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A STUDY OF THE
INFORMATION ACQUISITION BEHAVIOUR
OF SMALL AND MEDIUM SIZED MANUFACTURING
ENTERPRISES IN NEW ZEALAND



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ABSTRACT

Access to scientific and technological information enables companies to be more aware of new developments in technology and the resources available for obtaining and using the technology correctly. Harnessing a clear understanding of the technological and market environment is essential for most small businesses to improve their competitive position and face up to increasing national and international competition.

This study investigates the information acquisition behaviour of small and medium sized manufacturing enterprises (SMEs) in New Zealand, where SMEs not only dominate manufacturing employment but constitute 99.5% of all New Zealand companies.

Using a questionnaire methodology, this thesis reports an empirical study of the information acquisition characteristics and performance of 132 SMEs. Recent years have witnessed increasing international interest by academics, managers and policy writers, in the role of information within the business environment. However, information acquisition is seldom publicly discussed in relation to SMEs and is significantly absent from scholarship. To date very few studies have investigated how SMEs acquire information, how they disseminate this resource through their organisation and subsequently, if any barriers inhibit effective information infusion.

The results of this thesis demonstrate that SME owner/managers rely heavily on their own personal experience and judgment when making decisions. Information acquisition within SMEs is primarily a reactive procedure, where information is acquired to solve a specific problem. Criteria such as the inhibiting feature of individualism, a lack of managerial competence, resource deficiencies and the turbulent economic environment facing SMEs, suggest there is merit in seeking government support to develop an information assistance programme for the small business sector.

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CHAPTER ONE

INTRODUCTION

The Industrial Revolution brought about momentous social and economic changes. From an agricultural based society, the world's economy was transformed under a factory based system. Machinery slowly replaced manual labour and led to a considerable increase of manufactured goods. As this process accelerated, vast amounts of wealth or capital were accumulated. The third economic wave or the Information Age of our time, has placed capital in a secondary role and knowledge has become the source of wealth creation (Hope & Hope, 1998).

New knowledge provides the stimulus for innovation, organisational renewal and sustainable competitive advantage. The level of knowledge generated within a company is directly proportional to the quality of information collected within that organisation. The accelerating pace at which both technology and markets are changing, coupled with the rising level of international competition, demands that enterprises remain abreast of up-to-date information in a wide range of disciplines.

Both Government policy initiatives and economic imperatives are driving New Zealand's private enterprises, to rapidly expand their information networks. Two high level goals for the Ministry of Research, Science and Technology (1997) are relevant; the goal of enhancing the country's capacity to innovate through knowledge creation by developing capabilities and networks, and the goal of improving the international competitiveness of New Zealand's enterprises by increasing the contribution of knowledge to the added-value of products, processes and services throughout the value chain. The swift pace of economic and labour deregulation since the late 1980's, accompanied by dwindling export subsidies and the removal of tariff protections, also provides a compelling rationale.

An evident trend within the last decade is the strong growth in the number of small and medium sized enterprises (SMEs), which suggests it is smaller companies rather than big business and corporates which offer the greatest growth potential to New Zealand

(McGregor & Tweed, 1998). According to McGregor and Gomes (1998) future economic prosperity is indexed to the survivability, performance and growth of these enterprises. This thesis is therefore a compilation of these two highly relevant themes and aims to provide a holistic picture of the information acquisition behaviour of New Zealand's small and medium sized manufacturing sector. The wider research context examines the barriers to effective information acquisition, determines the methodologies used for information dissemination, identifies the type of knowledge sourced by SMEs and investigates whether any relationship exists between the extent of a company's information acquisition behaviour and the influence on business performance.

The topic is of importance, because it recognizes the significance of using external information to complement a companies internal capabilities, in a time when domestic manufacturers are under pressure from low cost imports and a customer base that has become increasingly more demanding in terms of cost, design and quality. Information acquisition has seldom been discussed in relation to SMEs and is significantly absent from scholarship. Research to date has concentrated on either large business information technology systems, or highly successful international SMEs, which are significantly larger than New Zealand firms in terms of both size and resource capacity. Consequently, the following thesis seeks to provide a comprehensive framework for describing and analyzing national SME information processes, and subsequently developing the foundations for further research and policy attention.

This thesis explores the information acquisition behaviour of 132 New Zealand manufacturing SMEs. This study was initiated to spur national awareness of this neglected industry sector. In terms of the research structure, the literature review focuses on those aspects of scholarship which address the principal research questions and investigates comparative international studies. The review has drawn heavily on international scholarship and investigates both small business practice and information acquisition techniques in terms of six basic themes - the distinction between data, information and knowledge; the significance of SMEs; large business information theory; small business information theory;

international information acquisition studies; and New Zealand information studies and policy implications.

Chapter Three reviews the development of the thesis, outlining the key research questions under analysis. Chapter Four provides an overview of the methodology applied, namely a tailored questionnaire, to extract the relevant information from the sampling frame. This approach is critically appraised and the research limitations have been discussed in relation to future enhancement. This section then progresses to overview the demographic characteristics of the sample respondents.

The findings from this study have been extensively analysed in Chapter Five. Given the discrete and qualitative nature of most of the questionnaire data obtained in this study, non parametric testing was applied to explore the relationships of interest. Chapter Six evaluates these research findings and discusses them in relation to both comparative international studies and national research/policy agendas.

The following chapters provide readers with an in-depth snapshot of the prevailing information acquisition behaviour of New Zealand's small and mediums sized manufacturing enterprises, and highlights potential areas of weakness that require further research attention.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The development of New Zealand's small business sector, has suffered from a severe lack of research attention. This is despite the fact that the sector, a prominent division of New Zealand's industry base, is of increasing economic and social significance. An obvious trend of the last decade is the strong growth in the number of small businesses which suggests that it is smaller enterprises, rather than big business and corporates, which offer the greatest employment potential (McGregor & Tweed, 1998).

The swift pace of economic and labour deregulation in New Zealand since the late 1980s, accompanied by dwindling export subsidies and the removal of tariff protections, provides a dynamic and changeable environment for manufacturing SMEs (Ewing, 1998). New Zealand's manufacturing sector produces largely for the domestic market, partly because of the country's isolation and partly as a result of past government protection policies. By exposing the manufacturing sector to greater competition from foreign goods, it was hoped that more efficient production methods would result, and there would be a reallocation of resources to industries where New Zealand has some source of competitive advantage (Colgate & Featherstone, 1992).

However, the outcome from these policy developments has caused a number of labour-intensive, small business sectors to quickly become sunset industries, due to cheaper quality imports flooding an already retail-saturated domestic market (McGregor & Gomes², 1998). An appropriate analogy identified by Cameron, Massey and Tweed (1997) is that New Zealand small businesses are largely the "Cinderella" sector - seen but not heard, despite their important contribution to the economy. McGregor and Tweed (1998) augment this finding with an interesting point regarding New Zealand's small business sector suffering from a "non-policy" vacuum. Accordingly, SMEs and their working dynamics are a topical and relatively untapped field of investigation.

A growing volume of international literature is devoted to addressing the role of small business export performance (Crick & Chaudhry, 1995; Hansen, Gillespie & Gencturk, 1994; Nakos, Brouthers & Brouthers, 1998; Zafarullah, Ali & Young, 1998), technology transfer within SMEs (Balachandra, 1996; Buckley, 1997; Eden, Levitas & Martinez, 1997; Lang, 1996; Masten, Hartmann & Safari, 1995); networks within SME sectors for effective acquisition of technology (Birley, Cromie & Myers 1991; Dean, Holmes & Smith, 1997; Hagedoorn & Schakenraad, 1994; Holmstrom, 1994; Jones & Tang, 1996); and the characteristics of SME owner/managers (Chaston & Mangles, 1997; Jennings & Beaver, 1997; Lyles, Baird, Orris & Kuratko, 1993). However, little effort has been devoted to understanding information acquisition and the subsequent dissemination of knowledge, as an essential part of small business practice.

Policy advisors and leading business consultants emphasise the importance of information to business success and the ability of firms to respond to change (Frater, Stuart, Rose & Andrews, 1995). More generally, Harper (1993) suggests that:

information and effective information processes are critical to enhancing the innovativeness and out-ward looking orientation of our businesses, to improving productivity and New Zealand's international competitiveness and trade performance, and to achieving more rapid rates of economic growth. Information plays an important role at all levels: in the economic performance of individuals, firms, industries and the economy as a whole (p.1).

However, information acquisition is seldom publicly discussed in relation to SMEs and is significantly absent from scholarship. This phenomenon according to Christie, Arnold, Holdsworth, Townsend, Buwalda & Lucas (1996) is perhaps not surprising when you consider the legacy of New Zealand's protected economic history, where small firms did not have to be internationally competitive and relied on the country's agricultural backbone and commodity focused trading structure.

The evolution of information acquisition literature means a number of researchers have broadened the scope of their inquiry to study integrated systems of information technology (Court, Culley & McMahon, 1997), which subsequently, are not viable to the majority of New Zealand owner/managers who lack both the time and managerial competence to implement formalised business systems (McGregor & Gomes, 1998). The more relevant findings of Dixon (1991) identified all companies, especially manufacturers that seek product or process leadership, depend on their ability to acquire cost-effective relevant information and transform this into products their markets want to buy.

This literature review focuses on those aspects of scholarship which address the principal research questions and identified patterns of best practice. Clearly, this research does not allow a broad sweep of all theoretical elements regarding information acquisition, but it does embrace the findings of two seminal pieces of research. Choudhury and Sampler (1997) believe that as the transition is made from the industrial age to the information age, many companies are undergoing radical re-engineering. This rapidly increasing pace of change, is making it imperative for businesses to develop strategic and organizational flexibility, whereby information acquisition is typically the first step. The second step, according to Dixon (1991) is formal information infusion.

Information about new methodologies and technologies is generally acquired by manufacturers long after design and process innovations are made and new products introduced to the market. There is also a lag between the information's arrival and its distribution to the employees who are most able to use it. These delays can reduce or even eliminate the competitive edge the company might have realised by implementing the new methodologies or technologies soon after their development (p.16).

The scope of this literature review is framed by several key themes relating to information acquisition and the unique practice of small business owner/managers. With little specific scholarship available, this literature review will necessarily reflect on large business theories to outline distinctive variation. Contextual material will also be provided in terms of

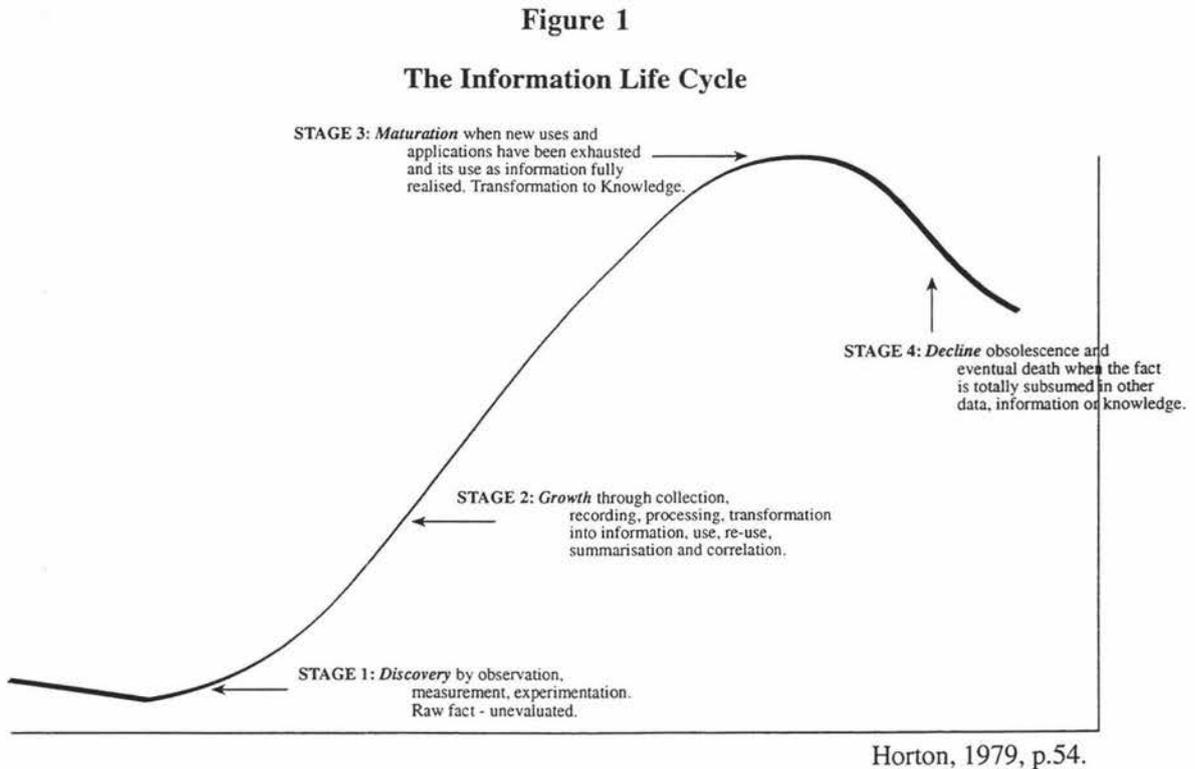
international research comparisons; recognition of the isolation and cultural variability of New Zealand will be acknowledged. The review will conclude with an overview of relevant New Zealand literature and the associated policy implications.

