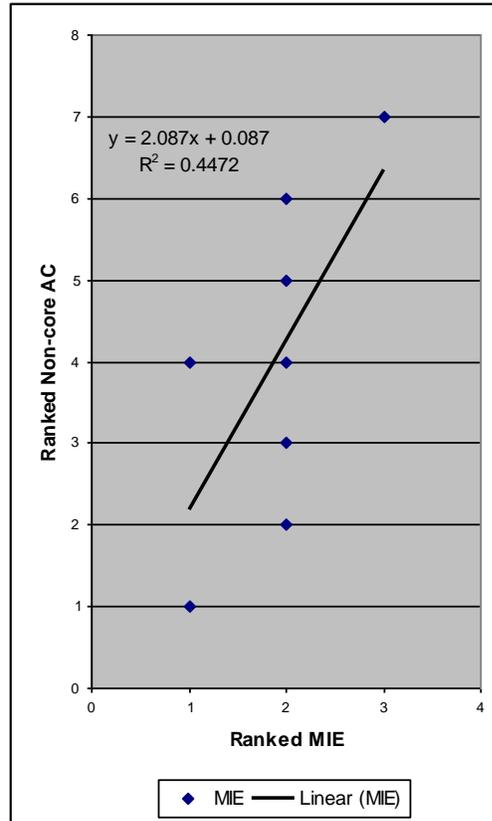


Figure 7.19: Non-Core AC vs. MIE

In Figure 7.18, the low R-squared value implies that MIE has an indeterminable effect on the Tech AC. In Figure 7.19, the moderate R-squared value and the very high gradient value implies that MIE has a significant positive effect on the Non-Core AC. Therefore, MIE has a strong significant positive effect only on Non-Core AC.

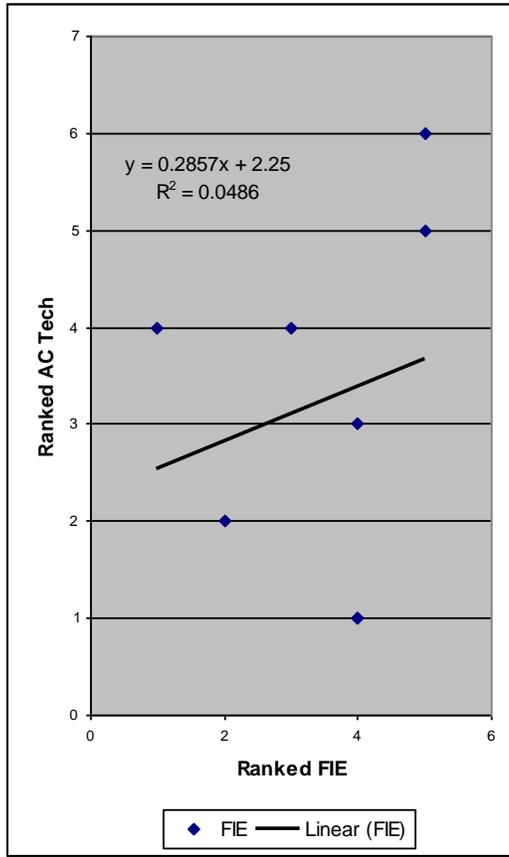


Figure 7.20: Tech AC vs. FIE

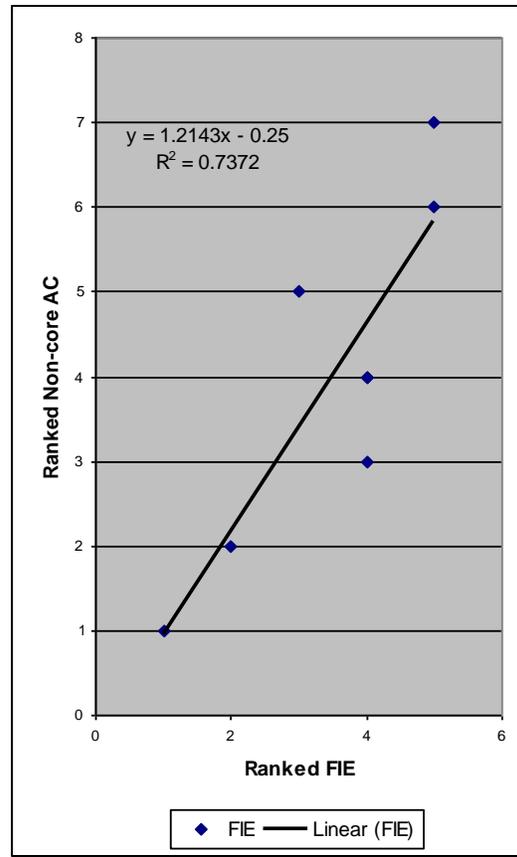


Figure 7.21: Non-Core AC vs. FIE

In Figure 7.20, the low R-squared value implies that FIE has an insignificant effect on the Tech AC. In Figure 7.21, the high R-squared value and the higher gradient value implies that FIE has a significant positive effect on the Non-Core AC. Therefore, FIE has a significant positive effect only on Non-Core AC.

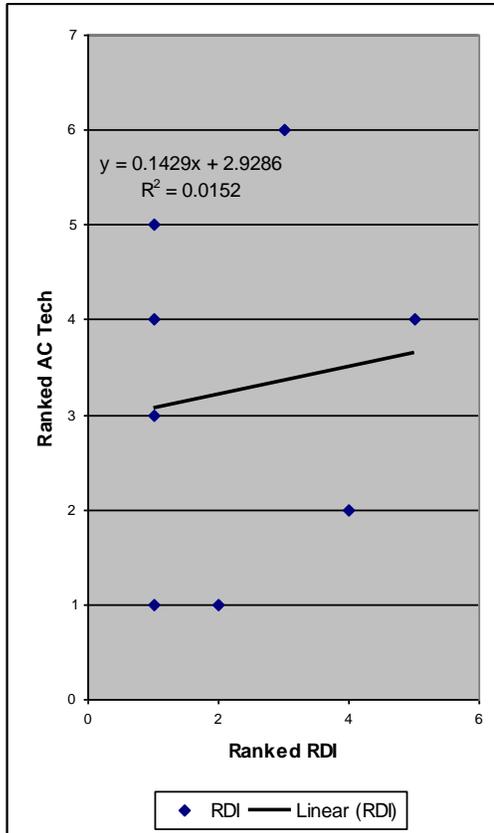


Figure 7.22: Tech AC vs. RDI

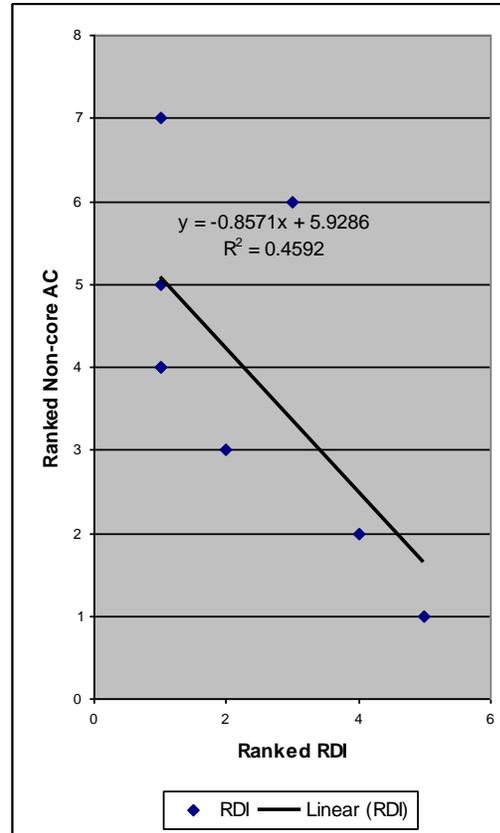


Figure 7.23: Non-Core AC vs. RDI

In Figure 7.22, the low R-squared value implies that RDI has an indeterminable effect on the Tech AC. This indeterminability means that there are more internal factors that have varying influence. This could be due to a focus towards a narrow field of technology (overspecialization). In Figure 7.23, the medium R-squared value and the moderate negative gradient value imply that RDI has a significant but moderate effect on the Non-Core AC. Therefore, RDI has no significance on Tech AC, and a tendency towards a negative effect on Non-Core AC.

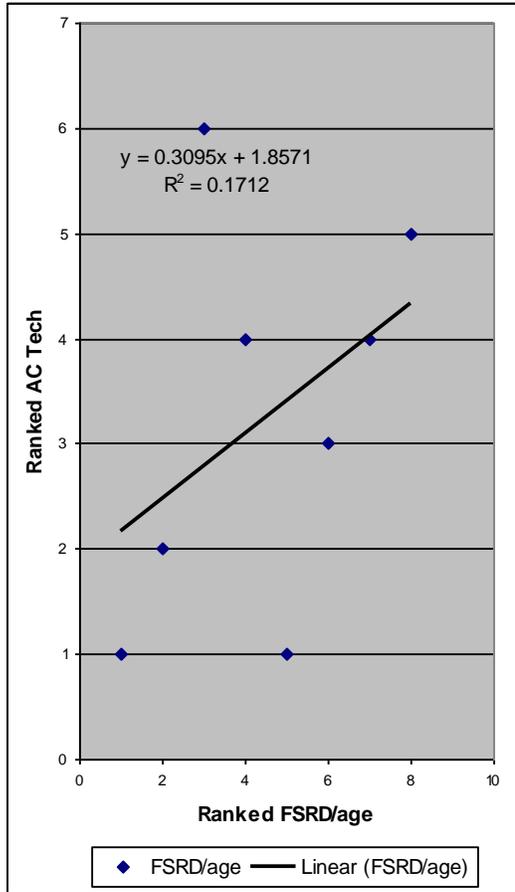


Figure 7.24: Tech AC vs. FSRD/Age

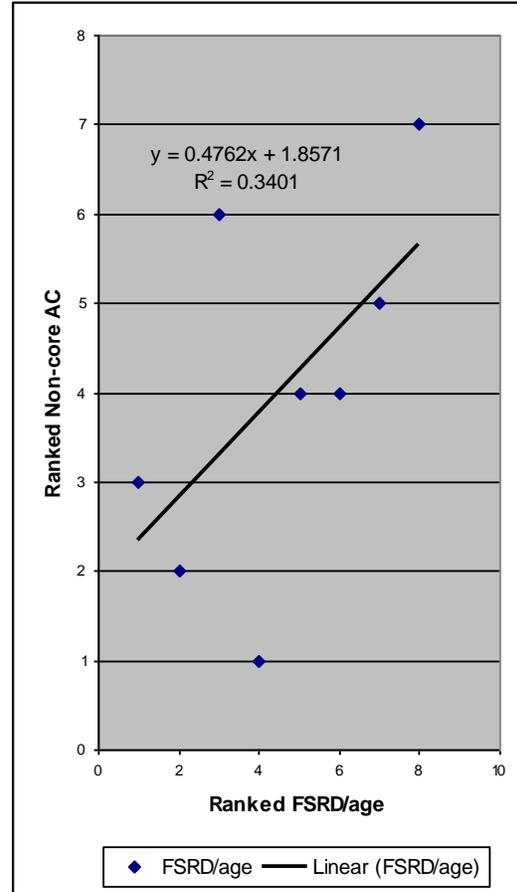


Figure 7.25: Non-Core AC vs. FSRD/Age

In Figure 7.24, the low R-squared value implies that FSRD/age has an indeterminable effect on the Tech AC. The indeterminability means that there are more internal factors that have varying influence. This could be due to a focus on a narrow field of technology (overspecialization). In Figure 7.25, the lower R-squared value implies that FSRD/age has an insignificant effect on the Non-Core AC. Therefore, FSRD/age has no significance on any AC.

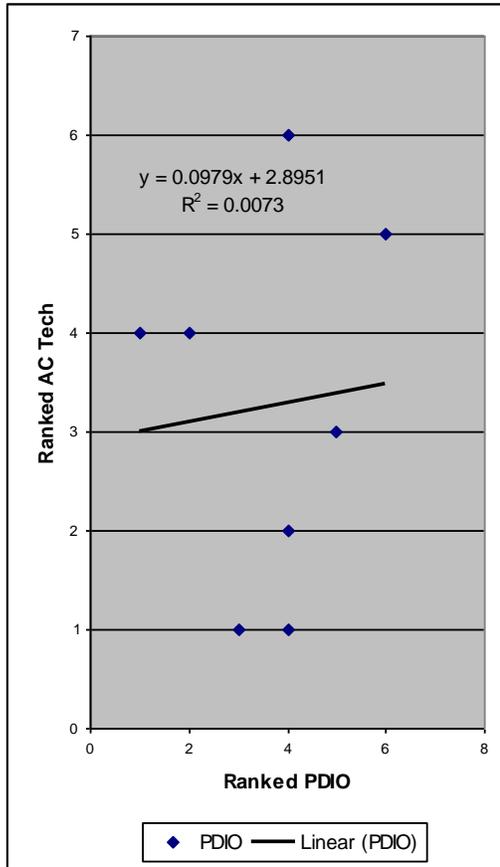


Figure 7.26: Tech AC vs. PDIO

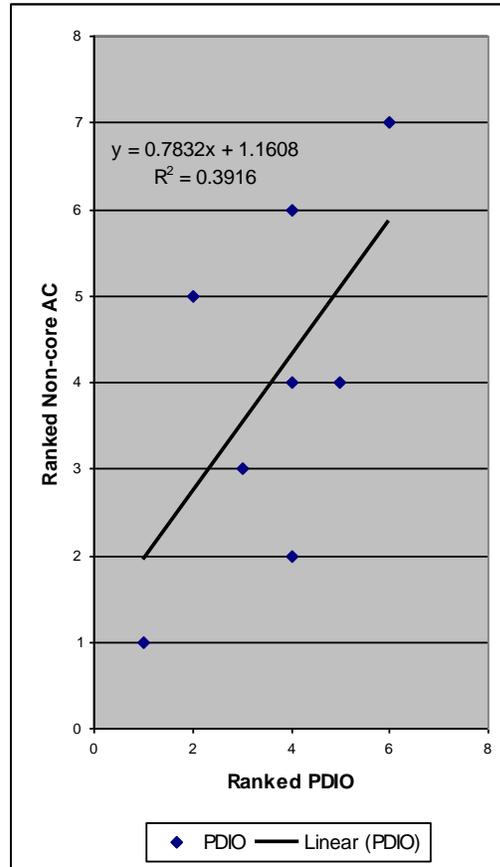


Figure 7.27: Non-Core AC vs. PDIO

In Figure 7.26, the low R-squared value implies that PDIO has an indeterminable effect on the Tech AC. In Figure 7.27, the medium R-squared value and the moderate gradient value implies that PDIO has a weak significant positive effect on the Non-Core AC. Therefore, PDIO has a significant positive effect only on Non-Core AC.

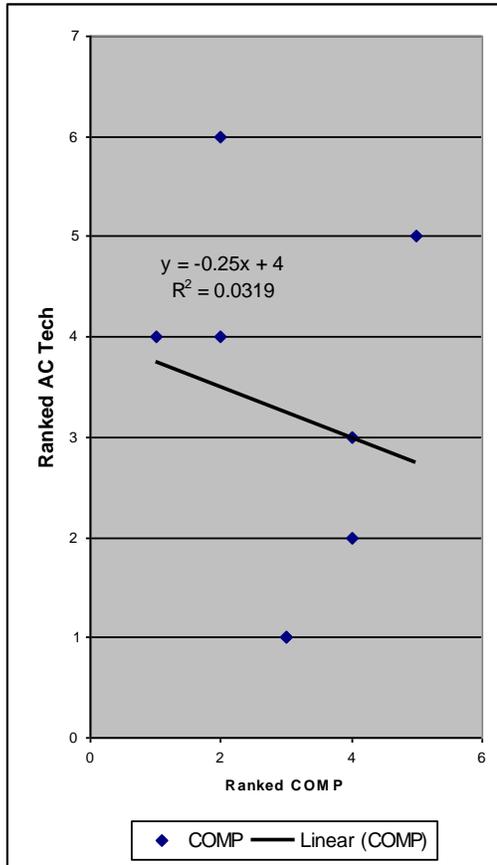


Figure 7.28: Tech AC vs. COMP

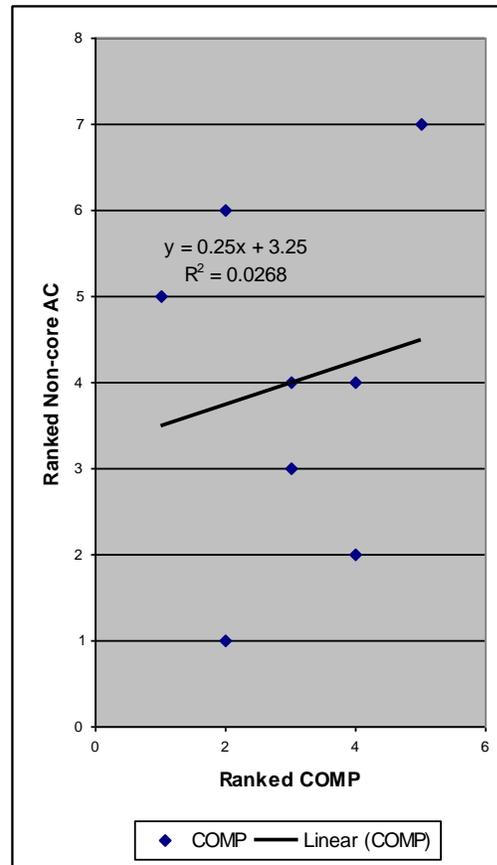


Figure 7.29: Non-Core AC vs. COMP

In Figure 7.28, the low R-squared value implies that COMP has an indeterminable effect on the Tech AC. In Figure 7.29, the low R-squared value implies that COMP has an indeterminable effect on the Non-Core AC. Therefore, COMP has no significance on any AC.

Table 7.6: Comparison of Variables of Technological AC

Tech AC	(1) R ²	(2) R ²	(1) Gradient	(2) Gradient
FSTS	0.57	0.58	+ve	+ve
RDI	0.01	0.02	NA	NA
MIE	0.08	0.02	NA	NA
FIE	0.17	0.05	NA	NA
FSRD/age	0.13	0.17	NA	NA
PDIO	0.03	0.01	NA	NA
COMP	0.03	0.03	NA	NA

In Table 7.6 it can be observed that only the FSTS has a significant effect on Tech AC. This is in agreement in both instances, demonstrating its *tendency* towards a significant, positive influence. However, all the other variables have an indeterminable effect on the Tech AC. This does not mean that the other variables do not have an effect but, more precisely, are less influential compared to each other.

Table 7.7: Comparison of Variables of Non-Core AC

Non-Core AC	(1) R ²	(2) R ²	(1) Gradient	(2) Gradient
FSTS	0.65	0.80	+ve	+ve
RDI	0.32	0.46	-ve	-ve
MIE	0.42	0.45	+ve	+ve
FIE	0.86	0.74	+ve	+ve
FSRD/age	0.14	0.48	NA	+ve
PDIO	0.53	0.39	+ve	+ve
COMP	0.09	0.03	NA	NA

In Table 7.7 it can be observed that COMP does not have a distinguishable effect on the Non-Core AC. Also, for FSRD/age it can be seen that the two methods produce

different results in determining the significance of the variable onto the Non-Core AC. This demonstrates and confirms the need for implementing multiple approaches in data interpretation, as discussed in Section 4.5.3. Therefore, the FSRD/age has an indeterminable effect with a positive tendency.

Another interesting observation was that both methods agree on the RDI variable having a moderately significant but negative influence on the Non-Core AC. The PDIO and MIE both have an agreement of moderate positive effect on the Non-Core AC, while the *FSTS* and *FIE* agree in both methods to have a strong, significant, positive influence on the Non-Core AC. However, only *FSTS* has a strong, significant positive effect on both AC's. The variables seen as indeterminable could only be explained as having more internal factors that have varying influences. Therefore, this influence need to be further divided into more fundamental factors and each individual factor analyzed independently.

Since the present study concerns the impact of the possession and development of technology, and absorptive capacity on the internationalization process of the New Zealand high-tech SMEs with core-competencies in agro-technology, the following question initiated the study: “*What kind of knowledge should New Zealand high-tech SMEs possess in order to develop the ability to successfully adapt in a new business context?*”

The ability of a firm to *recognize opportunities* in its environment and avoid threats is also a form of knowledge showing the capability to see patterns in the new emerging information. The results show that *FSTS* and *FIE* reflect the experience and knowledge gained through interaction in foreign activities in case companies and have a strong influence on the Non-core AC (only *FSTS* has an influence on both AC's). Further, the RDI has a moderately significant effect on Technological AC but a negative influence on the Non-Core AC, which indicates the high-tech SMEs focus on their core capabilities. The qualitative data analysis (see Section 6.2, p. 291) suggests that the case companies by conducting their own R&D are able to use

externally available information related to their core competencies, although this is only associated with promoting and fostering R&D rather than developing methods to detect new opportunities in markets. The majority of firms do not have well developed marketing and sales teams, which puts the commercialization of their products at risk.

However, sharing and adequate managing the flow of information across the firm is of critical importance to firm's growth. In the same manner, this study addressed the question: *"How do SMEs acquire new information and how is the flow of newly acquired information managed across the high-tech firms?"* The empirical analysis (see Section 6.2) shows that all case firms emphasize the importance of human resources, which is comparable to the investment in the R&D projects they undertake. All firms have built the learning environment in which they share information related to R&D, which help develop firm's Technological AC. However, having a strong focus on their core specialization and the lack of people with specialty in market research challenges the ability of the firms to recognize, assimilate and exploit/commercialize new opportunities and increase in the overall absorptive capacity.

For this reason this thesis embarked on the development of the absorptive capacity model (explained in the next section) to identify the areas of business strengths in the firms in which the organization should invest and grow. It also identifies the areas where the firm should give serious thought to divesting themselves of weaker business areas.

7.2.6 Primary Absorptive Capacity Model

The reasons for using Karnaugh map for classifying results into discrete zones, and why this method was appropriate in this study was discussed in section 4.5.4 (p. 222). Using the expanded principles of the Karnaugh map design, the areas of business strength can be defined using the basic Boolean arithmetic principles. The expanded

design incorporates three dimensions (High, Medium and Low), while the standard Karnaugh map (see Table 7.8) utilizes only two possibilities (True or False). Therefore, the basic Boolean algebra still applies, with expanded arithmetical principles.

Table 7.8: Example of the Basic Karnaugh Map Design

Z	Y ₀	Y ₁
X ₀	1	1
X ₁	1	0

$$Z = X_0 \bullet Y_0 + X_0 \bullet Y_1 + X_1 \bullet Y_0$$

$$Z = X_0 + Y_0$$

Source: Adapted from Katz, (1994, pp. 70-71)

Note: $\bullet \Rightarrow$ logic AND

$+$ \Rightarrow logic OR

Since this research expands to the area of internationalization, the international activities of high-tech SMEs in New Zealand served as a context. The results are based on the themes that emerged from the analysis of the interviews. The results are linked to the extant literature with the goal to developing theoretical explanations of the relationship between technological AC and non-core AC and technology. Table 7.9 demonstrates the use of the expanded Karnaugh map to identify the areas of business strength in eight high-tech New Zealand firms.

An example of a linguistic variable and how terms High, Medium and Low are defined is previously introduced in more detail in fundamentals of fuzzy systems theory, in Section 4.5.7 (p. 232).

Table 7.9: The Expanded Karnaugh Map for Identifying the Areas of Business Strength

		Non-Core AC (Y)		
Tech. AC (X)		H	M	L
	H	A	A	B
	M	A	B	C
	L	C	C	C

Zone A – shown as bright yellow color in surface plot Figures (7.30, 7.31 and 7.32), areas of business strength in which the firm should invest and grow; identified through (are true for) High Tech. AC accompanied by High or Medium Non-Core AC, or just the Medium Tech. AC and High Non-Core AC. This can be expressed using the Boolean algebra:

$$A = X_H \cdot Y_H + X_M \cdot Y_H + X_H \cdot Y_M$$

$$A = X_H \cdot (Y_H + Y_M) + X_M \cdot Y_H$$

This area is at a high AC level and the firm should focus towards maintaining the current balance between the two ACs.

Zone B – shown as tones of green color in surface plot Figures (7.30, 7.31 and 7.32), areas of business strength that are at the level that the firm should maintain its level of investment and more focus on slightly weaker variable; identified through (are true for) the combination of Medium Tech. AC accompanied by Medium Non-Core AC, or High Tech. AC accompanied by Low Non-Core AC. This can be expressed using the Boolean algebra:

$$B = X_M \bullet Y_M + X_H \bullet Y_L$$

This area is at a medium level and the firm should focus towards the following variables that significantly affect Non-Core AC (e.g., FSTS, FIE, MIE). The recommended solution may be to seek (acquire) MIE (e.g., employing a manager with the international experience) which leads to improvement of FIE, which would ultimately increase FSTS. Augmented FSTS increases Non-Core AC and places them into Zone B of Karnaugh map.