2.2 Information Acquisition

The scope of this section is framed by three assumptions. The first concerns the definition of what constitutes “information”. In the context of this study

Information is knowledge which is being conveyed, communicated or imparted about some particular fact, event or situation (Harper, 1993).

According to Horton (1979) it is essential to develop a clear understanding of the relationship between knowledge, information and data. The most effective way to outline this association is through the information life cycle figure depicted below.



According to Koniger and Janowitz (1995) “Information is only valuable to the extent that it is structured. Because of a lack of structure in the creation, distribution and reception of information, the information often does not arrive where it is needed and, therefore, is useless” (p.6). Subsequently, Mutch (1997) has identified that many prescriptions which claim to be about information, are actually about data. “Although the acquisition, maintenance and delivery of data are a vital part of organizational life, problems arise when we fail to recognize the necessary links to knowledge” (p.377). Earlier research by Inkpen (1996) supports this assertion and reiterates that new knowledge provides the basis for organisational renewal and sustainable competitive advantage.

The transformation of information to knowledge or “information infusion” is the second assumption. The distinction according to Choudhury and Sampler (1997) between information and knowledge is that:

knowledge is the stock of information possessed by an individual, based on previous experience and/or training, whereas, information is the regular, ongoing flow of data to which the individual is exposed (p.8).

The distinction between information and knowledge is time dependent, that is “what is information at one point in time can become part of the individual’s or organisation’s knowledge base at a future point in time”(p.7). Dixon’s (1991) premise that knowledge is the ultimate payoff, is particularly relevant to this research, especially when he confirms that *knowledge is the goal, but information is the first step.*

The third assumption relates to Buchanan and Gibb’s (1998) assertion that information must be recognised as a resource that needs to be managed and accounted for like any other resource.

Information resources are those resources which facilitate the acquisition, creation, storage, processing, or provision of information that generated the

knowledge or other value required to achieve the goals and objectives of the organisation (p. 31).

Court et al., (1997) maintain that a company's knowledge base is widely considered to be a company asset. Traditionally, it is comprised of the information that is created, collected and stored which guides future design and production, as well as the people within the organisation. The authors also make an interesting point that "while the value of a piece of equipment will decline with time, if properly managed the 'value' of information can grow. But, if improperly managed, its value can be zero" (p.360).

Hope and Hope (1997) ascertain that the Information Age has placed capital in a secondary role, with knowledge becoming the source of wealth creation. Deeter-Schmelz (1997) clearly define "information as a source of power and effectiveness in organisational co-ordination and co-operation" (p.1). Today information is a resource that is not only becoming more productive than in the past, but also relatively less expensive when compared with alternative assets such as human resources (Deeter-Schmelz, 1997). However, Mutch (1997) has identified that the problem with information systems literature to date, is that writers shy away from exploring the issue of how we ask questions about data, in our search for knowledge.

2.3 The Significance of Small and Medium Sized Enterprises

The 1972 United Kingdom Bolton Committee investigation of small firms, outlined three features that were likely to be found in small businesses and are pertinent to the New Zealand environment:

Firstly, in economic terms, a small firm is one that has a relatively small share of its market. Secondly, an essential characteristic of a small firm is that it is managed by its owners or part-owners in a personalised way, and not through the medium of a formalised management structure. Thirdly, it is also independent in the sense that it does not form part of a larger enterprise and

that the owner-managers should be free from outside control in making their principal decisions (Johns, Dunlop & Sheehan, 1989, p.1).

Small and medium sized enterprises, defined in the New Zealand context as entities with less than one hundred employees (Statistics New Zealand, 1998), constitute 99.5% of all companies, leaving less than 1300 enterprises in the large category. SMEs currently employ 60.3% of the New Zealand workforce, nearly 830,000 people. Bearing in mind New Zealand's comparatively small population base overall, 3.76 million in total, it is no surprise that micro-businesses (0-5) predominate (McGregor & Gomes, 1998).

Table 1
The Significance of SMEs in New Zealand

Employment Size Category		Number of Enterprises		Employment	
		Number	Percent	Number	Percent
Small:	0 - 5 Persons	208,465	85.7	319,440	23.3
	6 - 9 Persons	16,255	6.7	112,150	8.2
	10 - 49 Persons	15,955	6.6	295,750	21.6
Medium:	50 - 99 Persons	1,429	0.6	97,740	7.1
Large:	100+ Persons	1,276	0.5	543,890	39.7
Total		243,380		1,368,980	

Source: Business Activity Statistics, February 1997, Statistics New Zealand. (Published April 1998)

Note: These figures include "economically significant" enterprises only, according to the definition used by Statistics New Zealand. The main criteria for inclusion is that the enterprise has more than \$30,000 annual GST expenses or sales, or that it employs more than 2 full-time equivalent employees.

Nyamori and Lawrence (1997) have rightly commented that New Zealand's small business sector regardless of its significant contribution to capital accumulation and manufactured exports, along with acting as a seedbed for innovation and technological development, has not received its proportionate share of academic attention.

Throughout the developed world, the significance of SMEs is being increasingly acknowledged through the growing volume of international literature. The UK Council for Industry and Higher Education (1997) readily admits that “while SMEs are currently a major source of new job creation, they also add markedly to the flexibility of an economy and provide an outlet for individuals’ creativity” (p.2). However, they also acknowledge the UK’s relative absence of fast-growing, wealth creating SMEs prevalent in the USA and the large number of innovative medium-sized companies which characterize the German economy. Endorsing the primary notion, Mulhern (1995) comments on the crucial contribution of SMEs to European competitive development. “The SME sector employs the majority of the European labour force and commands two-thirds of sales volume in the non-primary sector. Most of the expansion of employment in Europe over the last decade has been in very small firms” (p.83).

The majority of literature on small firms highlights the differences between the small and large firm in terms of financial, managerial, operational and organisational competencies (Bijmolt & Zwart, 1994; Chaston & Mangles, 1997; Kotey & Meredith, 1997; Lyles et al., 1993; Youngbae & Youngrok; 1994). However, a unique mix of factors such as insularity, nation size, isolation and a lack of managerial competence has been neglected from these studies and is of particular relevance to the majority of New Zealand SMEs. As McGregor and Gomes (1998) suggest, strong cultural norms underpin the New Zealand SME style of entrepreneurship, which arise partly from the national characteristic of rugged individualism and partly from the country’s geographic isolation at the bottom of the world. Rightly or wrongly, the popular conception is that small to medium business owners are tough, individualistic and are propelled by self-initiative. The significance of these cultural norms is the need to recognize the limitations of international literature and acknowledge the independence and autonomy of the New Zealand SME owner/manager.

A review of the literature delineates three characteristics unique to SME practice, which may impede the process of information acquisition. The first distinction concerns the inhibiting feature of individualism. Strategic management in small businesses is enacted in a highly personalised manner and is strongly influenced by the disposition, experience, personality

and ability of the owner/manager (Kotey & Meredith, 1997). “Contrary to popular belief, and a great deal of economic theory, money and the pursuit of a personal financial fortune are not as significant as the desire for personal involvement, responsibility and the independent quality and style of life which many small business owner/managers strive to achieve” (Jennings & Beaver, 1997, p.1). McGregor and Gomes (1998) concluded that it was therefore intuitively reasonable to suggest that the well-identified personal characteristics of many small business owner/managers and the relentless drive for personal achievement, may inhibit growth potential, where development requires independent specialist expertise and indeed may threaten the very survival of the small firm (Jennings & Beaver, 1997; Chaston & Mangles, 1997). This is because owner/managers may regard independent scrutiny as interfering with their autonomy.

The second prominent characteristic is the lack of managerial competence prevalent in SME owner/managers. The popular view that small business owner/managers are deficient in their broad managerial knowledge may be somewhat exaggerated. But, according to Johns et al., (1989), it is true that owner/managers are frequently required to spread their attention over so many areas, that they are unable to perform adequately all the management tasks necessary to operate their business successfully. Ahire’s (1996) examination of quality management in small firms, resolved that SMEs are characterised by a myopic view of management which focuses on meeting day-to-day survival challenges, partly due to a lack of resources and partly due to the inability of the owner/manager to exhibit understanding of the strategic aspects of business. McGregor and Tweed (1998), found from a Nationwide study of 1500 SMEs in New Zealand that management structures can be minimal and often consist of only one person, who while driving the business forward, becomes pivotal as the sole determinant and expression of the SMEs competence and the sole repository of organisational learning.

The lower level of resources, the frequent concentration of information gathering responsibilities into one or two individuals and the difficulty of obtaining specialist skills, due to the salaries and associated benefits offered in larger organisations (Lang, Calantone & Gudmundson, 1997) is representative of the third characteristic. “SMEs face particular

problems when wishing to introduce change into their operations. They do not have the same access to sources of best practice as do larger companies, while a lack of resources frequently constrains them only to undertake one major change at a time” (Frizelle, Gregory, Harris & Ridland, 1991, p.66). According to Barber, Metcalfe and Porteous (1989) the scarcity of time and expertise of SME owner/managers impinge on essential planning, staff training and information acquisition, often resulting in inadequate knowledge of progress within the business or developments in the market. According to Lang et al., (1997) “One of the liabilities of smallness is the greater vulnerability of SMEs to threats, because of fewer slack resources that can be used to absorb the damage caused by a threat” (p.20). This conclusion is supported by Ahire’s (1996) earlier research outlining that “on the one hand, small firms are believed to have an edge over large firms in flexibility, innovation and overhead costs, while on the other, they are limited by a lack of market power, capital, and managerial resources” (p.44).

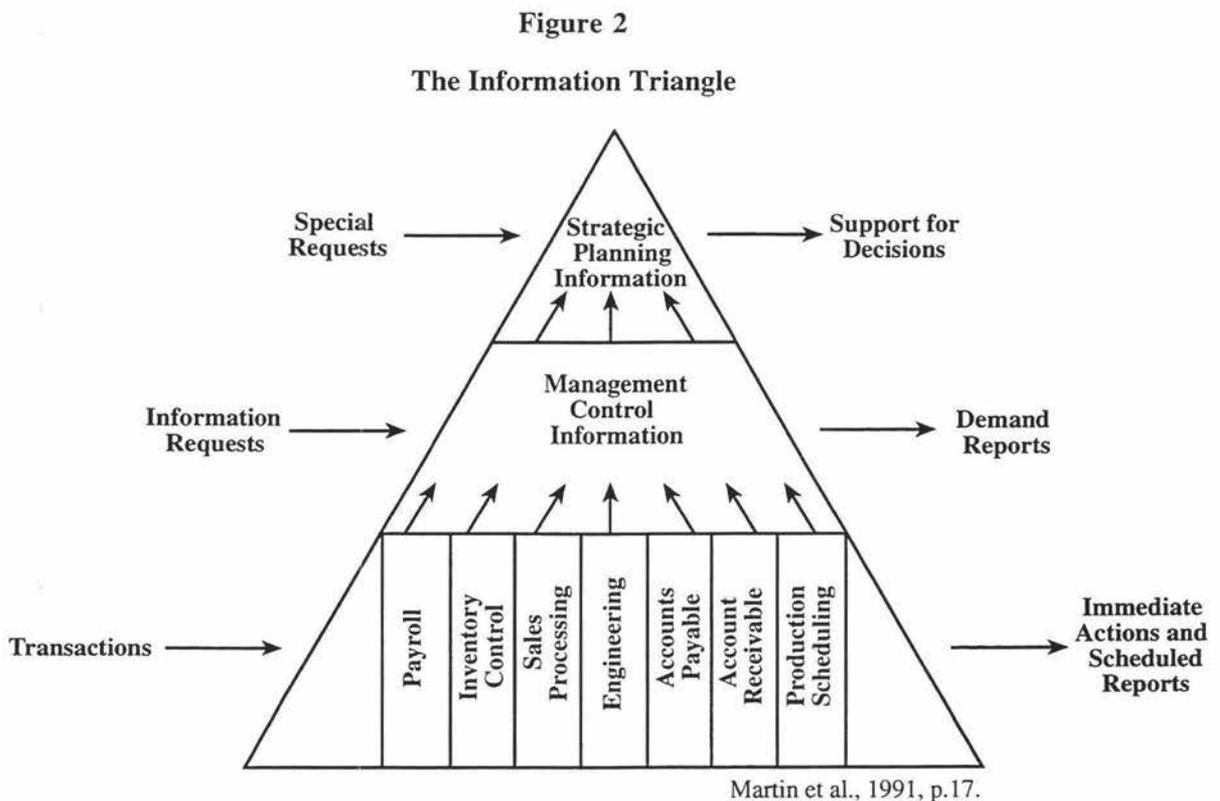
2.4 Large Business Information Acquisition Theory

A brief look at the literature regarding the practice of information acquisition within large firms is necessary in order to provide some perspective of the distinction between the formalised information technology (IT) systems implemented in large corporations, as opposed to the reactive environmental scanning approach common to SMEs.

According to Martin, Dehayes, Hoffer and Perkins (1991) there is a revolution under way in how data processing, information systems, office automation and telecommunications are being used and managed to improve business operations and strategy in large and small organisations. The rapidly changing pace of environmental change is making it imperative for businesses to develop strategic and organisational flexibility. Choudhury and Sampler (1997) identified environmental analysis and information acquisition as being the first steps in organisational adaptation. “The convergence of these trends means that, in order to avoid information overload, managers and organisations must develop effective strategies for acquiring relevant information in a timely fashion” (p.2).

A wealth of literature exists describing a diversified range of IT systems for a broad scope of industries (Court et al., 1997; Dixon, 1991; Garud & Nayyar, 1994; Horton, 1979; Martin et al., 1991; Sprague & McNurlin, 1993). The three way division of information technology outlined in Figure 2, provides an overview of the standard IT system, while acknowledging that the lines in practice would not be as clearly defined as in the Information Triangle.

The requirement for formalised information systems particularly within a large organisation, was identified by Koniger and Janowitz (1995) in that “information is only valuable to the extent that it is structured. Because of a lack of structure in the creation, distribution and reception of information, the information often does not arrive where it is needed and, therefore is useless” (p.6). It is mainly this dissolution of structure that makes it so difficult to draw the knowledge you want from the information you receive. Dixon’s (1991) information infusion research outlined that companies with successful information acquisition programmes also use gatekeepers, employees assigned to stay informed in selected areas, and then direct the flow of information to other employees as needed.



“Because information is a source of power and effectiveness in organisational co-ordination and co-operation, the capabilities of obtaining, receiving, processing and transmitting information have become crucial organisational functions” (Deeter-Schmelz, 1997, p.1). However, the paradox identified by Koniger and Janowitz (1995) that there is simultaneously too much and too little information because the information processing methods are inadequate for the fast growth in the amount of and fast change in the ways of processing information, highlights a weakness that has been commonly identified within IT literature.

A study by Stamper (1973) undertaken nearly 26 years ago, identified that “the explosive growth of information technology has not been accompanied by a commensurate improvement in the understanding of information”. Mutch’s (1997) research of information literacy also concluded that “despite the enormous expenditure on information technology, there is still a nagging doubt in many organisations that much of value is being realised from the investment” (p.377). Comparable research by Buchanan and Gibb (1998) noted that the latest Deloitte and Touche biennial information management survey, reveals that information overload, organisational misunderstanding of the role of information management, inadequate locator tools, poor coordination of information with decision making needs, and costs associated with paper handling, non-compliance and information loss are still significant features of the information terrain.

Obviously most small firm managers do not have the same ability for internal expert consultation, nor do they have the elaborate internal information systems of larger organisations (Lang et al., 1997). However, it is evident that “while information systems increase the amount of information available to the business, such systems do not ensure that this information will be acquired and used” (Deeter-Schmelz, 1997, p.9).

2.5 Small Business Information Acquisition Theory

“Early small business research used concepts derived from large firm behaviour and concluded that small enterprises could only succeed by becoming bigger. In the interim,

they should do all they could to imitate large firms, in particular by trying to catch up technologically” (Julien, 1995, p.472). However, the increasing academic interest in the small firm readily acknowledged a small business is not a little big business (Lang et al., 1997), that the management process in the small firm is unique (Jennings & Beaver, 1997) and one should avoid comparisons with large firms particularly in the area of information acquisition. Julien’s (1995) research outlines the necessity for distinction, because the resources of small firms are so much more limited and the domestic and international information transfer systems tend to be directed mainly at the needs of large firms. Additionally, SMEs “evaluate information by comparing different sources, and they use iterative techniques and intuition to complete their information and to decide on their investments; for small firms information acquisition is an entrepreneurial act that in no way resembles the behaviour of larger firms” (p.459).

During the 1980s a number of foundation information acquisition studies were conducted, identifying the unique characteristics and behavioural trends evident within small firms (Daft & Weick, 1984; Dutton & Jackson, 1987; Milliken, 1987). Johnson and Kuehn (1987) found that small business managers focus their searches narrowly, probing in response to stimuli, rather than generalised scanning. Capital Planning Information (CPI) (1986), found that owner/managers were often unable to define or understand their problems and the consequent information needs. These findings support Trott’s (1986) earlier assumption that “one-man-band-management, whilst in theory having more need of help in finding information, often does not have the time to consider what information is needed to improve the business beyond answers to immediate problems, which tend to be management-related and stem from day-to-day running of the business” (p.5).

Small firms rely heavily on sources of information that are easily accessible, inexpensive and informal (Fann & Smeltzer, 1989; Walters, 1996). Findings from previous studies suggest that most information in small firms passes verbally, especially that involving suppliers and customers (CPI, 1986). However, the quality of the sources and the capacity of small firms to extract all the information they need is a real difficulty small firms face. Kleinknecht’s (1989) study of 2000 Netherlands manufacturers, showed that the

difficulty of finding technological information was one of three elements in which a significant difference existed between small and large firms in terms of innovation. Literature produced by Julien (1995) implies that a large part of available information is too general or too badly adapted.

The most interesting information, which allows firms to differentiate from their competitors, is the most recent, but it is often difficult to obtain because it is developed in private or semi-public laboratories. Cost is involved in finding, evaluating, and adapting this type of information to the specific needs of each firm (p.467).

Meyer and Goes (1987) suggest that many small firms minimize costs and increase information quality through networks. Hansen et al., (1994) confirms that “inter-firm cooperation, irrespective of its specific form, offers the potential to share risks, resources and rewards beyond the capabilities of individual firms” (p.9). However, McGregor and Gomes² (1998) question this approach and state that from the New Zealand perspective, the strong cultural rivalry prevalent amongst SME owner/managers has traditionally pulled against industry clustering or networking linkages. This view was also supported by research findings of Birley et al., (1991) that indicate “members of networks do not usually disclose their contacts and they rarely discuss their association with others” (p.57); and Raymond, Julien, Carriere and Lachance (1996) subsequently identified that “memberships of associations or groups to obtain technological information was not very important, leading us to believe that more informal networks are used for this purpose” (p.276).

Regardless of the source or methodology implemented for information acquisition, the Organisation for Economic Cooperation and Development (OECD) (1993), has identified that it is the dynamism of a small firm that will establish a broad information portfolio.

“This requires an adequate *technological culture* (a receptive attitude with regard to scientific and technological change), followed by an interest in and active search for information through technological scanning, and then processing and conversion of the information into knowledge and applications”(Julien, 1995, p.472).

2.6 International Small Business Information Acquisition Studies

“Knowledge has become the principal resource in the world economy, especially in its dynamic form as the capacity to generate new technologies and to market new products. Information and knowledge are now abundant and the main problem has become how, where and when to use different information and knowledge” (Whitehouse, 1998).

Academic literature has identified that owner/managers acquire information for two reasons. According to El-Sawy and Pauchant (1988) in the ‘reactive’ mode, also termed ‘problemistic’ or ‘decision orientated’, information is acquired to solve a specific problem. On the other hand, Huber (1984) describes the ‘proactive’ mode, also referred to as environmental scanning or surveillance, where the purpose of information acquisition is exploratory, used to detect potential problems and opportunities. Subsequent findings from the Lang et al., (1997) research of 671 small firms in the Midwestern States of USA, confirmed that the extent to which small firm managers seek information, is directly related to how they perceive the extent of their opportunities or threats. This finding conforms to the “expectancy theory, suggesting that the more a person values an outcome, the greater the effort they will expend to achieve the desired outcome” (Pineda, Lerner, Miller & Phillips, 1998, p.65).

Previous studies identify that small firm owner/managers rely more on internal information sources (personal judgment) as opposed to external sources (advice from experts). An early exploration by Rice and Hamilton (1979) found that small business people rely heavily on their own accumulated experience to make decisions. Julien’s (1995) survey, conducted on 344 small manufacturing firms in Quebec, Canada, revealed the most important sources of

information were customers, specialised magazines, staff, suppliers, sellers and tradefairs. Further analysis identified an average of 8.6 informal personal sources, whereas only 3.7 formal sources were employed for a total of 12.3 information resources sought, when new information was required. These findings were consistent with previous studies of Johannisson and Johnsson (1988) and Birley et al., (1991).

Determining whether information search activities vary regarding the topic of investigation, was beyond the scope of this project. However, the Pineda et al., (1998) study of 131 Tennessee, USA, small firm owner/managers, revealed that “rather than searching for the optimal sources of information and incurring the additional cost of obtaining such information, they appear to use the most readily available information sources. Such behaviour would be characterised as adaptively or boundedly rational” (p.65). Within the last decade several studies have focused on the general information behaviour of small companies. Summarising these findings Johannessen and Dolva (1995) uncovered the following facts:

The small firm owner/manager is the central actor in handling information in the company. The owner/manager looks for information among personal and social contacts. Behaviour of the owner/manager is characterised by unsystematic, short-sighted, and one-dimensional searching for information. Owner/managers possess a general scepticism to establishing relations with institutional sources (p.368).

However, on a more positive note, Stokes (1992) theory that small firms have the advantage of entrepreneurial, opportunistic management, fast internal communication, and an ability to react quickly to new problems or opportunities, coincides with Johnson and Kuehn's (1987) research conclusion that small firm owner/managers spend more time searching for information than their counterparts in large firms. Their study of 436 small and 188 large firms, revealed that the small business owner/manager typically spends 2.1 hours per day actively seeking information, in comparison with 1.5 hours per day for a large organisation manager. Further analysis identified market-based information (competitor analysis,

demographics & sales data) and technological information (new service/product availability, equipment) were the two main types of knowledge (Refer Table 2) required by small firms. Choudhury and Sampler (1997) also refer to four previous studies identifying that the majority of information acquisition time is spent scanning the marketing sector. “No clear explanation is offered for these findings. A possible reason may be that the marketing sector is the one likely to yield the most highly time-specific information and changes in these marketing elements of the competitive environment typically require a swift response in order to avoid loss of competitive position” (p.13).

Table 2
Percentage of Time Owner/Managers Search For External Information by Type

Type of Information	Small Business (N = 436)		Large Business (N = 188)	
	Percentage of Time	Standard Error	Percentage of Time	Standard Error
Economic Conditions	16.32	0.71	14.35	1.08
Government	13.26	0.80	18.38	1.60
Growth Potential	13.5	0.67	10.03	0.83
Marketplace	32.44	1.05	24.85	1.62
Technology	19.03	0.87	26.27	1.75

(Johnson & Kuehn, 1987, p.57).

Former literature relating to small firm growth and competitive advantage have taken into consideration the significant impact information acquisition has on innovation (Acs & Audretsch, 1988; Crawford, 1991; Ilori & Ireferin, 1997; Kleinschmidt & Cooper, 1991; Tipping, Zeffren & Fusfeld, 1995). Alvarez (1998) maintains that “small businesses are at the leading edge in developing the products of tomorrow, with the rate of innovation in small businesses about twice that of large businesses” (p.11). The 1992 report on SMEs by the OECD, noted that the modern SME has a more innovative and progressive pattern than do its earlier predecessors (Frater et al., 1995). “A significant proportion of SMEs today (between 50-60%) regularly innovate. The reason for this change of behaviour appears to

flow from the higher quality of their resources, the level of training of staff, and their ability to obtain and use scientific and technological information which has become one of their vital strategic resources” (p.15). This supposition is validated by Julien’s (1995) research of technological information in small businesses, which identified that:

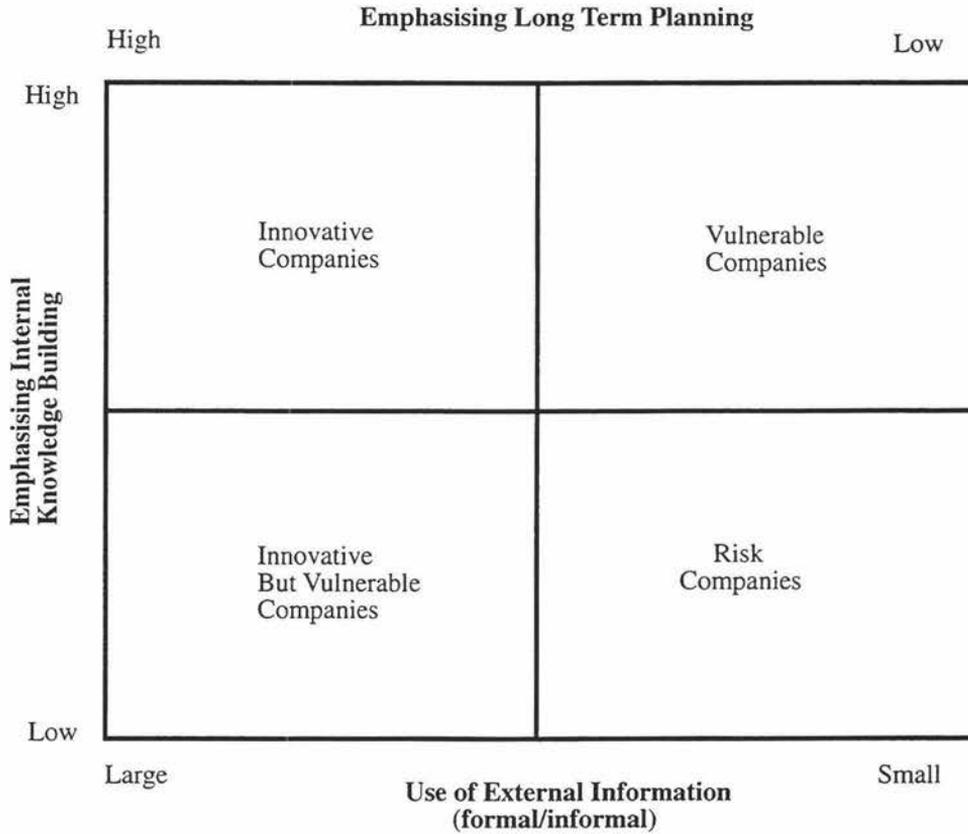
Innovation and new technology penetration both require external information to facilitate the development of new ideas for market differentiation or increase knowledge on the state of available technology and the level of dissemination among major competitors (p.466).