Zone C – shown as deep blue colour in surface plot Figures (7.30, 7.31 and 7.32), areas of business strength identified through (are true for) the Medium Tech. AC and Low Non-Core AC or just Low Tech. AC. This can be expressed using the Boolean algebra:

$$C = X_L \bullet Y_H + X_M \bullet Y_L + X_L \bullet Y_L + X_L \bullet Y_M$$

$$C = X_M \bullet Y_L + X_L$$

This area is at a low level and the firm should give serious thought to divesting, or focus towards the following variables that significantly affect AC Tech (e.g., FSTS, FSRD/age, RDI). The recommended solution may be to increase RDI (e.g., more funding or employing more experienced R&D staff). Augmented RDI will increase AC Tech and places them into Zone B of the Karnaugh map.

7.2.7 Refined Absorptive Capacity Model

The refined model is based on the implementation of the modified Karnaugh map for zone classification, while the transition between zones was facilitated through fuzzy-logic design.

Conventionally fuzzy logic is implemented where a smooth transition is required from one state to another (Hong, 2005). That is because not all practical world

problems/states can be classified as completely true or completely false (yes/no). This allows systems to cope with significance rather than be distracted by seeking precision of the problems. Where a number carries the meaning, one has more use of knowing the meaning rather than the value.

The primary model is shown in the modified Karnaugh map in Table 7.9. The model was further refined using the fuzzy-logic design to allow for smoother transition between absorptive capacity levels (Low, Medium & High). In the surface plots three zones (A, B & C) are designated with transition from deep blue to bright yellow, meaning transition from LOW to HIGH respectively.

All the principles from the primary AC model still apply to the refined model, with added robustness due to more gradual transition (smoother boundary). The surface plot of the refined model is shown in Figures 7.30, 7.31 and 7.32.

Fuzzy logic moulds reality into the Karnaugh model (refined model from primary model). In the refined model, a narrow zone B is formed between zones C and A for high non-core AC and low Tech AC, see Figures 7.30, 7.31 and 7.32 fuzzy surface plots. This zone does not exist in the primary model, but nonetheless exists in the real world case, providing a narrow transition band between High and Low.

This model relates firm's AC variables to their capability levels (Low, Medium, High). In order to determine company's AC level, estimation/evaluation of the variables is required.

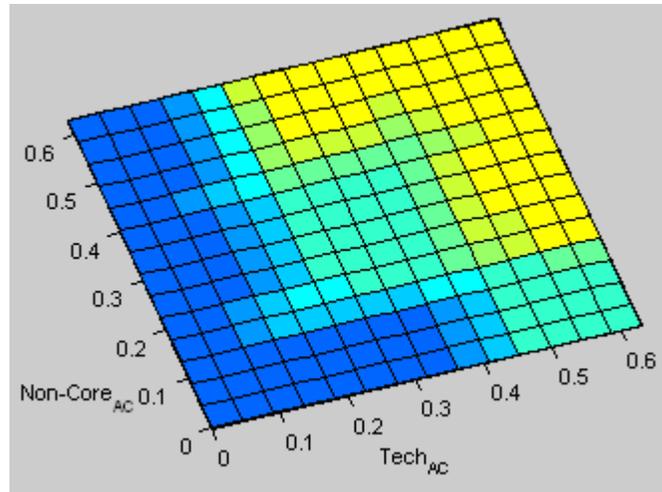


Figure 7.30: Fuzzy Surface Plot A

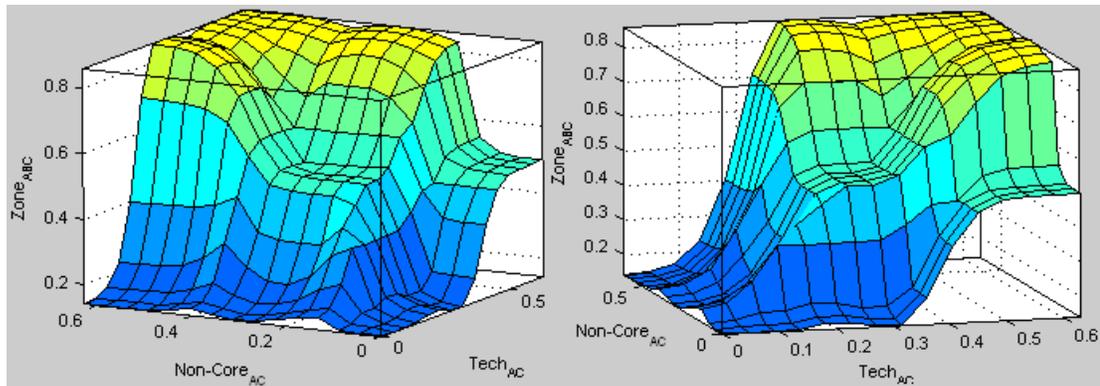


Figure 7.31: Fuzzy Surface Plot B

Figure 7.32: Fuzzy Surface Plot C

The fuzzy surface plot is viewed from three different angles to provide a better perspective of the convenience and effectiveness of fuzzy logic models is shown in above Figures (7.30, 7.31 and 7.32).

7.2.8 Implementation of the Refined Model

This section looks at matching and implementation of the refined model on to the research data. The Figures 7.33 and 7.34 show the eight case companies based on the results of AC measurements plotted onto the AC refined model.

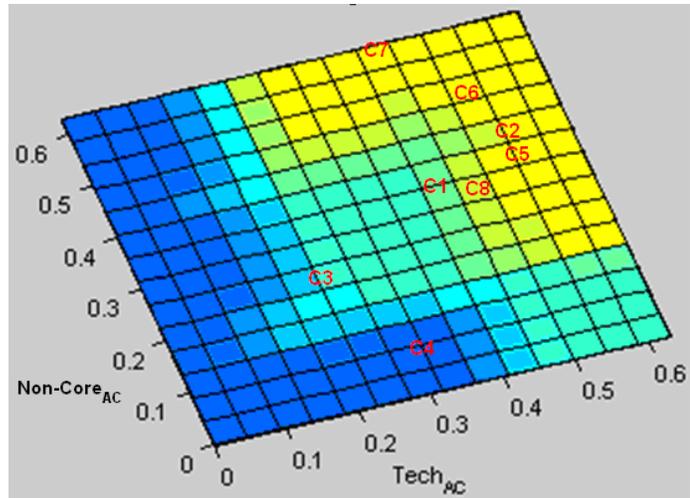


Figure 7.33: Companies Mapped onto the AC Model, Top View

Figures 7.33 and 7.34 clearly lay out the eight firms' location on the model. However, the 3-dimensional surface plot (Figure 7.34) provides a visual perception of the research cases, where one can almost immediately recognize the companies' zones.

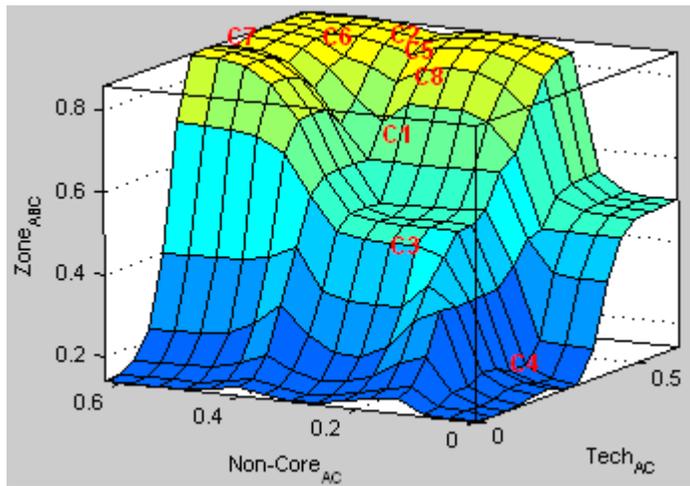


Figure 7.34: Companies Mapped onto the AC Model, Side View

The following text interprets the firms' results on the refined AC model in relation to the qualitative case results in Section 5.3:

C1 has medium AC_{total} . To achieve high AC_{total} it needs a small increase in AC_{tech} , while maintaining the present level of $AC_{non-core}$.

This firm produces a range of diverse products, from developing new products to saving the environment (see Section 5.3.1). The firm does not have a sharp focus, except for producing fruit-based food and food components. Their focus is still divided not only between products they produce and projects they want to pursue, but also is shown in their trying to balance business and science, as the respondent put it, “Scientists are running the firm” (p. 250).

Although the business development team works closely with scientists to identify the established markets’ needs, the firm’s success is driven by science. The firm’s understanding of markets and competitors comes from its distributors in established foreign markets. The firm has made a significant progress in developing the project management initiative and new idea to commercialization process, which began with embedding business development ideas in the science teams. As the respondent admitted “turning science into appropriate income is always a challenge for a research organization – even more so in our case, where we need to make the leap into new markets” (p. 252). The firm has developed research skills and capabilities beyond the capacity of the New Zealand market, however there is still long way to go before these capabilities are fully utilized in foreign markets.

C2 has a moderately high AC_{total} . To achieve even higher AC_{total} it needs a small increase in $AC_{non-core}$, while maintaining the present level of AC_{tech} .

This is a young ‘born global’ company. From the very beginning this firm’s intention has been to internationalize, but only to the extent of finding the distributors and agents interested in this sort of technology (see Section 5.3.2). The firm’s business strategy revolves around developing innovative, on-demand media solutions. Although, the firm’s understanding of its environment is drawn directly from its markets, specific research and reliance on networking provides a basis for partner/agent selection and initial operational strategies. A key resource, apart from

the shared knowledge and innovative spirit, is the firm's marketing partners located in other countries.

C3 has a medium AC_{total} . To achieve a high AC_{total} it needs to choose one of two shortest paths: a small increase in $AC_{non-core}$ while significantly increasing the level of AC_{tech} ; or a small increase in AC_{tech} , while significantly increasing the level of $AC_{non-core}$. Choosing to equally invest in both directions leads to a longer path.

This organization is formed to manage a cluster which is the New Zealand's growth hub for Ag-Biotech businesses. It was established to boost economic growth within the region by encouraging the further development of its existing agri-tech firms (see Section 5.3.3). This is where leading primary sector science, technology and research meet a catalyst for entrepreneurship and the growth accelerants of resourcing, collaboration, and a global channel of opportunities (p.259).

In order to grow and stay ahead of the competition, the firms in the cluster continue to innovate relying on the feedback from established markets, but they are not quite prepared to change their direction. Although there is no formal policy and reached agreement on the international strategy of the cluster as a whole, the atmosphere and communications between firms on site are informal because of physical proximity and entire layout of the building. Even though the cluster acts as the management agent for companies there is still no collective plan to help the firms' access to the international markets and there is no plan to help firms to commercialize their products.

C4 has a low AC_{total} . To achieve a high AC_{total} it needs equally invest in $AC_{non-core}$ and AC_{tech} .

The firm was established to help dairy farmers create profitable and sustainable dairy farm businesses. It sees its environment principally in terms of needs of the New Zealand dairy farmers (see Section 5.3.4). They monitor the changes in the

external/international environment that may have potential impact on the farmers' productivity.

The firm acts as a knowledge centre, transferring knowledge to dairy farmers and also provides an influence over farmer adoption of new technology. It drives innovation by building a stimulating work environment, providing opportunities and encouraging personal development and growth of its people. From time to time it engages external parties in R&D projects.

Even though, R&D is highly emphasized, the firm produces exclusively for the domestic market demands. There is still no international policy in the company. This is a good example of a firm which does not fully utilize its resources and does not completely benefit from technology and knowledge they develop.

C5 has a moderately high AC_{total} . To achieve even higher AC_{total} it needs an increase in $AC_{non-core}$, while maintaining the present level of AC_{tech} .

It is a young and enthusiastic New Zealand-based research and technology firm with main capabilities in science and innovation (see Section 5.3.5). The firm sees its environment principally in terms of research, development, science and innovation. In understanding its environment, the firm does not distinguish between its domestic and international markets. Strategic direction is set by an overall global strategy.

Comprising an R&D team of some 14 scientists and engineers, along with several graduate students, the firm is supported by a highly specialized international management team, based in four countries in Australasia and Europe. The firm's business model leverages its own in-house expertise with strategic collaborations with universities and research centers world-wide. Projects have included collaborations with more than ten such organizations in over seven countries.

This unique strategic architecture gives the firm a significant competitive advantage by creating a specialist knowledge base that enables it to devise customized products for a broad range of problems. The technology development process is a part of their future internationalization strategy because they continuously look to find areas where their expertise can be applied.

C6 has a moderately high AC_{total} . This company is in a unique position, where to achieve an even higher AC_{total} it can choose to invest in either $AC_{non-core}$, AC_{tech} or both.

This firm fits into a category ‘traditional’ firm, which has developed its domestic market first and then explored and expanded into the foreign markets (see Section 5.3.6). This is an internationally active firm. Product and manufacturing flexibility allows the firm to highly customize product in recognition to the customer’s individual requirements as well as individual markets. Research and development is vital to the firm’s success. The firm deals with large pharmaceutical companies.

The firm’s sales team travels extensively to markets to gain first hand experience and gather ideas from customers incorporating these into the developing programs and with its international network of agents provides customers with seamless response to any enquiry, linking local knowledge with their specific expertise.

The philosophy that underline all their business activities and what is regarded as being the key requirements for success in doing business from New Zealand, is “Preparedness to travel” (p. 275). Research and development is essential to the firm’s success coupled with their sales and marketing team efforts to travel extensively to gain first hand experience and gather ideas from customers integrating these into the developing programs.

C7 has a moderately high AC_{total} . To achieve even higher AC_{total} it should consider investing in AC_{tech} , while maintaining the present level of $AC_{non-core}$.

This well established firm has a long business history in the New Zealand and foreign markets (see Section 5.3.7). The firm strives at building its world-class product innovations, supported by practical ‘how to’ customer advice. The firm’s success is attributed to their expertise in product innovation and strong brand management, which is a core role of marketing in the firm.

The firm draws on its proven skills in R&D and manufacturing to deliver superior systems and products. However, the success is probably due to their extensive and successful international distribution network in more than 130 countries to deliver the products to the world. The firm has a very proactive approach to the international activities.

Feedback from markets provides understanding of market and customer requirement and a basis for product adaptation. The firm’s technology development process is not a part of future internationalization strategy of the firm because their approach to internationalization is atypical to the other case firms in this research in sense that it is more market pull strategy.

C8 has upper medium AC_{total} . To achieve high AC_{total} it should consider investing in AC_{tech} while maintaining the present level of $AC_{non-core}$.

This is a firm that put its emphasis to help improve the effectiveness and efficiency of farming in New Zealand by providing innovative solutions for on-farm problems (see Section 5.3.8). The firm is focused on the discovery and development of new and leading-edge technologies for the benefit of New Zealand’s pastoral sector.

The majority of its projects are funded by government agencies, leaving commercialization as a secondary priority. “We are moving forward on a wave of knowledge. Much of this is science, “(p. 285), which focuses on ‘why’ (science),

rather than ‘how to’ (technology) which concerns the practical implementation of science.

The criteria firm uses when selecting a market for the international activities, “could be climatic, or it could be related to the technology itself,” (p. 284). The firm is very determined to find out new technological invention globally with the aim of being one step ahead. The strategy that is utilized is technology push, rather than market pull on most occasions.

Direct Path to Further Growth - Example

Having explained the positioning of the firms, the following example shows the shortest path towards High AC. The C4 case firm can immediately be recognized as belonging to Low zone. Also, a clear distinction is visible for the zone levels of C1 and C8, which is not so obvious in Figure 7.33.

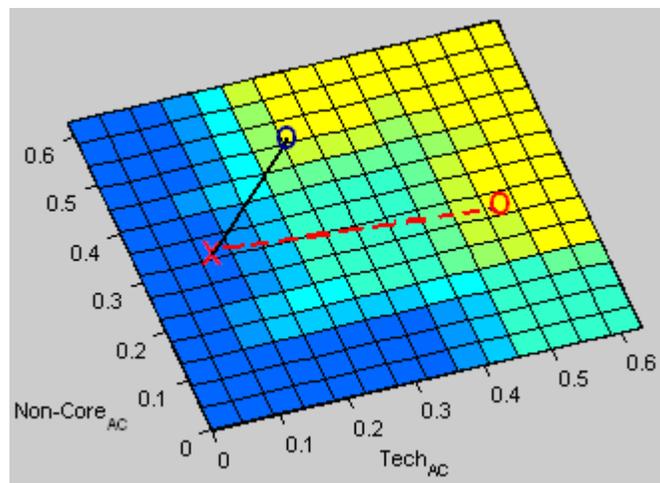


Figure 7.35: The Shortest Path Example from Low to High AC

Figure 7.35 above shows the shortest path example from Low to High AC based on the refined AC model. Instead of going a long, time and resource consuming path to

achieve the High AC (red line), a firm may choose a much shorter, more efficient path (black line) to achieve the same goal, High AC.

For example, the implementation of the above claim can be applied to the C4 firm as a worst-case scenario company in the sample group (see Table 7.4: Firms' AC results). The firm had very low non-core AC (0.11) and medium technological AC (0.29). The graph (Figure 7.36) shows the shortest path for the C4 firm (black line). Instead of following the long path (red line) and developing non-core AC only, the suggestion would be to further develop technological AC and to some extent improve non-core AC at the same time.

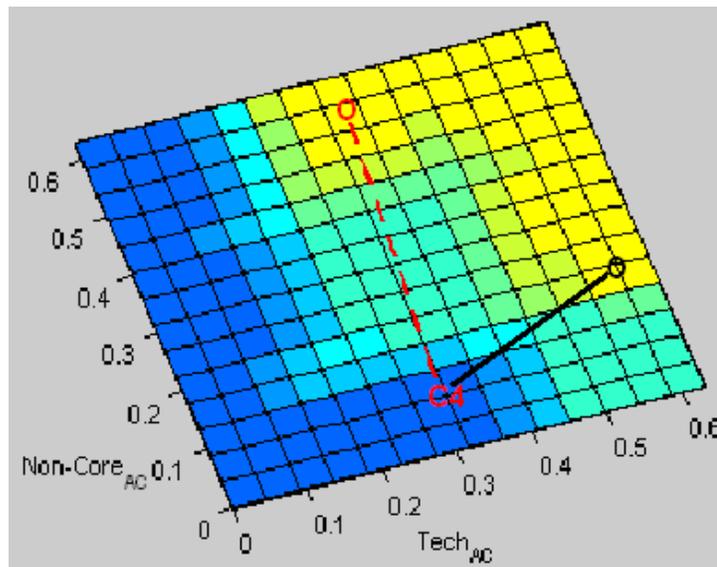


Figure 7.36: Implementation Example on the C4 Case Company

This thesis adopts Sullivan's (1994) premise that absorptive capacity measurement is not an absolute state but a continuous choice that managers make relative to the current circumstances. The case of this is most vivid when a manager is replaced. This is based on his/her capabilities, previous business and international experience, and ultimately new strategic direction of a firm. As a consequence, firm's absorptive capacity and competitive capability could change on a larger scale by, for example, international hiring, because a new manager influences decision-making process.

After analyzing the AC variables, the AC model can be applied to any firm for self-evaluation and gaining insight towards further growth and strategy development, giving a clear direction of the future progress.

These results directly challenged the two most-cited absorptive capacity definitions in the international business literature: Cohen and Levinthal (1990) and Zahra and George (2002) for the same reason. First, Cohen and Levinthal (1990, p. 128) refer to AC as "... the ability to evaluate and utilize outside knowledge..." This definition establishes three capabilities of a firm, which have been categorized as components of absorptive capacity: recognizing the value, assimilating and applying new external knowledge to commercial ends. Second, Zahra and George re-conceptualized absorptive capacity and defined four components of absorptive capacity (acquisition, assimilation, transformation and exploration). Neither Cohen and Levinthal's (1990) definition of absorptive capacity capabilities of the firm, nor Zahra and George's (2002) components of absorptive capacity are directly measurable. However, in order to achieve a competitive advantage in the world market and sustain it, firms have to be able to measure absorptive capacity through a process of self-assessment. This research has proposed a way of doing so.

7.2.9 Summary

The previous section suggested that the case companies with underdeveloped non-core AC were not able to utilize fully their technological capabilities and is failing to capitalize on their exceptional resources. Being SMEs their size acts as a constraint since they are unable to exploit new emerging information and market potential, and in turn, take the commercialization of R&D through to the stage where revenue streams can be created, therefore, demonstrating possible underutilization of their resources.

However, it has shown that the internationalization process does not necessarily lead to higher absorptive capacity ex post, but rather that the firms that have higher absorptive capacity ex ante are those that internationalize. In other words, it is absorptive capacity that explains internationalization process, not internationalization process that explains absorptive capacity. The practice of internationalizing is therefore as much a reflection of a firm's absorptive capacity as it is its determinant.

This research established the link between the degree of internationalization of a firm's activities and its absorptive capacity. The results found a positive but weak relationship between internationalization and absorptive capacity – one that is dependent on each firm's non-core absorptive capacity.

Further, by the use of the modified Karnaugh map to identify the areas of business strength in the firms and fuzzy-logic design to facilitate transition between zones (High, Medium, and Low), an absorptive capacity model was established. This model relates firm's variables to the absorptive capacity zones (Low, Medium, High). In order to determine firm's absorptive capacity level, estimation/evaluation of the variables is required.

Furthermore, the eight case firms based on the results of absorptive capacity measurement were plotted onto the AC refined model to help to detect the shortest path to achieve High AC and improved efficiency for further growth.

7.3 Conclusions

The significance of absorptive capacity becomes inevitable in the strategic development in firms. This study presented the internationalization process as a dynamic process in an approach which is an extension of past thinking. Since this research investigated the relationships between absorptive capacity and technology transfer on one hand and the internationalization process on the other hand, the key feature of this dynamic process is the flow of information and knowledge created in

firms, which enlightens and generates change in firms' business strategy and particularly foreign strategy process.

This research aimed to measure absorptive capacity to facilitate a deeper understanding of the relationship and implications that it has on business in general and on the international business in particular. The research suggested that if a firm is able to *measure* its absorptive capacity this may result in improved business activities and enhanced presence in the world market. The study expanded the existing literature on internationalization process by developing variables for and by evaluating absorptive capacity in firms. Further, the findings of the study helped develop an absorptive capacity model, which can be used as a valuable tool for firm self-assessment to facilitate gaining insight towards further growth and development.

Chapter 8 Conclusions

This chapter consists of the following sections: Section 8.1 gives an overview of the research project including the research objectives; Section 8.2 summarizes the thesis by going over the main points of each chapter, while Section 8.3 briefly explains the finding of the study. This is followed by Section 8.4 where implications of the research for internationalization process theory, policy and for practitioners together with practical recommendations for firms contemplating expansion to foreign markets are explained. Section 8.5 addresses the limitations of the study, while Section 8.6 suggests the areas for future research. Section 8.7 concludes the thesis.

8.1 Introduction

This study sought to establish a relationship between firm's technology and absorptive capacity, and the internationalization process. The focus of the research was on the New Zealand high-tech SMEs with core capabilities in agro-technology and their process of internationalization. This research identified the most influential factors that affect the international activities and expansion decisions of New Zealand high-tech SMEs with a particular emphasis on the new emerging markets.

The nature and timing of this study is important in two respects. The first is that, in spite of the popularity of the absorptive capacity concept, few studies have measured absorptive capacity in such a manner that the findings can be generalized to many situations. This is particular to studies of SMEs, because previous studies in absorptive capacity have mostly involved technology oriented large firms. Although the literature supports the traditionally-held view that marketing activities are important elements in the success of the firm, there is limited empirical research on the role and influence of both technology and absorptive capacity of the firm in the internationalization process. Similarly, research of the impact of technology transfer and absorptive capacity on strategy, international activities and market development

has to date been limited, although there is an extensive literature on the internationalization process of large firms. This lack may be partially attributed to emphasis in research on understanding the internationalization process from the perspectives of *foreign market entry mode* and the sequence of stages rather than *the managerial perspective* in terms of management foreign experience, functions and activities.

The second reason which makes this study important and timely is that New Zealand economy has moved from being one of the most protected market economies in the world, to being one of the most open (Enderwick and Akoorie, 1996) corresponding with the developments of regional blocs and regional trade policies around the world, e.g. expansion of the European Union. These and other occurrences have seen New Zealand firms facing strong competition both at home and abroad. A study such as this one helps, despite the location and firm size constraints, to increase the understanding of the link between firm's absorptive capacity and its foreign strategies. This thesis offers an empirical study of how lack of foreign market knowledge can be perceived as an obstacle to carrying out international business, and how the firm organizes technology transfer and knowledge management in the process. This understanding is critical to managers who seek to develop and establish foreign programmes that will lead to worldwide success.

In the light of this, the objectives of this study were threefold:

1. The first objective was to explore and understand the process of internationalization of high-tech SMEs with core capabilities in agrotechnology (from the perspective of technology transfer, knowledge management and absorptive capacity).
2. The second objective was to develop a conceptual model that sought to describe the underlying determinants of the strategy choice and dynamic interaction between strategy and technology, on one hand, and absorptive capacity and strategy, on the other hand.

3. The third objective was to measure absorptive capacity with the purpose of gaining the understanding of the significant factors that facilitate the development of absorptive capacity in firms. In the course of this study it was found that absorptive capacity consists of two subsets: technological AC and non-core AC.

In order to achieve the depth of understanding that the research question demanded, a mixed method strategy was selected for this study. The analysis of complex issues, such as the internationalization process and particularly absorptive capacity, required methodological variety to overcome the complexity of the phenomenon as completely as possible. The assumption was that a research strategy which uses rigorous and comprehensive data, that is analyzed both qualitatively and quantitatively, would succeed in a creation of a much more detailed and richer description than if either of the analytical methods were used separately.