Choudhury and Sampler (1995) acknowledge the significance of information infusion, specifically in regard to technological opportunities and innovation. However, they endorse the fact that information is highly time-specific in acquisition, as it loses value if not used very soon after it first becomes available. Supporting this assertion, Harper (1993) alludes to Kirzner’s theory that “entrepreneurship is alertness to the opportunities presented by new and existing information, rather than the possession of information per se” (p.17). “In today’s rapidly changing environment, a new technology quickly becomes less proprietary, making access and effective use more important than possession” (Atuahene-Gima & Lowe, 1994, p.27).

Although it is beyond the scope of this project the level of innovation within a company is positively correlated to R&D expenditure and export performance, with all three attributes intricately linked to information infusion. “Unfortunately, for many SMEs technological innovation is not a key element of the firms business strategy for growth, or even recognised as a requirement” (McGregor & Gomes², 1998, p.10). However, Johannessen and Dolva’s (1995) prior research of innovative companies external information search, outlines that innovative small business owner/managers are more proficient in rational thinking, long-term planning and systematic search procedures” (p.376).

Figure 3

Information Acquisition by Innovative Companies



The proposition generated from Johannessen and Dolva's findings and depicted in Figure 3, is that in order to transform non-innovative small companies in a more innovative direction, their external information procedures must be improved.

2.7 New Zealand's Small Business Information Acquisition Studies and Associated Policy Implications.

Despite New Zealand's small size and population, IT applications requiring co-operation and integration have witnessed great success (Whitehouse, 1998). However, the day-to-day information requirements of the small business sector do not reflect the same success stories.

Harper's (1993) inaugural information report, provided an exploratory analysis of New Zealand's information environment along with insights and suggestions for future policy analysis. Harper, concluded that the "total configuration of all New Zealand's public policies must help create an institutional and regulatory environment which is conducive to the speedy diffusion and adoption of new technologies and products" (p.60). The Ministry of Business Development (1996) expanded Harper's study by investigating the business information needs of 558 New Zealand firms. The results of this survey identified that:

Significant numbers of respondents experience difficulty in accessing all types of information. In particular, over 20% of respondents find it difficult to obtain information on the regulatory environment and over 25% find it difficult to obtain information on their local/regional economy. For the majority of respondents, the major difficulty is simply a case of not knowing where the relevant information can be found (p.2).

The Technology Innovation Working Group (TIWG) (Christie et al., 1996) similarly identified that "many New Zealand firms are poorly informed about global technology developments, relying mostly on internal sources of information for new technology. Knowledge on foreign technological developments that can solve local problems and expand local opportunities is limited" (p.8). Research findings by Johnston (1991) also found that New Zealand manufacturers suffer from an over-reliance on familiar information sources, and an unwillingness or inability to search more widely, particularly overseas, for new technology developments.

Harper's (1993) report identified that many of the outputs for the business sector are informational services which include advice, statistical information, data processing, data analysis and communication services. However, the Christie et al., (1996) study acknowledged that the New Zealand SME environment, particularly in the manufacturing sector, is desegregated in nature. "This means that the cost of providing technology based services are inherently high which limits the motivation of technology providers (both public and private) to offer a full range of services to this group of firms. There is currently

little incentive or encouragement for working with SMEs” (p.15). Furthermore, the findings of Sandu’s (1996) international study of technology transfer, recommends that in order for the infrastructure supporting manufacturing growth to prosper, public policy must address the growing needs of information acquisition within the SME sector.

The New Zealand Government’s strategy for Research, Science and Technology to the year 2010, has identified the need to expand knowledge bases and capabilities, as an essential measure of sustaining an innovative manufacturing sector, able to adapt quickly to the changing and sophisticated market requirements. Much of the Government’s research attention until recently, has focused upon science orientated R&D, as opposed to technology per se (Christie et al., 1996). However new policy initiatives are currently being introduced to ensure that New Zealand firms are:

More aware of relevant technology developments worldwide; able to access that technology for their competitive advantage; better integrated into the global technology market to enhance their ability to contribute to both technology development and use; improved linkages between firms and the total science and technology domestic resources, particularly those supported by public funding; and assisting more effective enterprises into new areas of technology with growth potential. (Ministry of Research, Science & Technology (MoRST), 1996).

Regardless of the change and progress in legislative policies, the question regarding information quality is still relevant, together with the subsequent capacity of small firms to extract all the information they need (Julien, 1995). Although, government departments have initiated programmes such as the Tradenz Joint Action Groups (JAGs), to increase industry networking for exporters; the Business Technology Link Scheme, which provides technology consultants who can work individually with SME owner/managers; as well as the TIWG integrated policies for enhancing technological innovation, the question remains as to whether programmes such as these are an effective mechanism for assisting the small business owner/manager’s information infusion and technological advancement.

New Zealand only has less than 0.1% of the world's knowledge capability.

Therefore, it is essential that New Zealand researchers keep informed on what the other 99.9% of researchers are doing (Whitehouse, 1998).

An OECD study in 1992 identified that policy development regarding information and technological acquisition in Germany, Sweden and Switzerland ensures that the infrastructure and environment is conducive to the rapid and efficient flow of information, leading to technology uptake. Mulhern (1995) also refers to the effectiveness of the Pan-European Open Access Information Programme, "European governments have acknowledged that smaller firms have higher than average information costs. They need particular help obtaining the information needed to take advantage of niche markets. The chief instrument for this is the 148 Euro-Info-Centres. These raise awareness of EU policy and fulfill an essential information function necessary for competitive advantage to exist within SMEs" (p.85). In a similar vein, the British Technology Foresight Programme, aims to identify and support the development of those technologies which have the potential for widespread application across many sectors, with particular relevance to SMEs (Anderson, 1997).

New Zealand's history of providing protection to incumbent producers and safeguarding these manufacturers from competitive elimination through tariffs, has traditionally reduced the incentive for domestic SMEs to seek out new information sources and new types of information. Subsequently, there has been less urgency for domestic firms to keep abreast of, and obtain information about, technological and market developments happening overseas. Harper's (1993) initial recommendation to overcome this situation, is that policy makers must seek to identify obstacles to information diffusion which could easily arise from public policy itself.

It must be recognised that although the development of internal capacity for absorbing new ideas and technologies is primarily the responsibility of individual firms themselves, there is a role for policy makers to consider whether existing research, science and technology policies, and the policy

environment in general, are hindering firms' investment in such capacity (p.60).

2.8 Conclusion

The increasing pace at which both technology and markets are changing demands that SMEs have access to accurate, up-to-date information in a diverse range of topics. As the New Zealand SME environment evolves and is subject to increasing international competition, the impact and benefits of effective information acquisition procedures and knowledge dissemination techniques need to be assessed and evaluated. The impact of the Information Age on New Zealand's small and medium sized manufacturing sector, provides the specific context for this research. The review has drawn heavily on international scholarship and investigates both small business practice and information acquisition techniques in terms of six basic themes - the distinction between data, information and knowledge; the significance of SMEs; large business information theory; small business information theory; international information acquisition studies; and New Zealand information studies and policy implications.

A unique mix of factors such as insularity, nation size, isolation, predominant small business enterprise and a traditional commodity focus, makes New Zealand a challenging case study for researching information acquisition. The study aims to examine how SMEs currently uptake technological information and identify any barriers to information infusion and knowledge dissemination. This area of research has not been formally addressed in prior New Zealand academic literature.

The following chapter will outline the thesis development and research methodology employed in the study, providing a justification as to why the questionnaire tool was selected for data collection. Chapters Five and Six will outline the results and comparative analysis with international studies.

CHAPTER THREE

THESIS DEVELOPMENT

A review of the literature highlighted many of the central issues of information acquisition and how they relate to small business practice. The key consideration regarding information acquisition techniques within SMEs, revolves around the distinction between data collection and meaningful information uptake; which is data that is purposefully collected, processed, organized and interpreted in light of some hypothesis and then transcribed to knowledge which is understood and disseminated throughout an organisation (Whitehouse, 1998). Secondary issues which relate to small business information utilization, incorporate: managerial competency of owner/managers, barriers which inhibit effective information uptake within SMEs and policy implications that effect the future prosperity and competitive advantage of the New Zealand small and medium sized manufacturing sector.

This study examines the information acquisition techniques of small and medium sized manufacturing companies within New Zealand, through the medium of a tailored questionnaire. The aim of this report is to address the following questions:

- How do SMEs currently uptake technological information? Do they have specific budgets and dedicated staff allocated to this operation? Furthermore, once the information is acquired do they have any methodologies in place for disseminating it through their organisation?
- What are the main areas SMEs target when searching for information, do these vary depending on the industry sector or competitive strategy of the SME? Are there any recognisable barriers to information acquisition within SMEs?
- What is the main resource stimuli used for innovation within SMEs and do these equate with the most frequent sources used for information acquisition? Does an SME's R&D budget incorporate information acquisition?

- Is there any relationship between the number of resources sourced for information acquisition and company demographics? Is there any relationship between the number of personnel dedicated to information collection and the level of knowledge dissemination?

CHAPTER FOUR

METHODOLOGY

This study was conceived to provide an analysis of the current techniques used within New Zealand's small and medium sized manufacturing sector, for information acquisition and its subsequent correlation with business enhancement. This analysis is intended to provide a follow-up investigation of the New Zealand PGSF funded "Improved Technology Adoption by Small Groups of Manufacturing Enterprises" study. This continuance offered a number of advantages including the highlighted deficiency of information and technology uptake within SMEs; and provided initial contact with twenty manufacturing SMEs (case-study appraisal), whereby the original survey instrument was trialled.

4.1 Sample Selection

Small and medium sized New Zealand manufacturers were selected as the target population for this research, because New Zealand's industry base is characterized by SMEs, and the New Zealand Trade & Development Board (Christie et al., 1996) has identified the significant untapped potential for niche market exports within the manufacturing sector. Furthermore, the majority of research in this field has previously focused on large multinational and predominantly high-tech companies, with little academic scholarship concentrating on SMEs.

The following four sectors were chosen to represent a cross-section of New Zealand's manufacturing industry:

- Electronics
- Furniture
- Marine
- Plastics

The electronics industry was selected due to its international presence, high-tech capabilities and significant levels of innovation and R&D activity. Marine companies were chosen because of their international recognition and the unique personal networking skills prevalent within the industry. The ongoing interaction with international consumers and variable export markets, would enable these two sectors to access a wider scope of information than their more traditional counterparts. The New Zealand furniture and plastic manufacturing sectors have been found to suffer from a conventional insular approach to product design and development, which focuses predominantly on efficiencies of scale. Subsequently, these two sectors presumably have a much smaller networking base for information uptake and tend to record lower levels of product innovation. The cross section of companies represented by these four sectors provides both a comparative base for and accurate illustration of New Zealand's SME manufacturing population.

The sampling frame utilized, to select the actual population, was a combination of the New Zealand Business Who's Who (New Zealand Financial Press Limited, 1998) and the company listings data held on Bookfind CD Rom (1998). Due to the financial constraints of the study and the pre-determined requirement for small and medium sized manufacturing companies (i.e., entities with less than 100 employees); a random selection process reduced the sampling population to 250 SMEs across the four allocated sectors.

4.2. Questionnaire Design

The most appropriate method to collect information acquisition data from SME owner/managers, was through a tailored questionnaire. The mailed questionnaire had the advantage of being efficient time-wise and it was the most suitable approach to the respondent, as it could be answered at their convenience. In order to reduce the possibility of non-response, a covering letter was addressed to the owner/manager, explaining the importance of the study and the requirement for his/her individual feedback (Refer Appendix I for Covering Letter).