8.2 Summary of the Study

Chapter one presented an outline of the major issues in relation to technology and absorptive capacity and their impact on the internationalization process of a firm. The background for the study was outlined to place the work in a wider context. The research problem, research question and research model that provided the basis and framework for the research study were described and explained. The reasons for conducting the study were introduced and the methodology and research approach employed was briefly described and explained. The contextual and theoretical limitations of the study were presented along with the layout of the thesis.

Chapter two presented an overview of the literature and the relevant theories concerning the area of study. It critically reviewed theories relevant to the research question. The purpose was to illustrate the importance of absorptive capacity concept and the transfer of technology for firms faced with the new knowledge environments. Building on the research question, the conceptualization of the relationship between

the internationalization process and technology transfer, on one hand, and the internationalization and absorptive capacity on the other hand, provided a framework for the research process. This was then presented as a schematic model and discussed.

Based on a review of the literature, three factors were emphasized (prior knowledge, R&D intensity and organizational structure) as organizational determinants of absorptive capacity. This discussion served as the theoretical starting point for defining the frame of reference and as the building blocs of the conceptual framework proposed in the research. Particular attention was paid to the literature in the areas of internationalization process, technology/knowledge transfer and absorptive capacity of a firm. While within the existing literature these areas have been extensively researched with regard to MNEs, substantial theory with a focus on high-tech SMEs remains undeveloped. From this base, a set of preliminary propositions and an initial conceptual framework was developed as a foundation for conducting the empirical investigation.

Chapter three outlined the research context of the thesis. This chapter explained the New Zealand and CEECs' economies and established a background for the study in outlining the significance and rationale for using New Zealand and CEECs as the research context. This research looked at the New Zealand high-tech SMEs with core capabilities in agro-technology. They all produce unique, novel products in the agro-technology area which are in growing demand among world producers who are seeking increased productivity and efficiency as well as offering new distinctive products. On the other hand, following to the EU accession and a commitment to the EU goal of transforming the region into the world's most competitive knowledge-based economy by 2010, CEEC's industries will have high demand for various kind of products (equipment, machinery, software solutions etc.), which suggests that there is a potential for New Zealand high-tech firms to improve their international presence and performance in such markets. This potential was a reason for the selection of New Zealand and the CEEC's region as the context for the study. The findings of the research show that despite the potential for New Zealand, these firms are currently

limited in their abilities to tap this potential because of lack of foreign market knowledge.

Chapter four described the methodology used when obtaining and analyzing the data needed for analysis. The fundamental research objective of building theory explaining factors associated with absorptive capacity development and its influence on the internationalization process formed the basis upon which the methodological decisions were made.

The chapter provided the justification for using mixed methods in this research, which referred to studies that combine quantitative and qualitative elements in the data collection and/or analysis. The choice of mixed methods was based on the fact that the research problem would be more difficult to address if only one method were used. Particularly in the field of international business, the justification arises from the subject matter itself - international business in a multi-faceted area of research, crossing national, cultural, organizational and personal boundaries which create complex research questions.

The use of mixed methods in this thesis was rationalized on the basis that a deeper understanding of the research subject would be acquired by utilizing this research strategy because the analysis of complex issues, such as the internationalization process and particularly absorptive capacity requires methodological variety. The use of qualitative and quantitative methods took place in parallel. The quantitative and qualitative data were thus complementary. Both methods were used to study the same subject but they had specific objective related purposes and they offered the possibility of developing rich empirical data as well as a more comprehensive understanding of the subject under the study. The validity and reliability of the study's findings were reinforced by the inclusion of specific research design features to address such concerns.

Chapter five presented and discussed the results of the empirical research conducted for the study. The analysis looked at the data gathered using interviews and additional information, in relation to the three major research areas (internationalization process, technology transfer and absorptive capacity) and initial propositions.

Firm characteristics were presented to set the context for the study while informant characteristics confirm their position in that context. Understanding of individual cases drawn from within case analysis provided the basis for further analysis. Within case findings were framed using the concepts and propositions proposed in the conceptual model before focusing on international activities of the firms and their application in international strategy process.

The data collection and analysis process described in this chapter showed that although firms operate in similar industries, each of them were uniquely different. However, the informants' eagerness and passion for undertakings, as well as enthusiasm, innovative and supportive culture of the case firms were characteristics shared by all case companies. The entrepreneurial drive of individuals played a key role in developing and building these firms.

Even though each firm was uniquely different, they shared some common features and practices. All the case firms use experience from their past business activities to shape their further foreign strategy and activities. The repetition and consistency of these characteristics across firms became apparent as the fieldwork and analysis proceeded, indicating that theoretical saturation had been achieved and the data collection could be concluded. While the focus in this chapter was on the individual nature of each firm, those features that case firms shared provided a basis to continue the analysis.

Chapter six presented the interpretation of the collected data and compared it to the proposed conceptual framework. It described the across case analysis undertaken in this study and the understanding that it generated of the internationalization process

among the participating firms. This analysis across cases synthesized the findings of within case analysis to convey a wider level of understanding. Intensity of understanding of the common characteristics across cases was developed to the point where a conceptual model of the internationalization process across case firms was developed. This model suggested that current foreign activities result in a stream of indicators closely related to the firm's superior technology and absorptive capacity which are instrumental in shaping and driving future international strategy and activity.

From the individual experience and perceptions of the case firms the following conclusions were reached. Sometimes commitment to international activities was reduced to concentrate on the domestic market, while the effort in serving individual overseas markets also varied, depending on a variety of conditions. For example, in some cases, joint ventures were set up to serve key markets, while in the majority of cases firms would use licensing, contractual agreements or even co-operative research arrangements to serve the chosen markets. Further, some managers were found to concentrate on key markets while others not willing to spread efforts over a number of markets considering them to be 'risky' for one reason or another. This was related to the 'riskness' of unknown foreign market conditions.

This research found that high-tech SMEs might possess absorptive capacity that consists of two simultaneous subsets: *technological AC* which comprises the accumulated knowledge acquired in relation to R&D activities in high-tech firms, and *non-core AC* which centers on knowledge acquired outside the R&D activities and the area of expertise in high-tech firms, such as marketing and sales operations. The two absorptive capacities' processes impact differently on the daily activities of firms and in a different way influence their strategies.

The findings of this study lead to the development of a revised model of the internationalization process which differs to some extent from the initial one. The model shows a 'broken link' or no positive relationship between foreign market

experience and technological AC. At the same time, the results suggest that even though having outstanding technological AC, this does not necessarily impact on firms' international strategy. At the same time, the results show that the firm's international activities are influenced by the firm's technology and that the firm's technology is not affected by the foreign strategy the firm pursues.

The framework suggested by the revised model of the internationalization process across case firms is seen as better representing the reality and understanding of the foreign strategies and the process.

Chapter seven evaluated the findings from the analysis in Chapter six and drew conclusions based on the research questions. This research aimed to measure absorptive capacity to facilitate a deeper understanding of the relationship and implications that it has on business in general and on the international business in particular. The research suggested that if firms were able to *measure* its absorptive capacity this may result in improved business activities and enhanced presence in the world market. The study is positioned as pioneering endeavor to expand the existing literature on internationalization process by developing variables for evaluating absorptive capacity in firms.

The results show that it is absorptive capacity that explains internationalization process, not the internationalization process that explains absorptive capacity and that there is a positive relationship between internationalization and absorptive capacity, one that is dependent on each firm's non-core absorptive capacity. The findings of the study helped develop an absorptive capacity model, which could be used as a valuable tool for firm self-assessment to facilitate gaining insight towards further growth and development.

8.3 Findings of the Research

The link between the internationalization process, technology transfer and absorptive capacity postulated in the research question was identified from the findings of the study. The findings are as follows:

Internationalization process – a managerial approach to internationalization depends on the level of international experience of a particular manager. In the international business literature three ways of internationalization, namely ‘traditional’, ‘born global’ and ‘born again global’ have been identified. Yet, this study found that only two ways of internationalization ‘traditional’ and ‘born global’ were evident in the sample firms. No evidence was found for ‘born again global’ path of internationalization in the sample firms. This study identified the significance of networks throughout the entire process of internationalization and their impact for long-term survival of firms. Each of the cases found that networks were, in fact, very critical at all stages of the internationalization process, as was the importance of actively creating new networks to support internationalization across other markets.

Absorptive Capacity vs. International Strategy – The focus of the study was on determining the type of knowledge necessary for firms to develop the exploitation of new emerging information. The research identified that high-tech SMEs possess technological AC and non-core AC at the same time, although of dissimilar intensity. Technological AC comprises the accumulated knowledge acquired in relation to R&D activities in high-tech companies, while non-core AC centers on knowledge acquired outside the R&D activities and the area of expertise in high-tech firms, such as marketing and sales operations. The two ACs impact daily activities of the firms and in a different way influence their strategies, particularly foreign strategy.

However, the research has shown that the internationalization process does not necessarily lead to higher absorptive capacity ex post but rather that the firms that possess higher absorptive capacity ex ante are those that are most likely to internationalize. This leads to the conclusion that firm’s absorptive capacity is the one

factor that influences firm's internationalization process and consequently, one could suggest, the firm's share in the world market.

Technology vs. International Strategy – Firms with underdeveloped non-core AC were not able to utilize fully their technological capabilities and failed to capitalize on this outstanding resource, probably due to size of firm constraints and an inability to exploit new emerging information and prospective markets potential, particularly in relation to potential markets (CEEC). The conclusion is that there is one-way relationship between the firm's technology and its international strategy. That is, the firm's international activities are influenced by the firm's technology but not the other way around – the development of firm's technology is not influenced by its foreign strategy.

Absorptive Capacity Measurement – In an effort to measure absorptive capacity this study established a link between the degree of internationalization and its absorptive capacity. The results found a positive relationship between internationalization and absorptive capacity – one that is dependent on each firm's non-core AC. Further, by the use of the modified Karnaugh map to identify the areas of business strength in the firms and fuzzy-logic design to facilitate transition between zones (High, Medium, and Low), the AC model was established which facilitated detection of the shortest path to achieve High total AC and the development of capabilities to enable the firms to grow more efficiently. These capabilities may already exist in firms but they may not be utilized to their fullest extent, thus inhibiting the ability of the firms to enter the market.

Moreover, the findings suggest that firms' technological capabilities and the advantage of specialized knowledge, and their limited non-core AC act as constraints to the development of the future internationalization strategy. However, at some point in time, the firms will have to face the problem of expanding into new markets. When such a decision is considered, firms need to reassess their existing relationships and

knowledge of collaborating with external networks. The extent to which they share knowledge and experience will provide the foundation for future prospects.

While many elements influence firms' business-related goals, generally, firms develop preferences for familiar assignments and undertakings which allow them to develop know-how and proficiency in using information in certain ways. This notion may help develop competitive advantage but it also limits the firm's ability to undertake successfully other less familiar types of ventures, which has implications for the absorption, integration and commercialization of new external information.

All firms in the sample are *product-driven* – they produce the output and then look for a market, rather than being *customer-driven*. Firms need to identify the preferences of customers, then develop products to suit them. Successfully moving into international markets depends on developing an in-depth understanding of the market, which often requires significant investment in learning as well as costs associated with establishing a local presence. The findings suggest that firms should use an extensive range of information from wide range activities to build awareness of likely positive outcomes and potential competitive advantage.

8.4 Implications of the Research

Implications for Practice

The findings of this study have several implications for managers in general and for the international business literature. Although the study focused on the agrotechnology high-tech SMEs, most of the findings could, with proper caution, be generalized to other industries.

The thesis explored the process of internationalization of high-tech SMEs and identified the most influential factors that affect the expansion decisions of New Zealand firms into new emerging markets. The findings of this study have provided

potentially helpful analysis about factors affecting past decisions and could inform and possibly improve future firm decision-making process. Knowing the factors that were central considerations in the strategy choices made by other firms, could improve firms' strategies and decision-making process generally. Subsequently, understanding why particular factors are associated with the particular strategy choice in a particular market can be useful in helping developing international strategies for New Zealand firms. This could be of great significance for business practitioners, because choosing the means of entering a foreign market is a vital strategic decision, especially where technology transfer is concerned, and it has a crucial impact on the competitive advantage of firms.

This thesis recognizes absorptive capacity as a dynamic capability that influences the character and sustainability of a firm's competitive advantage. Viewing absorptive capacity as a dynamic capability also means that it can be influenced through appropriate managerial actions that redefine and deploy the firm's knowledge-based assets. This thesis has provided evidence that understanding absorptive capacity concept is beneficial for firms.

More importantly, the data set suggested that few firms understand or even recognize the concept of absorptive capacity and utilize it in creating a business strategy. They may not understand the term but this does not mean that they do not intuit its importance. In a global environment where competition is ever increasing and competitive advantage is often based on slight differences, this lack of understanding of the importance of absorptive capacity is a cause for concern. Therefore, firms need to have methods to ascertain that all their capabilities are fully employed to maximum efficiency.

The results of this study should encourage firms to identify, capture and articulate knowledge achieved by their ventures. Managers must develop and nurture skills that ensure effective integration of learning as their firms expand, particularly internationally. These findings and AC model offered as a tool should encourage

managers to explore when, where and how to best use firm's resources in the business operations. This is particularly important in regards to the research context (high-tech companies) where scientists are managers as well.

New Zealand has a narrow range of potentially high-value agro-technology products which currently is exploiting in an equally narrow range of potential markets. Firms are hampered by their admitted lack of knowledge of markets such as CEEC, where there is potential to exploit these capabilities. This shows the existence of 'myopia' in firms in two respects: first, "technology myopia" (firms have great products but they adopt a sales-push approach); they do not realize the importance of non-core AC that is market knowledge. This is related to second aspect, "market myopia". The respondents realized the importance of networks but they refer to networks only in the narrow scientific sense (scientists are linked through research networks, conferences and academic outputs). As is typical of SMEs, they concentrate on markets where there are similarities in economies in agriculture (i.e. Chile, USA and Uruguay) rather than markets such as CEECs. New Zealand's high agro-technology specialization means that firms have to occupy a global niche (serving small segments in a variety of markets) rather than building larger positions in a narrow range of markets (diversification vs. – market spreading argument). (Piercy, 1982)

Agriculture is still New Zealand's biggest export earner. New Zealand is now more dependent on agriculture and pastoral production than it was 25 years ago thanks to a booming Asia and other developing countries; demand for Western food products is growing rapidly. For this reason, the primary industries are going to have to produce more from less land to stay competitive in the future. Instead of supplying large Asian markets with dairy products, expanding overseas by selling superior know-how would be more rewarding. New Zealand's intellectual capacity and knowledge in agriculture is evident, however, the marketing abilities still have to be developed, so it can be transferred around the world.

Even though the current New Zealand Government has demonstrated renewed faith in the primary sector's ability and it has expressed this through the Fast Forward Fund¹ for boosting the research in the primary industries, there is a need to think of different models for undertaking research in the primary industries, since the returns from pharmaceutical and nutraceutical products are likely to be far more rewarding than earnings from commodities such as dairy products.

Implications for Policy

Over-focusing on markets in which pre-existing relationships are driven by political motives which exhorts that New Zealand business should have closer relationship with geographically proximate but psychically distant markets, such as Asia, particularly since the conclusion of the New Zealand and China Free Trade Agreement in April 2008 and ASEAN-Australia/New Zealand Free Trade Agreement (AANZFTA) in May 2008. This is predicated on changing tastes in the market such as the Westernization of food tastes.

Myopia regarding CEEC markets and their potential as the markets stems possibly from an unfounded concern over system instability and lack of interest in seeking market knowledge about the CEEC, which limits the potential of the agro-technology industry to contribute to the internationalization of New Zealand's knowledge industries.

Implications for Theory

Besides having significant implications for practice, the research may have the implications for international business research, technology transfer and absorptive capacity. First, the related fields of the internationalization process, technology transfer and absorptive capacity have been synthesized to identify the relationships between them. Second, mixed methods have been used, which best suits all three

¹ The Business Herald (2008).

research areas, namely the internationalization process, technology transfer and absorptive capacity. Third, a conceptual model, which includes both technology transfer and absorptive capacity at the same time, has been developed and refined based on the findings. Fourth, measurements to measure absorptive capacity have been developed and refined. Fifth, absorptive capacity has been empirically tested and measured. Sixth, an absorptive capacity model has been developed.

The significance of absorptive capacity has importance for the strategic development in firms. This research attempts to import this idea into the absorptive capacity literature. The implications are as follows:

First, the study presents the internationalization process as a dynamic process in an approach which is an extension of past thinking. Past research has been motivated towards *generalization* across firms to understand what is common to them in the process of internationalization, losing sight of the important fact that firms and industries are distinctive to each other in one way or another.

Second, since this research investigated the relationships between absorptive capacity and technology transfer on one hand and the internationalization process on the other hand, the key feature of this dynamic process is the *flow of information and knowledge creation in firms*, which enlightens and generates change in firms' business strategy and particularly foreign strategy process. A firm operating in diverse foreign markets accumulates a wide range of knowledge, which provides it with the absorptive capacity to recognize which new opportunities to exploit. However, a firm needs to know how to integrate its knowledge by recognizing what it has learnt in the diverse markets and how it can use this knowledge. *A firm needs to have the capability* to successfully integrate this knowledge in an ongoing business.

Third, after analyzing the results, this thesis argues that internationalization is significantly a *reflection of firm's absorptive capacity*, and not the other way around as suggested previously in literature. The prior literature often implicitly assumes that

internationalization is the “cause” of firm absorptive capacity – that is, increasing internationalization activities has a direct impact on firm’s absorptive capacity. Although this may hold, the causality may move from internationalization to absorptive capacity. This is a case when firms go abroad to exploit firm-specific advantages developed in the domestic market.

Fourth, this thesis suggests that the effect of domestic operations on knowledge accumulation in internationalizing firms is unclear. Accumulating knowledge in domestic markets may have a negative effect on a firm’s accumulation of foreign business knowledge. This may happen, as going abroad implies operations in a new environment and this may require *unlearning* of some old knowledge and practices developed in the domestic market. The knowledge accumulated in domestic markets may over develop as a barrier to internationalizing. *The longer a firm operates in the domestic market the more difficult it is to unlearn such knowledge and practice.*

Fifth, if it is believed that internationalization somehow improves firm’s absorptive capacity, then it should be accepted that expanding abroad will lead to improvements in firm’s knowledge. On the other hand, to the extent that firm’s knowledge is high because of firm-specific advantages, internationalization might be *a reflection of underlying firm-specific advantages.*

Sixth, this study suggests that if firms decide to move abroad and improve absorptive capacity, and the decision is solely based on the belief that there is a positive relationship between the internationalization and absorptive capacity, then such a strategy may not result in improved firm’s performance.

Seventh, this research suggests that *current knowledge and current foreign activities* result in a stream of indicators closely related to the firm’s absorptive capacity which are instrumental in shaping and driving future international strategy and activity. The focus in firms should be on identifying the type of knowledge/capability necessary to develop and to facilitate the exploitation of new emerging information.

Eighth, absorptive capacity in high-tech SMEs consists of two subsets: technological AC and non-core AC; *technological AC* comprises the accumulated knowledge acquired in relation to R&D activities in high-tech companies, while *non-core AC* centers on knowledge acquired outside the R&D activities and the area of expertise in high-tech firms, such as marketing and sales operations.

Ninth, non-core AC does not necessarily have a dominant role in the process of internationalization comparing to technological AC for the reason that non-core AC usually is not part of a firm-specific advantage but firms can improve their non-core AC by focusing on the development of specific areas of business.

Tenth, the thesis suggests that there might be a fine interplay between internationalization activities and absorptive capacity, indicating a bidirectional reinforcement; there is a need to measure absorptive capacity to determine what absorptive capacity subset should be developed and reinforced in order to improve firm's performance.

Eleventh, this research suggests that being able to *measure* absorptive capacity, a firm may improve its overall performance. A reason for absorptive capacity measurement is to help firms better understand international environment, to achieve competitive advantage and to enhance their presence in the world market.

Twelfth, by measuring absorptive capacity the research challenged the two most-cited absorptive capacity definitions in the international business literature: Cohen and Levinthal (1990) and Zahra and George (2002). Both studies established capabilities of a firm and components of absorptive capacity which are not measurable in nature. However, in order to achieve and sustain a competitive advantage in the world market, these concepts must be readily translated into operational measures of absorptive capacity.

Thirteen, the findings of the study helped develop an AC model, which can be used as a valuable tool for firm self-assessment to facilitate gaining insight towards further growth and development. The research provides suggestions with the potential application to assist small and medium local firms to grow into truly international successful companies.

8.5 Limitations of the Study

The research approach identified as appropriate for this study proved to be suitable for providing the insight sought in the research questions. Specific care was taken to ensure the validity and reliability of the findings. The attention to detail in the design and implementation of the study along with the support found in prior academic thinking strengthened the findings, although the understanding of the internationalization process and factors that influence it, which this thesis suggested, differ from past research in some respect. However, the findings complement rather than invalidate past research. These findings fill a gap in past thinking by making a modest contribution to our understanding of the impact of absorptive capacity and technology on the internationalization process of a firm.

At the final stage of the research, it became apparent that there were some limitations in the research design: a) single industry data collection, b) self-reported data, c) lack of durational data, and d) limitation of findings to SMEs.

The data to investigate the conceptual model were collected on a *single-industry*, rather than cross-industry and on a longitudinal basis. During the research design phase it was anticipated that single-industry data would be satisfactory to examine the conceptual model, which proved to be correct. However, the collection of longitudinal data might have provided additional insights into how the relationships between the internationalization process on one hand and absorptive capacity and technology transfer on the other hand changes over time and what are the impacts of these changes.

The data collected on each case relied on *self-reported* information. Self-reported findings are not thought to be an issue in the present study because individual participants can only reliably report these factors. Further, to enhance the reliability of the findings mixed methods have been used combining quantitative and qualitative research.

The decision to link absorptive capacity measurement with the degree of internationalization (Sullivan, 1994) was a starting point to develop a deeper understanding of the process. This could be extended to some other industries and areas of business where variables would be probably different depending on a focus of the research. While the measures of absorptive capacity captured perhaps the most important dimensions, the *durational data* would have provided greater depth in terms of understanding the relationships between the three areas of investigation.

8.6 Future Research

Specific industry context and small sample size which facilitated the research approach used in this study restricts the applicability of the findings. In the future, the application of the findings over a wider sample frame may lead to an understanding of the internationalization process that applies across industries in general.

Rather than being inconclusive, the findings of this study open new opportunities for further research. The study has indicated a possible fruitful approach to further study which involves a focus on the perceptions and cognitive structures of managers who perform business activities and have personal experience of the internationalization of firms.

It is reasonable to claim that experience is a factor in learning effectiveness. However, there is a need for further refinement of this construct because it is not the magnitude of experience but the quality of experience that counts. Experience is

valuable only when it is systematically managed and integrated into collaborative know-how within the firm.

A rich area for further research is how firms learn because it cannot be presumed that the way SMEs learn is the same as large firms do. Neither can it be assumed that new companies learn like established firms. Further, the preferences and characteristics of a firm's founder, available technology and whole environment are likely to play the key roles for learning and the value that can be achieved from it.

Given the critical significance of absorptive capacity to firms, further research may focus on absorptive capacity variables to facilitate refining the AC model to better suit a particular industry.

8.7 Conclusions

Following the research questions which draw on the impact and relationship between technology, the AC of a firm and its internationalization process, this thesis addressed a clear *gap* in present thinking. There has been limited previous research which recognizes that the degree and pattern of the internationalization process are likely to be closely interrelated with firm's technology and absorptive capacity in the SME.

The literature on the internationalization process is silent on absorptive capacity on one hand, and the literature on absorptive capacity is silent on the internationalization process on the other hand. Past research has not considered how firm technology and absorptive capacity may influence the competitive capabilities of a firm in foreign markets, which certainly constitutes a gap in past research. To date, there is no well integrated approach or research perspective that considers the impact of both technology and absorptive capacity on the internationalization process and there has been no attempt to measure absorptive capacity in high-tech SMEs. The present study makes some modest contribution in this area.

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APPENDIX A

QUESTIONNAIRE

Transforming Agriculture in CEECs Countries: Foreign Market Entry Mode for New Zealand Agro-technology Companies

Outline of Question Areas for Interview

A. For the interview, I am interested in your thoughts, experiences and perceptions in relation to the following broad topic areas. You do not need to have specific knowledge about that.

B. If you cannot give me the answer to a particular question right now, I want you to e-mail me your response later in few days.

C. We can stop recording if you need time to think.

I ABSORPTIVE CAPACITY - STRATEGY

1. Prior International Experience

1.a) Internationalization knowledge (in general)

1. Please tell me how your company first came to be involved in international business.

Prompt – When was that?

1a) Please tell me about your company's experience of operating in an international environment (not country-specific).

Prompt – The number of countries in which a firm has been operating abroad, and the length of operations.

2. What criteria do you use when selecting a market for your international activities?

3. What do you regard as being the key requirements for success in doing business from New Zealand?

1.b) Foreign business knowledge (CEECs)

4. Is your company involved in the CEEC's market?

4a) If not: Even though you are not involved in conducting business in CEECs, what are your thoughts and perceptions of CEECs as an foreign market of interest to New Zealand companies?