Due to the focused and concise nature of the research objectives, the structured questionnaire was designed to accommodate the qualitative response variables, through either nominal or numerical scales. The questionnaire was structured to include straightforward demographic questions in Section A so the respondent felt at ease and was then more confident in answering the following sections which required some personal judgment. In order to minimize confusion, reduce completion times and eliminate coding bias, the questionnaire contained no double-barrelled, leading or open-ended questions.

Overseas literature and national ministerial documents, were used to aid in the questionnaire development and enable a comparison of results against larger more progressive companies. The most pertinent questions include the Cooper & Kleinschmidt (1991), Griffin (1997) and Johnston's (1991) renowned innovation index measure; and the Johnston (1991) competitive strategy description. The overall design of this research tool was influenced by the Company Audit (DeMontfort Quality Centre, 1996), the Self Assessment Framework (Voss, Chiesa & Coughlan, 1994); the Technical Innovation Audit (Chiesa, Coughlan & Voss, 1996); the Self Analysis & Self-Help Guide for Management (Goulden, Bradford & Peak, 1996); Your Tomorrow's Company Inquiry (Tomorrow's Company Limited, 1996) and the Business Technology Link Initial Diagnosis (Kirk & Cunningham, 1996).

The questionnaire was divided into four sections. Section A covered demographics. Section B moved directly to the heart of the research with information acquisition questions. The section organization of this survey tool was arranged in such a way as to minimize confusion and enable owner/managers to clearly distinguish between information acquisition and Section C & D which covered technology uptake, innovation and research & development. (Refer Appendix I for Questionnaire).

4.3. Response Rate

In early February (1998) 250 questionnaires were mailed throughout New Zealand to the predetermined companies. After a period of approximately three weeks a reminder letter was sent to 82 selected companies who had not yet responded (Refer Appendix I for

Reminder Letter). Six of the questionnaires were returned unopened, and no forwarding address could be located. Four of the selected owner/managers sent their apologies with the returned questionnaire, but felt they were unable to reply due to reasons of confidentiality. The total sample size was therefore reduced to 240 SMEs. The following table outlines the total number of questionnaires returned within each industry sector.

Table 3
Industry Classification of Respondent SMEs

Industry Sector	Total Surveys Sent	Total Surveys Returned	Response Rate
Electronics	58	25	43.1%
Furniture	62	25	40.3%
Marine	57	25	43.8%
Plastics	63	23	36.5%
Other	-	34	
Total	240	132	55%

N.B.: * The 'other' category incorporates respondents that did not wish to identify themselves. The 34 responses within this category will not be included in any sector analysis work.

Ninety-four questionnaires were received initially and a further 38 were received after the follow-up letter was sent, making a total of 132 responses. The typical response rate for a small business mail survey has been suggested by Edmunds (1996) to be approximately 15%, therefore the 55% response rate achieved by this survey was highly acceptable.

4.4. Critique of the Methodology

This research is a benchmark study for New Zealand SMEs, concentrating primarily on the owner/managers information acquisition techniques. As such, it does provide an overview of the current environment for technology uptake, but comparative research design and response measures are limited.

It must be acknowledged that mailed questionnaires have certain associated limitations, such as the inability to probe additional explanations, the fact that respondents can selectively answer the survey and the subconscious influences that may have some bearing on the answers provided. Every practical attempt was made in the construction of this methodology to reduce the non-response bias prevalent in mail surveys (Chisnall, 1997). Every owner/manager was sent a personalised, vibrant coloured letter, in a hand written envelope, with an attached self addressed, prepaid, return envelope. The questionnaire was clear, concise, required primarily tick-the-box answers and was only 5 single-sided pages long.

The major criticism of this research design was the attempt to increase the response rate by advising the owner/manager that individual responses could not be identified. Whether this was a significant factor in the high response rate cannot be determined without a control sample. Unfortunately, this decision resulted in 34 unidentifiable questionnaires, which could not be used in the analysis of company sectors. The second wave of questionnaires were sent out with a code identification marked in the return envelope. The resultant data received from the selected sample population is sufficient to allow a meaningful analysis of most issues relating to SME performance. Care has been taken, however, not to draw statistically unjustified conclusions from the research results.

4.5. Characteristics of the Sample

The 34 unidentifiable questionnaire responses have been removed from any analysis involving sector comparisons, reducing the sample size for these tests to 98 manufacturing SMEs.

One hundred and eighteen or 89.4% of the sample companies were independently owned, with the remaining 14 companies (10.6%) operating as a subsidiary of either local or international companies

Table 4

Location of the Respondents Subsidiary Company

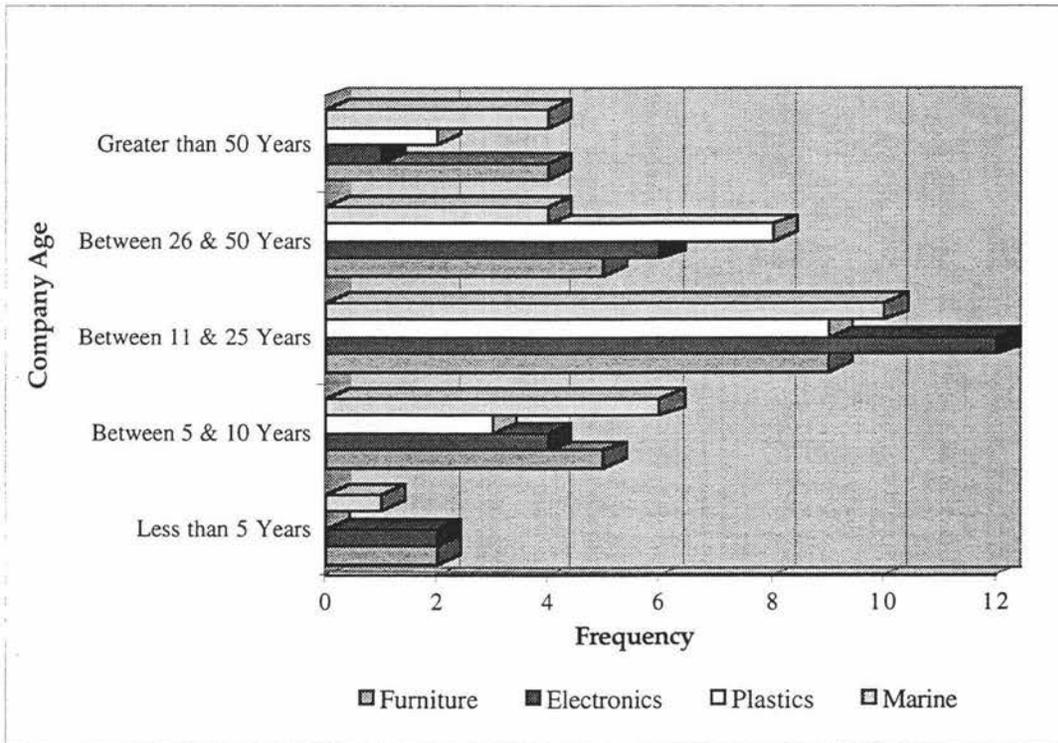
Location	Number of Companies
Auckland	4
Christchurch	1
Melbourne	3
USA	5
UK	1

Company Age, Size & Turnover

It is evident from scanning Figure 4, that the majority of companies have been in business for more than 11 years (76%). This is a positive research finding, as it would have been hard to define this as a representative sample and deduce accurate research conclusions, if the majority of respondents were still in their developmental phase of growth, (i.e. 0-6 years) where limited business practice tends to be more susceptible to environmental influences (Churchill & Lewis, 1983; Hamilton & English, 1997). The distribution of age across the four industry sectors revealed little variability, with the majority of companies clustered between 11-25 years.

Figure 4

Age of Company by Industry Sector



The seven outlier variables from the companies employing more than 100 staff have been removed from the employment levels and turnover analysis, in order to provide a more accurate description of SME demographics. It is evident from the employment level statistics and analysis that there is little variance in staffing levels across the four industry sectors.

Table 5

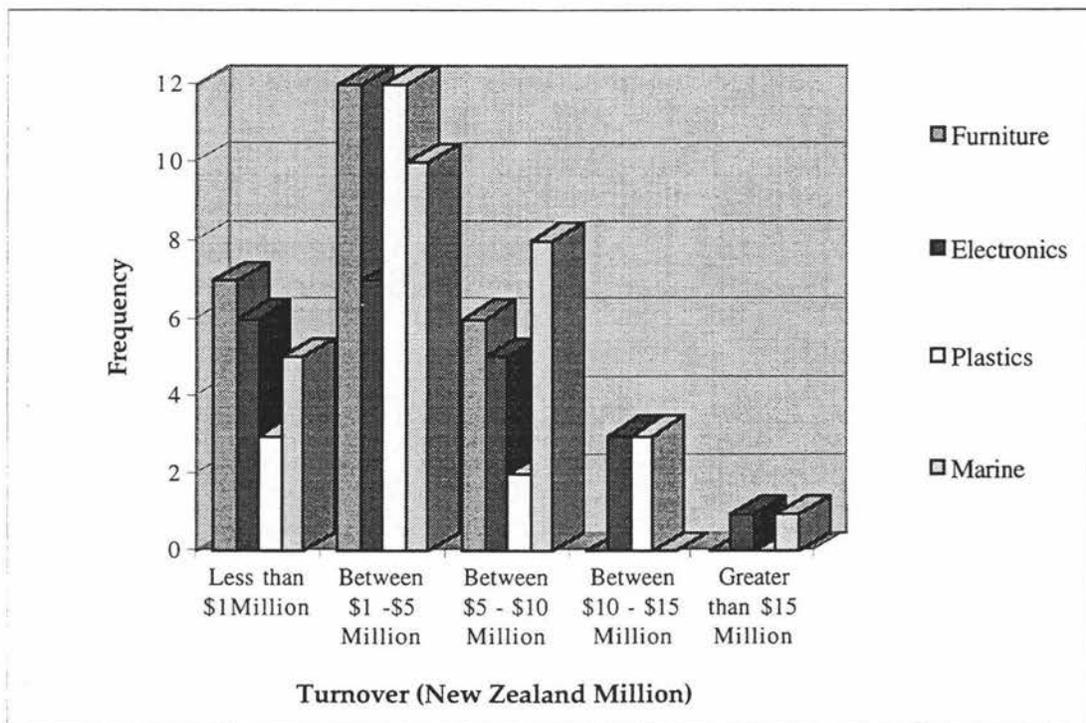
Employment Levels by Industry Sector

Sector	Mean No of Staff Employed (FTE*)	Minimum N ^o of Staff Employed	Maximum N ^o of Staff Employed
Electronics	32	1	109
Furniture	26	3	62
Marine	26	2	110
Plastics	29	5	90

* FTE: Full Time Equivalent

The majority (68%) of sample companies had an annual turnover of between (NZ)\$1-\$10 million; (68% = (Between \$1 - \$5 million (45%)) + (Between \$5 - \$10 million (23%)). A breakdown within the specific industry sectors revealed that 76% of the furniture and 75% of the plastics companies had a turnover of less than \$5 million, in comparison with only 59% in the electronics and 62.5% in the marine sectors. These statistics support the earlier affirmation that New Zealand's furniture and plastics manufacturing industries have a traditional focus on efficiencies of scale through mass production, which subsequently reap a lower turnover due to the limited size of New Zealand's domestic market. Alternately, the unique high-tech or added-value production evident in the electronics and marine sectors, are subject to higher turnovers generated by fewer staff.

Figure 5
Turnover of Company by Industry Sector



Respondents Export Involvement

Eighty-four or 64% of the total sample respondents export product overseas. Within this frame, 36% of the furniture companies were involved in export contracts, whereas the

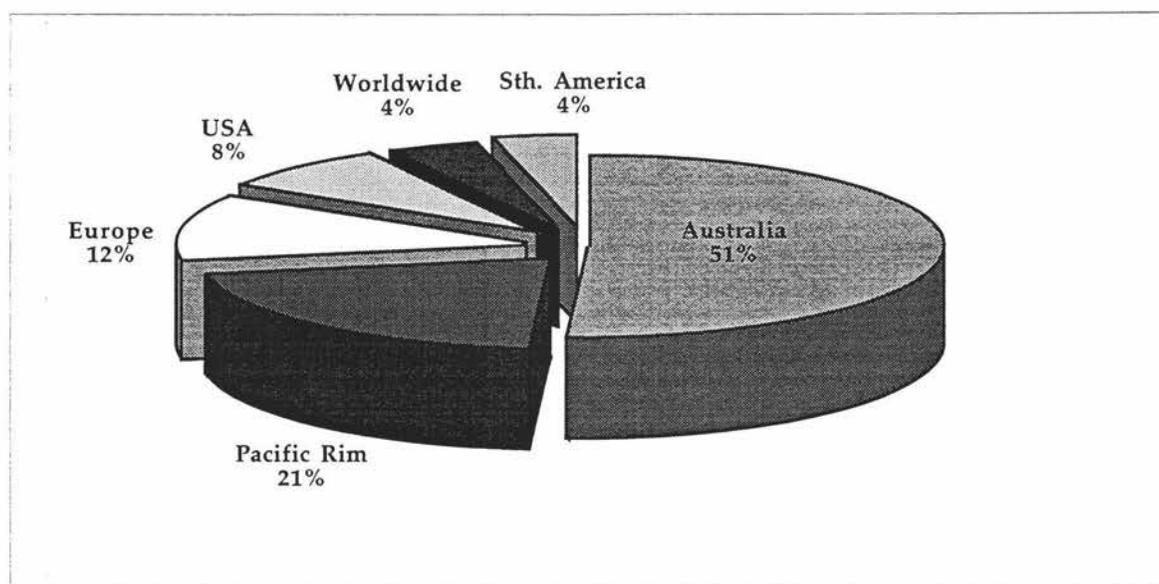
electronics (80%), marine (84%) and plastics (74%) sectors had significantly more companies actively involved in export agreements. The volume of export sales is broken down by industry sector in Table 6.