5a). What do you think would be the most important **requirements** for a New Zealand firm wanting to enter the CEECs' market?

6a). What do you see as being the **main obstacles or difficulties** for your company in operating in CEECs?

7a). How would you describe the CEECs business environment?

Prompt – Such as political, economic, socio-cultural, technological and competitive environments. Let's start first with political environment, then ...

4b). If yes – real experience: What factors led your company into deciding on CEECs (Poland, Czech Republic, Hungary, Slovakia and Slovenia)?

5b). What was the **first** step taken by your company in the initial stages of doing business with CEECs'?

Prompt- When was this?

6b). What did the process then involve, from gaining market entry, to the stage you are at now in conducting business in CEECs?

7b). What were the most important market-related factors that you had to consider in this process? (Such as: large unsatisfied market, educated cheap labor, resources...)

Prompt – Have these changed over the time of your involvement in CEECs?

8b). How would you describe the strategy your company has been using in the CEECs' market?

Prompt – Seek specific example: subsidiaries, wholly owned enterprises, agents, representatives, cooperative agreements with foreign firms, joint ventures.

1.c) Foreign institutional knowledge (CEECs)

9. What is **your perception** of CEECs' institutional framework (governments, rules, norms, values)?

Prompt – Is it transparent, difficult/easy to understand, open...? How did it affect doing business there? Generally – your opinion from what you know so far.

10. Do you have knowledge about laws on technology, patents and quality standards in the CEEC's market? Yes/No.

Prompt –**If Yes:** How did the practice of technology in CEECs affect your firm's operations in the market? Financial practices, currency laws?

11. What part, if any, do you think cultural differences play in conducting business in a foreign market such as CEECs?

Prompt - These might include, for example, language and communication, business practices, business protocols, etc).

2. Firm's R&D Intensity

12. How would you describe the degree of satisfaction with your overall R&D performance?

Prompt - How does it meet your company expectations?

13. What are in your opinion the strategic elements of success related to R&D performance?

3. Organizational Structure

3.a) System Capabilities/Formalization

14. Can you give me an example of the organizational routines in your company?
(procedures, manuals, policies, directions)

Prompt –To which unit do you submit the standardized reports? (corporate R&D, manufacturing, marketing)

3.b) Coordination Capabilities

15. How is knowledge and expertise transferred and distributed across the firm? (Such as technical expertise, codified, tacit knowledge).

16. How do you monitor the changes in the external environment which may have potential impact on the firm?

17. What can you tell me about the participation in decision-making particularly where the R&D projects are concern? Who is involved in these decisions?

Prompt – About the overall direction of the R&D, which new R&D projects to pursue, the R&D budget, hiring the R&D personnel.

18. From your experience what would you say are the main factors that encourage and facilitate transfer of knowledge in your firm? What are the main difficulties?

3.c) Socialization capabilities

19. In 2004, approximately on how many occasions did you or other personnel from your R&D unit visit other R&D units; receive visitors from other R&D units in your company?

20. In 2004, approximately on how many occasions did you or other personnel take part in your company's program for rotation of R&D personnel, and training program for R&D personnel?

21. How would you describe your firm's organizational culture and ideology?

Prompt – Are they shared by all employees?

22. If I proposed four organizational cultures (bureaucratic, innovative, supportive and affective/influential cultures), where would your firm's culture fit?

Prompt – Why is that?

II TECHNOLOGY TRANSFER - STRATEGY

23. How do you organize technology transfer and knowledge management? What are the techniques or strategies used by your company to 'safely' transfer technology (knowledge and practice) to a foreign country (CEECs)?

Prompt – Seek specific example.

24. Does your foreign strategy change to adjust for changes in your technology? How do international operations change to fit changes in your technology?

Prompt – Seek specific example.

24a). How do your firm's international activities change to fit changes in development of your technology? Or is it the other way around?

Prompt – Seek specific example. Do you usually adjust your technology to fit your foreign strategy?

25. Is technology development process part of future internationalization strategy of the firm?

Prompt – How do you adjust those two activities? Seek specific examples.

III COMPANY PROFILE

26. Your position and title.

27. The number of employees in your company.

28. The type of operational activities of your company.

29. Your company's total expenditures in R&D and total sales/foreign sale.

Level of the firm's investment in R&D.

{R&D Expenditures : Sales}: Number of Employees =

30. The products/services your company exports to CEECs.

31. The structure in your company through which international operations to CEECs are organized.

Thank you for your time and assistance with this research. I look forward to talking with you about the issues raised in the above questions, and any other which you regard as being particularly significant to the study.

APPENDIX B

CORRESPONDENCE

The University of Waikato
Waikato Management School Ethics Committee

Application for Ethical Approval of Research

COVER SHEET

Name _____ Department _____

Email address: _____ Phone Number: _____

Mailing address: _____

This is an application for ethical approval of: (tick one)

- Research project involving data collection from Human Subjects
- Course which involves student projects that collect data from Human Subjects
- 499/599 which involves data collection from Human Subjects

Supervisor's Name: _____

Supervisor's approval (signature): _____

Project Title: _____

-
- I request approval for this research and attach documentation pertaining to the items suggested in the Procedures for Ethical Approval of Research.**
 - I have read and complied with the University's Handbook on Ethical Conduct in Research 2001, pages 8 to 15.**

Principal investigator's signature _____

Date _____

WMS Ethics Committee Action

- Approved
- Request modifications
- Request application
- Forward to University Committee

Convenor's signature _____
Reviewer's signature _____
Reviewer's signature _____
Dated _____

WAIKATO MANAGEMENT SCHOOL APPLICATION FOR ETHICAL APPROVAL

Outline for Research Project

(For the benefit of the Waikato Management School Ethics Committee)

1. Title of Project:

Transforming Agriculture in Central and Eastern European Countries: Foreign Market Entry Mode for New Zealand Agro-technology Companies

2. Researcher Information:

Vesna Sedoglavich

170 C Ohaupo Road, Hamilton

Phone: 07 843 9915, vs9@waikato.ac.nz

3. Supervisor Details:

Chief Supervisor - Dr Michele Akoorie

University of Waikato

Department of Marketing and International Management

Second Supervisor – Dr Kathryn Pavlovich

University of Waikato

Department of Strategic Management and Leadership

4. Project Outline:

This study will seek to explain how firm technology influences the internationalization process of the company and the choice of entry mode, and how it drives cognition of future internationalization strategy of the firm.

5. Research Method:

This study will conduct semi structured interviews to provide evidence for a multiple case study among agro-technology companies. A copy of the proposed interview guide is attached (page 7).

6. Expected Outcomes of the Research:

The case study report resulting from this research will improve understanding of the relationship between technology and foreign strategy which may explain a firm's behaviors in the process of internationalization in the modern world where the emerging globalization and rapidly developing technology shape economic activities and determine business behavior. This research will provide some new observations of the nature of technological activities undertaken by firms outside their home base.

This research identifies the most influential factors that affect the international modes of entry and expansion decisions of New Zealand agro-technology firms to gain a deeper understanding of the mode of entry strategy used by firms having outstanding technology. The findings of this study would provide potentially helpful information about factors affecting past decisions, and could inform and possibly improve firm's future decision making.

7. Participant Selection:

Cases for this study will be drawn from a database of New Zealand agro-technology companies. Suitable firms will be identified in consultation with New Zealand Trade & Enterprise. A maximum of eight participant firms will be finally selected using agro-technology and innovation related criteria. A copy of the case selection framework is attached (page 9).

8. Participant Contact:

Participant firms and specific informants will be contacted by and invited to participate in the study. Informants will participate in an informed consent process prior to their first interviews.

9. Inducement:

No inducements will be offered to participant firms or individual informants to participate in this study.

10. Informed Consent:

Prior to participation in the study informants will have the study explained to them and will be asked to read the attached Participant Information Sheet (page 5). It will be made clear to informants that they can ask questions about the study and that they are free to withdraw at any time. At the conclusion of the study a summary of findings will be made available to informants. Confirmation of participant's consent to participate will be recorded on the attached Consent Form for Participants (page 4).

11. Protection of Anonymity:

The confidentiality of evidence gathered from informants will be protected through the use of pseudonyms during analysis and in the case study report.

12. Information Disposal:

It will be made clear to participants, in the Participant Information Sheet, that evidence collected in the study will be retained indefinitely and that it may be used as a basis for further research.

The University of Waikato
Waikato Management School

Transforming Agriculture in Central and Eastern European Countries: Foreign Market
Entry Mode for New Zealand Agro-technology

Consent Form for Participants

I have read the Participant Information Sheet for this study and have had the details of the study explained to me. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I also understand that I am free to withdraw from the study at any time, or decline to answer particular questions put to me. I agree to the use of any information I may provide as indicated in the Participant Information Sheet and as described to me.

I agree to participate in this study under the terms and conditions set out in the Participant Information Sheet and as described to me.

Signed: _____

Name: _____

Date: _____

Researcher: Vesna Sedoglavich, 170 C Ohaupo Road, Hamilton

Phone, 07 843 9915, vs9@waikato.ac.nz

Chief supervisor: Dr Michele Akoorie, University of Waikato

Department of Marketing and International Management

Second supervisor: Dr Kathryn Pavlovich, University of Waikato

Department of Strategic Management and Leadership

Participant Information Sheet

Title of Study	Transforming Agriculture in Central and Eastern European Countries: Foreign Market Entry Mode for New Zealand Agro-technology Companies
Researcher Details	Vesna Sedoglavich 170 C Ohaupo Road, Hamilton Phone: 07 843 9915, vs9@waikato.ac.nz
Supervisor Details	<u>Chief supervisor:</u> Dr Michele Akoorie University of Waikato, Department of Marketing and International Management <u>Second supervisor:</u> Dr Kathryn Pavlovich University of Waikato, Department of Strategic Management and Leadership
Study Outline	This study seeks to understand the relationship between technology and foreign strategy which may explain behaviors in the process of internationalization. In pursuit of this understanding the researcher will gather evidence from senior individuals within agro-technology firms using semi-structured interviews. Data gathered will be analyzed and the results will form part of a PhD thesis.
Sponsorship	This study will, apart from the researcher's personal resources and the support of Waikato University, be completed without sponsorship.
Confidentiality	Evidence collected in interviews and observation will be transcribed using pseudonyms for participating firms and individuals. These Pseudonyms will be further used to identify firms and individual informants in reporting of the findings of the study. At the conclusion of interviewing, one or more interviews, participants will be invited to comment on a summary of the contents of their interviews.

Participant Consent and Approval	<ul style="list-style-type: none"> ▪ Although participants will be asked to sign a Consent Form before interviewing commences they will be free at any time to withdraw from interviews or to refuse to answer any specific questions. ▪ Although participants will be provided with this Participant Information Sheet prior to interviewing they will be free at any time to ask questions occur to them during their participation in this study. ▪ At the conclusion of the study participating firms will be provided with a summary of the findings.
Archiving	Evidence collected in this study will be retained indefinitely and may be used as the basis for further research after the conclusion of this study.

Interview Guide
Foreign Market Entry Strategy / Technology Study

Conceptual Construct	Thematic Question Prompts	Dynamic Question Prompts
Market Identification	How do you identify and evaluate particular market or country?	Seek specific examples (measures and/or information).
	What are your motives and criteria underlying the evaluation?	Seek specific examples.
Considerations applied in the evaluation process	How do you make judgments about criteria employed in country selection?	
	How do you choose market entry mode for those markets/countries?	Seek specific examples of experience.
Technology Transfer	How do you organize technology transfer and knowledge management?	
	What are the techniques or strategies used by the company to ‘safely’ transfer technology (knowledge and practice) to a foreign country?	
Foreign Strategy	Does your foreign strategy change to adjust for changes in your technology? / How do international operations change to fit changes in your technology?	
	How do your firm’s international activities change to fit changes in development of your technology? Or is it the other way around?	Seek specific example.
Future International Strategy	Is technology development process part of future internationalization strategy	

	of the firm?	
	How do you adjust those two activities?	Seek specific examples.
International Experience	Do you have international experience?	
	If/how your previous experience influences your directions?	Seek specific examples.
	Have changes in technology influenced your view of doing business internationally?	Seek specific examples of experience of change.
	How have your views changed?	Seek specific examples of experience of change.
CEECs Market	How would you describe CEEC business environment?	
	How would you describe the strategy your company has been using in CEEC market?	Seek specific example.