Table 6
Percentage of Total Sales Exported by Industry Sector

Sector	Less than 10%	Between 11% - 25%	Between 26% - 50%	Between 51%-75%	Greater than 75%
Electronics	4	1	4	2	9
Furniture	6	1	1	1	0
Marine	9	4	3	1	4
Plastics	8	4	3	0	1
Total	27	10	11	4	14

The common export markets of the sample SMEs also coincide with the 1997 New Zealand Statistics export study, highlighting Australia, the Pacific Rim, the European Union, and the United States of America as New Zealand's major trading partners.

Figure 6
Predominant Markets of Sample Exporters



CHAPTER FIVE

RESEARCH RESULTS

This thesis has been written within the bounds of the technology environment. Therefore, all survey respondents were advised that within the questionnaire, the term *information acquisition* referred to the collection of information/knowledge predominantly in the area of technology, that would aid their company in the development of new products or processes.

The aim of this report was to address four significant themes. The first entailed the analysis of how the respondent SMEs sourced technological information, whether they allocated specific expenditure and human resources toward this operation and how they disseminated this information through their organisation. The second point covered the type of information SMEs were looking for and if any barriers existed regarding the uptake of this intelligence. Determining whether innovation and R&D were associated with information acquisition was the basis of the third theme. Finally, the fourth section determines whether any evident correlations exist within the data.

Given the discrete and qualitative nature of most of the questionnaire data obtained in this study, non-parametric testing was applied to explore the relationships of interest. More specifically, the chi-square analysis tool is used to determine whether a relationship exists between the stated performance and organisational characteristics of the SMEs and the defined information acquisition variables. Ten chi-square tests were performed in total, each conforming to the same null hypothesis - to determine whether the information acquisition variables were independent of the SME performance/organisational variables. As the chi-square analysis is most meaningful when the expected cell frequency is at least five, the number of response categories associated with different scales, were collapsed where deemed necessary.

5.1 Information Uptake

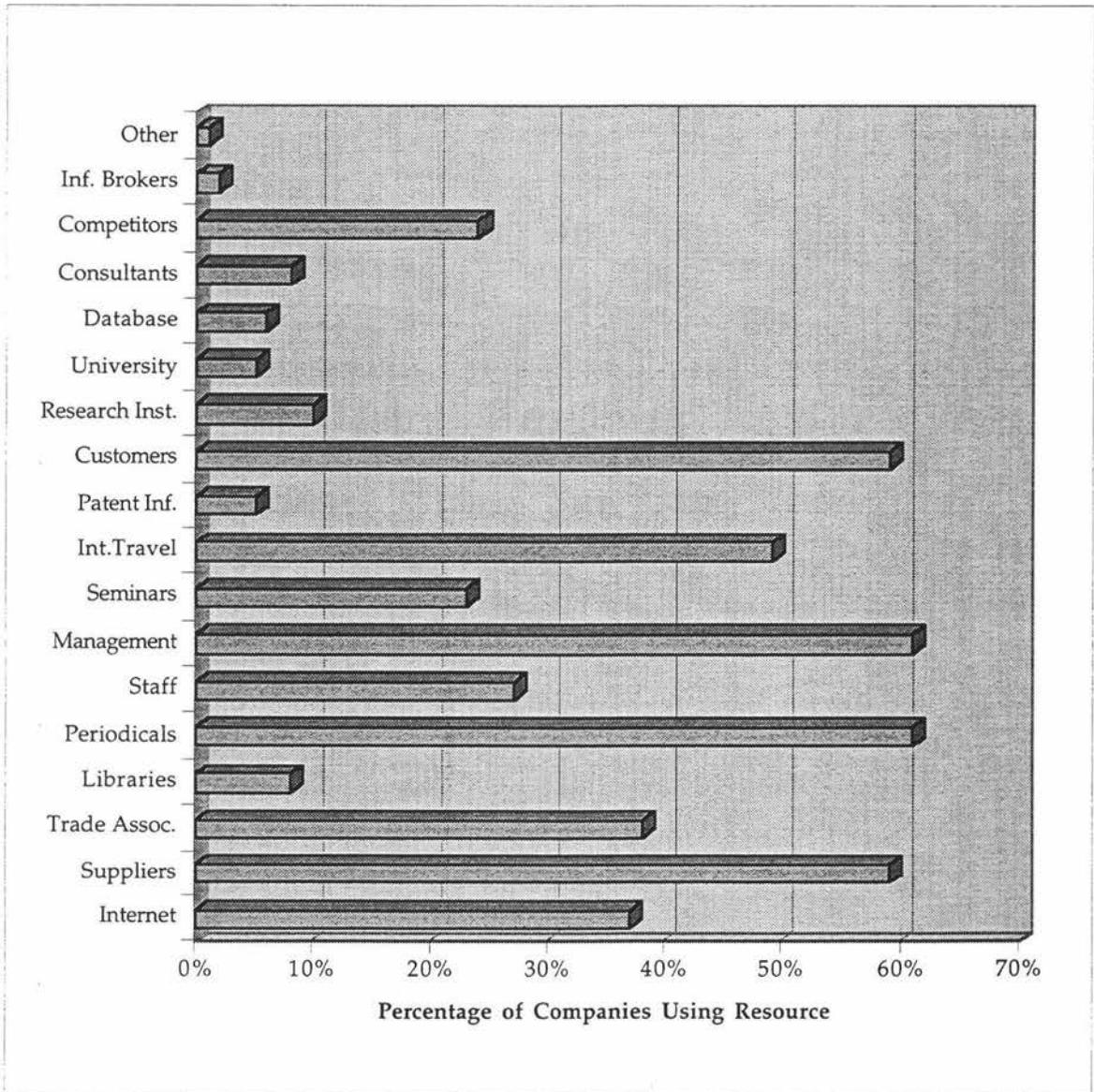
Information Resources

In order to fully understand how New Zealand manufacturing SMEs conduct information searches, each respondent was asked to identify which resources they regularly utilized for information acquisition. Management's personal experience, periodicals/magazines, suppliers and customer feedback were the four resources employed most frequently for information acquisition (Refer Figure 7). International travel, trade associations, the Internet and competitor analysis, were also identified by 24-49% of the sample as useful information resources. This initial finding identifies a potentially *insular focus* by many SMEs, by reason of their strong emphasis on local contacts and internal stimulation.

The search of databases, libraries, patent records, university resources and research institutions, which are important mechanisms for information and technology intelligence, were utilized by less than 8% of the sample. Johnston's (1991) early technology strategy research, also identified this close connection with customers and suppliers, which was subsequently reflected in the firms' dependent or imitative competitive strategy. These results suggest that either New Zealand companies are not fully aware of how or where to resource information, or they do not equate information infusion with enhanced knowledge and competitive advantage.

On average, five information resources were sourced when investigating new technologies and/or markets. Within the four industry sectors little variability existed in the number of information resources tapped, although the marine companies tended to access only four sources, whereas the electronics cluster investigated at least six variable resources. This set of external resource statistics appear alarmingly low in comparison to international figures of 12.3 sources (Julien, 1995), but correspond with Atuahene-Gima and Lowe's (1994) assertion that the lack of technology scanning by small firms, strengthens the view that much of the technology and information acquisition within SMEs is reactive.

Figure 7
Resources Used for Information Acquisition



Identifying whether a relationship exists between the number of resources used by SMEs and the size of the company, may resolve whether SMEs are actively trying to expand their knowledge base, or alternatively, if company size is in-fact an unconscious barrier to information acquisition.

The chi-square analysis revealed that the number of information resources sourced is significantly related to the total number of staff employed ($\chi^2 = 21.260$, $df = 6$, $p = 0.002$). More specifically, the staffing levels within the SME is likely to influence the number of

resources used for information acquisition. The results of the contingency table reflect that a large contribution to the χ^2 value, have come from the higher than expected counts in cells one and twelve. That is, 50% of those companies employing less than ten staff source fewer than four information resources, whereas, 58% of those companies employing more than fifty staff, source six or more variable resources, when searching for new information.

Table 7
Contingency Table of Total Staff Numbers Vs Information Resource Count

N° Inform Resources	Less than 10 Staff	Between 11-25 Staff	Between 26 - 50 Staff	Greater than 50 Staff	Total
Less than 4	18	7	8	3	36
Bet 4-5	11	11	10	10	42
Greater 5	6	15	5	18	44
Total	35	33	23	31	122

Information Budgeting

Twenty-two (16.6%) of the 132 respondent SMEs, indicated that they allocate a separate budget for the retrieval and analysis of information. The average percentage of turnover allocated for information acquisition by 17 of the 22 companies equalled 1.63%; the removal of one significant outlier (10% budget allocation) reduced this average to a more accurate figure of 1.08%. The age, turnover and staffing levels of these 22 companies portrayed a demographic profile consistent to that of the entire sample.

However, further analysis of performance and strategic planning variables identified three significant trends. The first being the higher level of innovation; an average innovation index of 58% was noted in this sub-sample, whereas the average for the entire sample was only 50%. Secondly, a greater percentage of companies, 77% exported within the sub-sample, as opposed to the overall average of 64%. The third observation is that 44% of the

sub-sample identified their company as having an *offensive* competitive strategy, that is, first to market with new products, compared with only 36% in the total sample.

Information Personnel

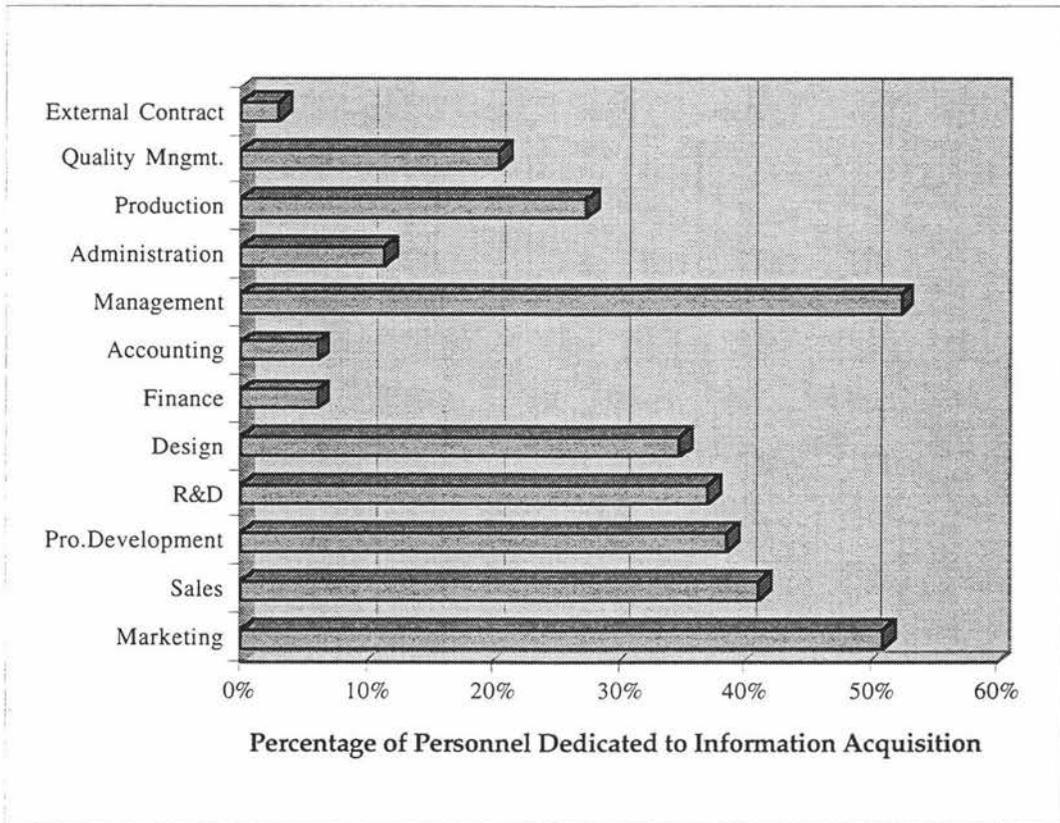
The respondents were asked which departments/personnel within their company undertook the majority of information searches. This question was posed, to determine the level of dedication each SME equated with information collection and whether the responsibility of remaining abreast of trends and new technologies was a task for the entire staff or purely the owner/manager's domain.

Figure Eight outlines that it is indeed the owner/manager or management team within the SME that undertakes the majority of information searches. The marketing, sales, product development, R&D and design personnel, also contribute toward information infusion. It is important to acknowledge here, that the owner/manager within the SME, is often responsible not only for the management of the company, but also the marketing and product development direction.

Examination of the information personnel data in relation to industry sectors (Refer Table 8) identifies that other than the management group, the majority of information collected by the furniture and plastics industry is predominantly through their marketing and sales staff, indicating a potentially biased 'consumer focus' based on current market trends, whereas, the electronics sector favour their R&D and design personnel, who are often driven by added-value differentiation. This finding supports the earlier stated phenomenon, that a large sector of New Zealand's furniture and plastic industries are producing low-tech, high volume, market-driven products, whereas the electronics sector are generating a greater volume of unique, technology-driven products.

Figure 8

SME Personnel Dedicated to Information Collection



Identifying the median number of staff dedicated to ongoing information collection would be inappropriate due to the variable sampling frame, with staffing levels that range from 5-110 employees. Therefore a chi-square test was performed on the data, to explore whether a relationship exists between the total number of staff employed within the SME and the number of staff dedicated to information acquisition.

Table 8

Frequency Table of Personnel Dedicated to Information Searches by Industry Sector

Department	Electronics	Furniture	Marine	Plastics	Other	Total
Marketing	12	14	10	14	19	69
Sales	7	15	10	10	12	54
Pro.Develop	10	11	6	9	15	51
R&D	18	6	5	8	12	49
Design	13	13	6	4	10	46
Finance	2	3	2	1	0	8
Accounting	1	4	0	2	1	8
Management	10	13	15	14	17	69
Administrative	2	4	3	4	2	15
Production	11	7	6	4	8	36
Qual.Mngmt	8	8	4	4	3	27
Ext. Contract	1	2	1	0	0	4
Total	95	100	68	74	99	436

The number of personnel dedicated to information acquisition, is significantly related to the total number of employees. More specifically, the staffing levels within the SME is likely to influence the number of personnel dedicated to information acquisition ($\chi^2 = 18.515$, $df = 6$, $p = 0.005$). Further analysis of the contingency table (Refer Table 9), coupled with the questionnaire responses, indicate that companies employing less than ten staff, rely primarily on the owner/manager for information infusion (28% of the sample had only one person allocated to the retrieval of information). A logical progression is apparent within this data set i.e., as the firm increases in size, so do the number of personnel dedicated to information collection (38% of the sample allocated more than four staff members to on-going information acquisition) but in very few SMEs were the entire staff expected to investigate new intelligence. In total, only six of the 132 sample companies had dedicated an employee solely to the retrieval and analysis of market and technological information.

Table 9**Contingency Table of Total Staff Numbers Vs Information Acquisition Personnel**

Inform Personnel	Less than 10 Staff	Between 11-25 Staff	Between 26 - 50 Staff	Greater than 50 Staff	Total
One / Two	29	22	13	12	76
Three/Four	3	10	3	8	24
Five +	2	3	7	11	23
Total	34	35	23	31	123

The second relevant question in relation to this data set, is determining whether any relationship exists between the number of personnel dedicated to information acquisition and the actual number of information resources used.

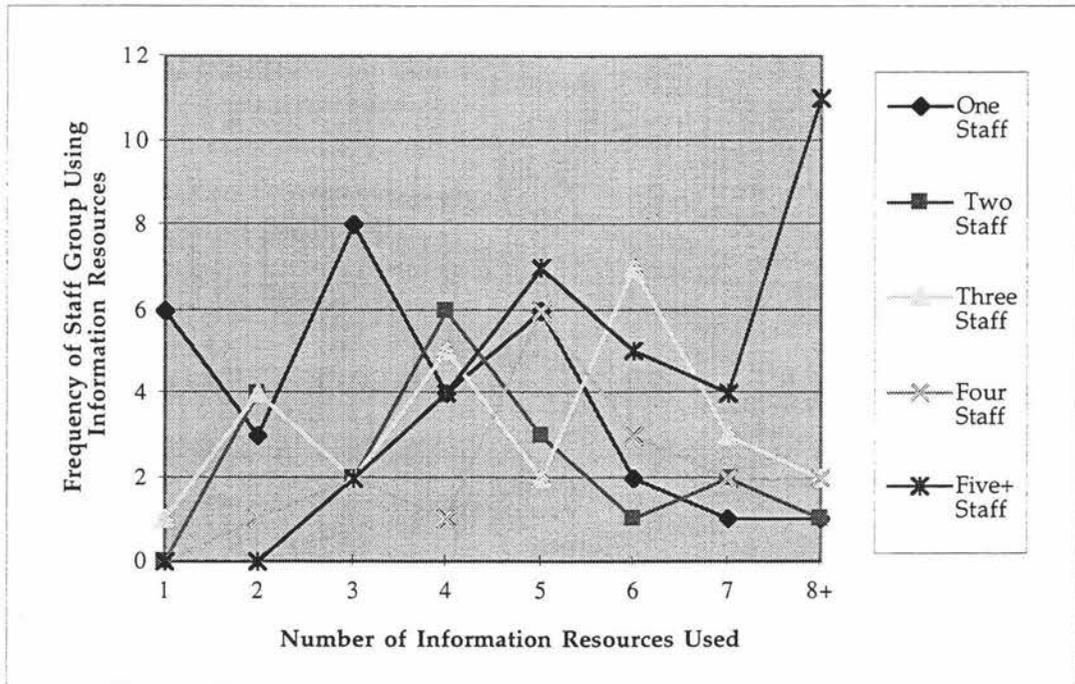
Figure 9 and the significant chi-square test ($\chi^2 = 23.786$, $df = 4$, $p < 0.001$) reveals that the number of staff dedicated to information acquisition is significantly related to the number of information resources used (Refer Table 10). This positive correlation indicates that as the number of personnel allocated to information acquisition increases, so does the volume of information resources tapped.

Table 10**Contingency Table of Information Acquisition Personnel Vs Resource Count**

N° Information Resources Used	One/Two Information Staff	Three/Four Information Staff	Five + Information Staff	Total
Less than 4	23	10	2	35
Between 4-5	19	14	11	44
Greater than 5	8	19	20	47
Total	50	43	33	126

Figure 9

Information Acquisition Personnel Vs Information Resources Count



Regularity of Information Collection

Defining the type of data search performed, helps to determine whether SMEs are consciously monitoring their market and technological environment, or whether information acquisition is more an ad-hoc process undertaken whenever the need arises. Therefore, all respondents were asked to select which procedure they performed most often when searching for new information. Table 11 identifies that the formal information search was performed most frequently (43%), indicating that information acquisition within SMEs is more a reactive procedure, whereby information is sought in response to a problem, as opposed to environmental scanning.

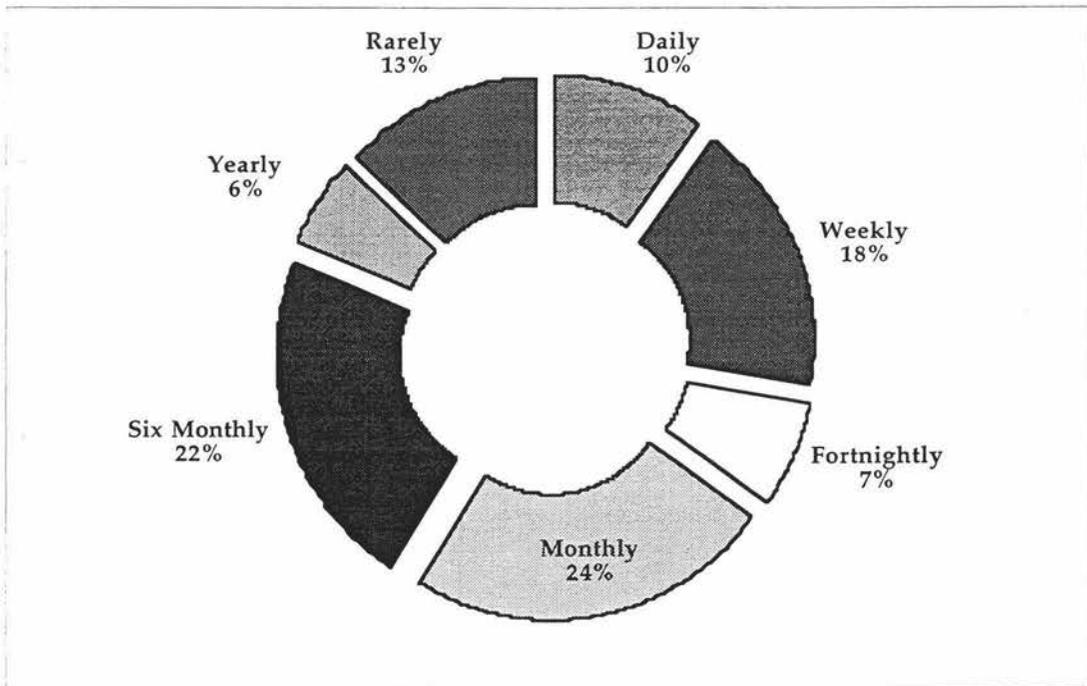
In order to determine the regularity in which SMEs undertook information searches, all respondents were asked how often they performed *formal information* searches. A formal search was defined as a deliberately planned search to obtain specific information for a particular purpose. Figure 10 outlines that the majority of companies (46%) regularly perform formal information searches between one-six months. However, 13% of the sample

companies rarely (less than once a year) performed a formal information search. The frequency of SMEs undertaking *undirected* information searches (environmental scanning) was not determined.

Table 11
SME Information Search Procedures

Search Type	Search Description	% of SMEs Using Procedure
Undirected	General information scanning with no specific purpose	12%
Conditioned	Directed exposure of an identified area or type of information	13%
Informal	Relatively limited and unstructured to obtain particular information for a specific purpose	33%
Formal Search	Deliberate planned search to obtain specific information for a particular purpose	43%

Figure 10
Regularity of Information Searches

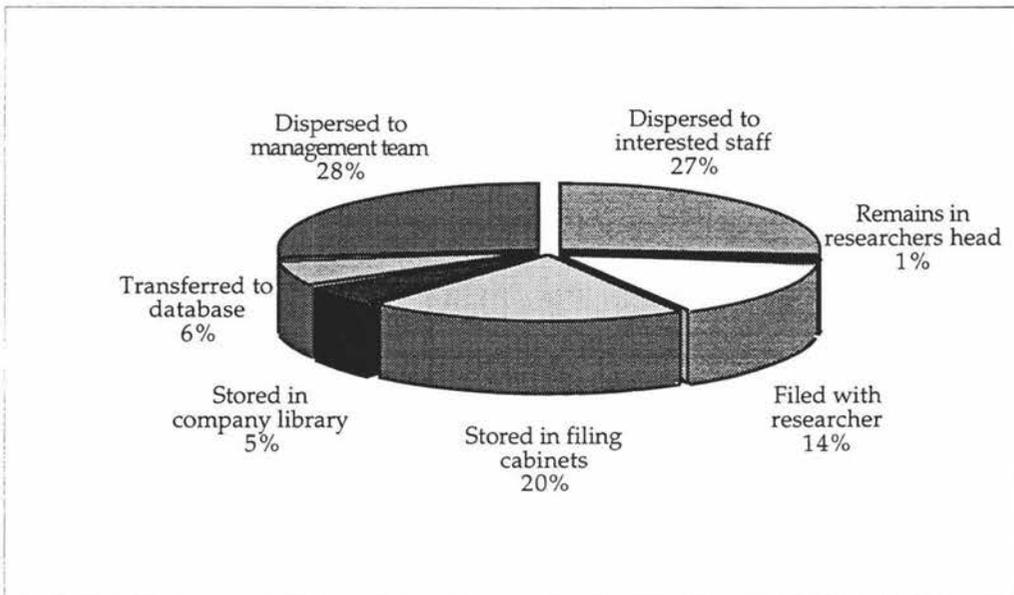


5.2 Information Dissemination

According to Koniger and Janowitz (1995) "Information is only valuable to the extent that it is structured. It is mainly this dissolution of structure that makes it so difficult for us to draw the knowledge we want from the information we receive"(p.6). Transferring information to knowledge, relies on effective interpretation of the data and its effective dissemination throughout the SME. In order to determine the effectiveness of information dissemination within SMEs, each of the respondents was asked what happens to information once it has been collected within their organisation?

Figure 11 shows that most SMEs disperse their collected information initially amongst their management team and secondly to those interested employees. Only 11 of the 132 SMEs had a dedicated library facility for storing information documentation; those 11 companies were either in the electronics or marine sector. Another twelve companies (some of which also kept an information library) had an information database.

Figure 11
Transfer of Collected Information



Identifying whether a relationship exists between the number of personnel collecting information within SMEs and the dissemination of this information, may help to determine whether SMEs are able to draw the knowledge they want from the information they receive. The chi-square analysis indicates that the number of personnel dedicated to information acquisition does not appear to influence the dissemination of this information ($\chi^2 = 10.316$, $df = 8$, $p = 0.245$). Potentially, a more worthwhile research direction may be to investigate the influence of SME owner/managers attitudinal variables and their relationship with information dissemination.