Case Selection Criteria

Firm Criteria	Measure	Rationale
Product Type	Agro-technology products	Confirms fit with the context of the research
Firm Size	No less than 10 staff	Indicates a likelihood of systematic management processes and management infrastructure
International Activity Criteria		
Experience in international operations	3 years international operation experience	Indicates that firms are experienced in conducting business internationally

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THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

MANAGEMENT SCHOOL
Te Rauapa

Mr Managing Director
Potential Participant
Company
Private Bag
Hamilton 2001

Dear Mr Managing Director

My name is Vesna Sedoglavich and I am a Doctoral Assistant at The Waikato Management School. I am also doing a Doctor of Philosophy Degree (PhD) in the Department of Strategy and Human Resource Management under the joint supervision of Associate Professor Michele Akoorie and Associate Professor Kathryn Pavlovich. It is in this connection that I am writing to you.

For my thesis, I am investigating the practical issues for New Zealand companies in expanding to foreign markets. In particular, I am interested in the perceptions and experiences of companies currently operating in CEECs' market, for the purpose of developing a framework for managerial decision making. I have chosen this field because of my strong interest in the requirements for developing successful business relationships in European markets and the challenge this represents for New Zealand companies.

The investigation focuses on small- and mid-sized agro-technology companies with strong emphasis on innovation and R&D, and I would like to include your company in this study. For this part of the research, I am conducting interviews with key senior staff from a small group of selected companies. These discussions take about an hour and I would like to hear about your international experiences generally, as well as your perceptions of CEECs' market as a prospective destination. **I am interested in your views whether or not your company is currently involved with, or has any future intentions to enter this market.**

I would prefer to tape the interview but this will only be done with your consent. The tape can be turned off at any time or you can withdraw information. All information provided

in interviews is confidential and neither the name of your company nor those of company representatives will be disclosed. A transcript of the interview will be sent so that you verify the interview material and/or amend if appropriate. A copy of the written results of the research will be presented to each company who takes part in the study. As your views and perspectives are of great value, I hope you will give favorable consideration to participation in this research.

I have included further information about the research, so that you can see the type of specific information I am seeking. I will telephone you within the next few days to answer any queries you may have about the project and to establish your willingness to participate.

Yours sincerely,

Vesna Sedoglavich
Doctoral Assistant
Waikato Management School

**Department of Strategy and
Human Resource Management**
Waikato Management School
The University of Waikato
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Hamilton, New Zealand

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www.management.ac.nz



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

MANAGEMENT SCHOOL
Te Raupapa

Mr Managing Director
Potential Participant
Company
Private Bag
Hamilton 2001

Dear [Name of the Respondent],

Thank you for your time and participation in the interview. Your input was of a great value for my research. The information you have provided was highly appreciated.

Yours sincerely,

Vesna Sedoglavich
Doctoral Assistant
Waikato Management School

APPENDIX C

CONSENT AND INFORMATION SHEET

The University of Waikato
Waikato Management School

Transforming Agriculture in Central and Eastern European Countries: Foreign Market
Entry Mode for New Zealand Agro-technology

Consent Form for Participants

I have read the Participant Information Sheet for this study and have had the details of the study explained to me. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I also understand that I am free to withdraw from the study at any time, or decline to answer particular questions put to me. I agree to the use of any information I may provide as indicated in the Participant Information Sheet and as described to me.

I agree to participate in this study under the terms and conditions set out in the Participant Information Sheet and as described to me.

Signed: _____

Name: _____

Date: _____

Researcher: Vesna Sedoglavich, 170 C Ohaupo Road, Hamilton

Phone, 07 838 4466 extn 5197, yesna@waikato.ac.nz

Chief supervisor: AProf Michele Akoorie, University of Waikato

Department of Strategy and Human Resource Management

Second supervisor: AProf Kathryn Pavlovich, University of Waikato

Department of Strategy and Human Resource Management

Participant Information Sheet

Title of Study	Transforming Agriculture in Central and Eastern European Countries: Foreign Market Entry Mode for New Zealand Agro-technology Companies
Researcher Details	Vesna Sedoglavich 170 C Ohaupo Road, Hamilton Phone: 07 838 4466 extn 5197, vesna@waikato.ac.nz
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Sponsorship	This study will, apart from the researcher's personal resources and the support of Waikato University, be completed without sponsorship.
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Participant Consent and Approval	<ul style="list-style-type: none"> ▪ Although participants will be asked to sign a Consent Form before interviewing commences they will be free at any time to withdraw from interviews or to refuse to answer any specific questions. ▪ Although participants will be provided with this Participant Information Sheet prior to interviewing they will be free at any time to ask questions occur to them during their participation in this study. ▪ At the conclusion of the study participating firms will be provided with a summary of the findings.
Archiving	Evidence collected in this study will be retained indefinitely and may be used as the basis for further research after the conclusion of this study.

APPENDIX D

SAMPLE CHARACTERISTICS

Summary of the case company characteristics

Product description:	CODE	Products aimed for a foreign market
Fruit-based food and food components; sustainable food bioproduction and biomanufacturing	C1	yes
Computer software and collaborative tools	C2	yes
A formal cluster of the R&D companies	C3	N/A
On-farm research, development, extension and education	C4	no
On-line measurement (developing sensors) of biological components in animal and human fluids	C5	yes
Applicators for delivering medication to cattle	C6	yes
Animal management	C7	yes
Agro-tech intellectual property	C8	yes
Number of employees:	Number of firms:	
Less than 10	-	
10-30	2	
31-50	-	
51-100	1	
100 +	5	
Ownership structure:	Number of firms:	
Foreign-owned NZ company	2	
Farmers' owned co-operative	1	
NZ public company	1	
Crown research organization	1	
Private NZ company	3	
Years of firm business experience	Number of firms:	
1-5	2	
6-10	1	
11-15	3	
16 +	2	
Firm international experience:	Number of firms:	
Less than 1 year (no experience)	2	
1-5	4	
6-10	-	
11-15	1	

16 +	1
Firm international intensity	Number of firms:
% of production sold internationally:	
10-25%	2
26-50%	1
51-75%	3
75-100%	1
Note: One firm does not have any international experience	
Firm foreign markets	Number of firms:
Main foreign markets:	
Australia, UK, USA	6
Europe (without CEEC)	3
CEEC	2
Asia (China)	2
South America	3
Note: Multiple responses	
CEEC market:	Number of firms:
Presence in the CEEC market	2
Plan to enter the CEEC market	1
No plan to enter the CEEC market	-
Note: The two firms that reported their presence in the CEEC market have been having small-scale business in the area.	
Informant position in the firm:	Number of firms:
CEO	3
General Manager	1
Marketing Manager	2
Senior Scientist	1
Principal Senior Scientist	1
Informant Education	Number of Informants
PhD	4
Masters Degree	2
Bachelors Degree	2
University Diploma	-
Years of International Experience	Number of Informants
1-5 years	5
6-10 years	2
11-15 years	-
16+	-

APPENDIX E

DESCRIPTIVE CHARACTERISTICS

INTERVIEW DATA: DESCRIPTIVE CHARACTERISTICS

Case Company Characteristics: Main Study											
Key issues	Core Category	Sub-Category	F I R M S								
			1	2	3	4	5	6	7	8	
Prior international experience Theme: "Getting the right people"	Market selection criteria	Global approach		1				1		1	
		Economy of scale			1						
		Technology suitability								1	1
		Similar climate	1		1						1
		Similar culture/language	1		1						
		Willingness to explore new opportunities							1	1	
		Size and market profitability		1							
		Business culture			1					1	
		Risk perception and difficulty in establishing			1		1			1	
	Building relationships/key success factors	Business relationships/partnerships	1	1		1	1	1	1	1	1
		Agent/distributor representation		1			1	1	1	1	1
		Networks	1	1			1	1	1		
		Personal visits to markets		1			1	1	1		
		Product compatibility									1
		Presence in the market		1	1		1			1	1
		Building credibility					1				
		Understanding the market									1
	International market decisions	Head-quarter decisions					1			1	
Agent advise on strategy			1			1	1	1	1	1	
Board decisions		1	1					1		1	
CEEC market awareness Theme: "Understanding the market"	Involvement in CEEC market	Present in the market									
		Limited presence in the market/agent's referral						1	1		
		No presence in the market	1		1	1	1				1
		Plan to enter the market		1							
	Key requirements to enter	Amount of market opportunities		1							
		Reduced economic and political			1						1

		risk/developed infrastructure							
		International orientation/awareness	1	1	1	1	1	1	1
		Multicultural staff		1					
		Connections/relationship, distributor	1	1					
		Climate	1						
		In-market support, servicing back-up		1					
		Market/industry knowledge/awareness, research/intelligence	1	1	1	1	1	1	1
	Key obstacles/barriers/pitfalls	Language/culture/different cultural perceptions	1		1	1		1	1
		Infrastructure undeveloped			1				
		Climate/incompatibility to NZ technology				1			
		Potential threat to NZ agriculture							1
		Political risk	1						
		Distance/time zone/no connections	1	1					1
		Lack of market knowledge				1			1
		Reluctance of adopting sophisticate technology						1	
	Benefits/advantages	Amount of opportunities		1		1		1	
		New technology requirements						1	
	Institutional/Business framework/Technology Laws	Different political, socio-cultural environment that complicate business	1						1
		Different farming practice							1
		Science and technology in a vacuum from the rest of the world/basic technology	1				1		
		'Europeanness' of the market/melting pot		1					
		Exciting business environment/new emerging market/reasonably predictable		1					

		Fast technology adoption/EU laws		1	1						
		Not a free market/government influence/kind of 'minefield'				1		1			
		Competition from Europe for the market							1		
		Low cost competitors in the market							1		
		Distributor/agent led strategy						1	1		
Firm's R&D Intensity Theme: "R&D satisfaction"	R&D performance	High satisfaction/clear future direction	1				1		1		
		Intellectual property in the heads of the scientist and engineers/importance of human resource	1				1	1		1	
		Innovation only valued by its adoption/establishing a market need/understanding the market				1				1	
		Mindset resistant to change/right environment and culture/passion and conviction			1	1	1				
		Government responsiveness							1		1
		Networking and commercialization/end users				1	1				
	R&D project decisions	Marketing department leading							1	1	
		Marketing/scientists/achieved balance	1						1		1
		Board/entire management team			1			1			
		Government agency					1				1
Organizational Structure Theme: "Managing People"	System capabilities	'Can do' attitude/'science engine room'						1		1	
		Passion and conviction	1	1			1				
		Intranet/procedures and instructions/formalization	1	1		1	1	1	1	1	
		Database system for managing ideas/sharing/communicating ideas (discussing)	1				1			1	
		Weekly team meetings/report to a			1				1	1	1

		Board								
	Coordination capabilities	Team intermixing meetings/flat structure/bunch of open-minded people/transparent communication	1	1			1		1	
		Whole environment, events, guest speakers, trade shows, seminars, electronic communication, conferences (video)	1	1	1	1	1	1	1	1
		Knowledge sharing within the company and within the market	1	1		1	1	1	1	1
		Interaction between scientists and extension specialists	1	1		1	1		1	1
		No ownership to an idea/innovation encouragement/incentives	1	1			1	1	1	
		Involvement in more than one project/skill matrix	1			1		1	1	1
	Socialization capabilities	‘Cup of coffee’ environment		1	1		1		1	
		Scientists watch changes in the environment	1	1		1	1			
		Distributors watch and share						1	1	
		Constant experience exchange	1	1	1	1	1	1	1	1
		Personnel rotation program	1			1	1	1	1	1
Innovative culture		1	1		1	1		1	1	
Knowledge & technology transfer Theme: “Managing knowledge”	Technical knowledge	Focus on sharing technical knowledge/comfort zone								
		‘Vocabulary’ familiar; feeling confident								
		Keep an eye on technical track globally/ fear of being technically left behind								1
		Feeling of being able to create								
		Generating R&D more exciting								
	Business knowledge	Lack of resources/specialized staff								
		Do not see the point/wasting my time; ‘not my job’								

		Lack of knowledge on international strategy			1	1				
		No business mindset								
		Underestimate the importance of business skills								
	'Safe' technology transfer	Importance of having an intellectual property protection knowledge	1							
		Relationship 'termination'		1						
		Product features themselves protected		1						
		Relying on patents; trade secrets; non-disclosure agreements; it's know-how that's locked inside the product			1		1	1	1	1
		Deliberately risk taking; not having enough money to fight them					1			
		No real control over it; people do leave the company and set up as consultants; software patents not efficient				1			1	
		Foreign strategy vs. superior technology	Change technology to fit the demand; 'hungry' to win international market; to suit the country; a market pull	1						
	Broad strategy doesn't change much			1						
	Higher threat – change of the strategy							1		
	Different countries, different strategies, but same technology; technology first, strategy adjusts			1					1	1

APPENDIX F

INTERVIEW TIME-FRAME

Appendix F – Interview Time-Frame

Company	Date
C1	10 May 2005
C2	30 May 2005
C3	30 May 2005
C4	13 June 2005
C5	23 June 2005
C6	27 June 2005
C7	29 June 2005
C8	19 August 2005