Table 12

Contingency Table of Information Acquisition Personnel Vs Information Dissemination

Inform Personnel	Held with Researcher	Filing Cabinets	Library or Database	Managmnt Team	Interested Staff	Total
One / Two	15	14	4	11	18	62
Three/Four	10	12	9	21	15	67
Five +	9	18	12	27	24	90
Total	34	44	25	59	57	219

5.3 SME Knowledge Requirement

Determining the main knowledge sectors the respondent SMEs target when searching for new information, helps to identify what SMEs believe are the key knowledge areas to improved performance and competitive advantage. Each respondent was asked to select which of the four main knowledge areas they targeted, when searching for new information.

- Market Sector: Competitor product analysis and consumer trends
- Technical Sector: New machinery or equipment
- Production Sector: New processes or methodologies for increased efficiency
- Technology Sector: Knowledge for practical and theoretical use

Table 13**Frequency Table of Target Information Sector by Industry Sector**

Industry Sector	Market	Technical	Production	Technology
Electronics	13	13	10	15
Furniture	20	9	10	5
Marine	14	7	10	10
Plastics	11	13	14	8
Other	19	18	13	12
Total	77	60	57	50

Table 13 outlines the frequencies in which the four industry sectors investigate new knowledge. It is evident from these findings, that the furniture industry tends to rely heavily on the market sector for new knowledge, whereas, the electronics sector appears to accumulate a broad range of information from each of the identified knowledge sectors. An appraisal of this frequency table, clearly indicates the respondent SMEs favour the market sector when investigating new information, whereas the technology sector receives the least investigative attention.

An important question relating to this knowledge requirement data set, is determining whether a relationship exists between the knowledge sector targeted for new information and the competitive strategy of the SME.

The chi-square analysis revealed that the knowledge sector targeted for new information does not appear to influence the competitive strategy of the firm ($\chi^2 = 5.630$, $df = 9$, $p = 0.776$). Regardless of the lack of significance, an area still worthy of future research attention is whether a relationship exists between the number of knowledge sectors investigated and the innovation index of the SME.

Table 14

Contingency Table of Knowledge Sector Targeted For New Information Vs Competitive Strategy of the SME

Competitive Strategy	Market	Technical	Production	Technology	Total
Offensive	36	27	25	30	118
Defensive	10	8	6	9	33
Imitative	21	18	13	10	62
Dependent	32	25	28	17	102
Total	99	78	72	66	315

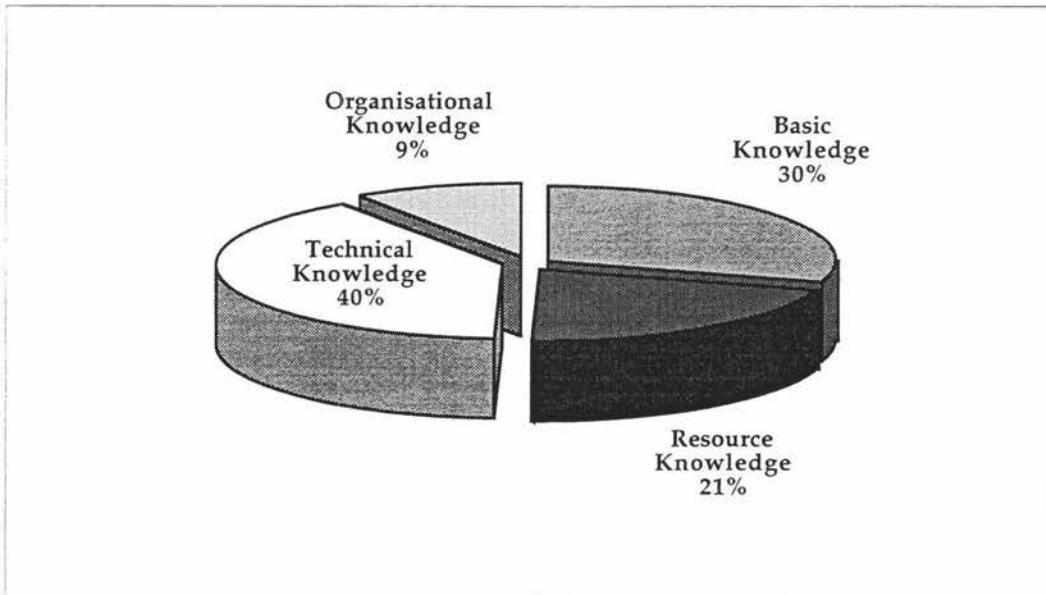
The third point worthy of further investigation, was the type of knowledge required by SMEs. Each of the respondent SMEs were asked to determine which of the following knowledge areas they predominantly investigated when searching for new information regarding technology.

- Basic Knowledge: Knowledge of a subject area
- Resource Knowledge: Knowledge of equipment/software
- Technical Knowledge: Knowledge of process applications
- Organisational Knowledge: Knowledge of management/quality systems

Figure 12 outlines that the majority of SMEs predominately investigate technical knowledge when searching for new information regarding technology. Further analysis of this data set also revealed that the furniture and marine sectors predominately sought basic knowledge, whereas the electronics and plastics sectors were more interested in technical knowledge.

Figure 12

Knowledge Requirement for Technology Investigation



Technology Acquisition

Determining where SMEs currently look for new knowledge is important for defining patterns within industry sectors and differentiating between technology driven companies, as opposed to customer or market driven firms. But, the key determinant of whether SMEs are willing to move ahead of their competitors or even remain abreast of market demand, is to ascertain whether SMEs are willing to invest in new technologies.

Each respondent SME was asked to identify how their company acquired new technology. Of the 132 respondent SMEs a total of only 17 companies had acquired *new technology* through an independent firm, 28 through an independent designer or inventor and just six SMEs had purchased technology from a research institute. These figures appear exceedingly low if New Zealand manufacturers want to gain competitive advantage through unique product differentiation. Table 15 gives a broad overview of the frequency in which SMEs acquire various new technologies. It should be acknowledged at this point, that the majority of the respondent SMEs had not acquired technology through any of the listed sources, and in-fact did not even acknowledge acquiring *any* new technology from an

external source. A future research direction derived from these findings would be a benchmark exercise of successful SMEs and how they acquire technology.

Table 15
Frequency Table of SME Technology Acquisition

Method of Technology Acquisition	Percentage of SMEs Sourcing Technology
Technology agreement with parent or affiliated company	15%
Technology agreement with independent firm	13%
Acquisition of companies	9%
Acquisition of personnel	19%
Purchasing technology from independent firms	14%
Imitation of other companies' products	26%
Customer or supplier initiatives	45%
Independent designers or inventors	21%
Universities	7%
Research Institutes	5%

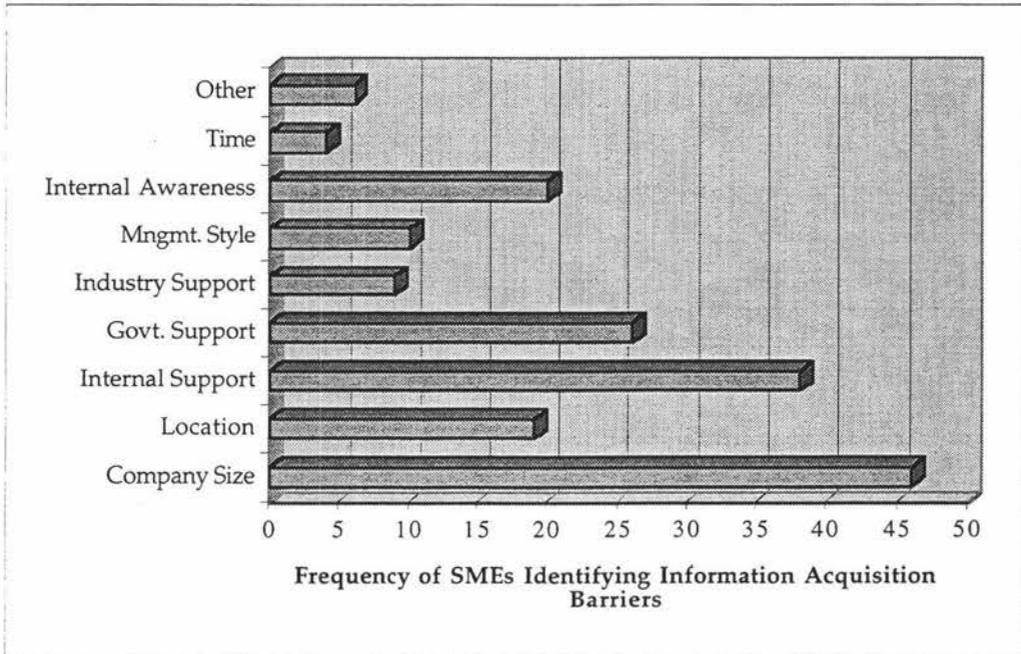
5.4 Barriers to Information Acquisition

Identifying the barriers to information uptake, assists policy makers to develop methodologies or programmes which help SMEs overcome these obstacles. Therefore, each respondent SME was asked to identify any barriers to technology or information uptake within their company. Figure 13 outlines that *Company Size* was the most frequently recognised barrier to information acquisition, followed by a lack of internal support. The 'other' category listed in Figure 13 consists of the following perceived barriers:

- Technology too difficult to implement.
- Difficulty in accessing commercially sensitive information, such as pricing.
- Meat industry authority restrictive practices.

- Difficulty in justifying R&D, in terms of cost/benefit when trading is tough and margins small.
- One needs information to grow, but customers are unwilling to pay for this, therefore it has to be built into the company's charge out rate.

Figure 13
Perceived Barriers to Information Acquisition



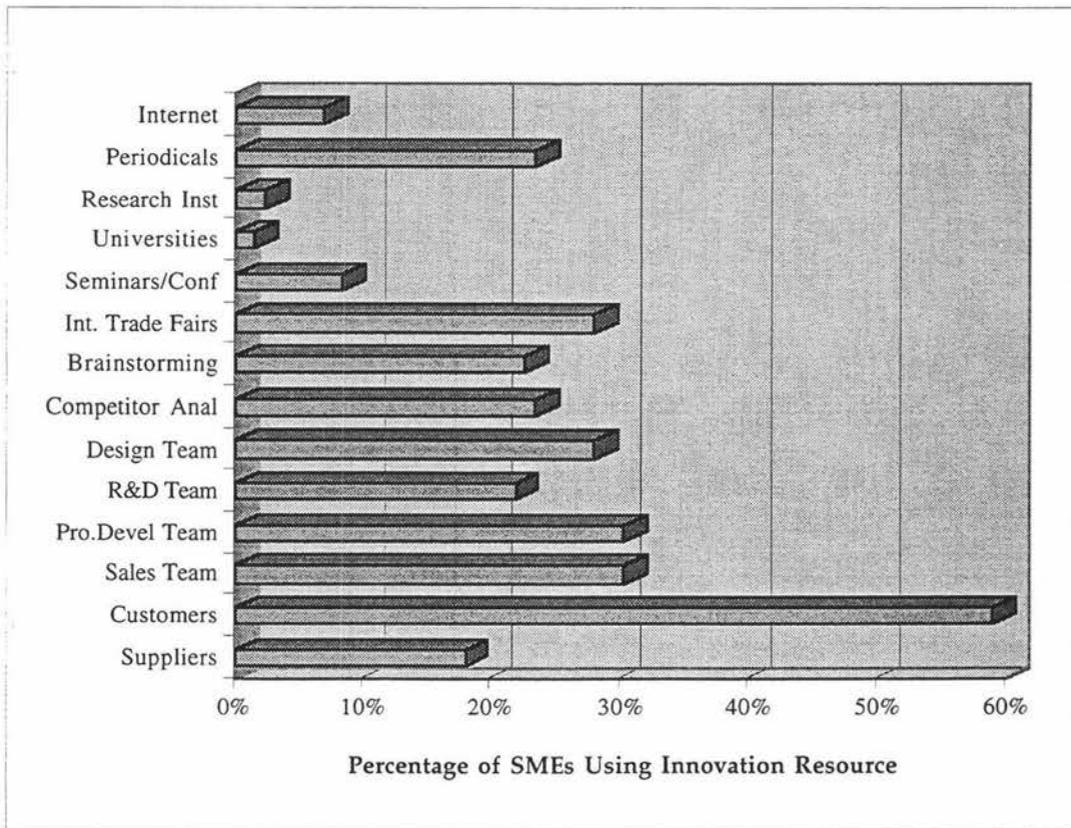
If the internal support, management style, internal awareness and time divisions merged to form an 'internal dynamics' category, this grouping would far exceed any of the other perceived barriers. This finding provides an interesting issue for future research attention, as programmes designed to improve information acquisition and technology up-take within SMEs, must initially endeavor to diminish the internal 'attitudinal barriers' prevalent within the company.

5.5 SME Innovation and R&D

Each of the respondent SMEs were asked to list the main sources of innovation within their company, in order to determine whether those external stimuli used for innovation were the

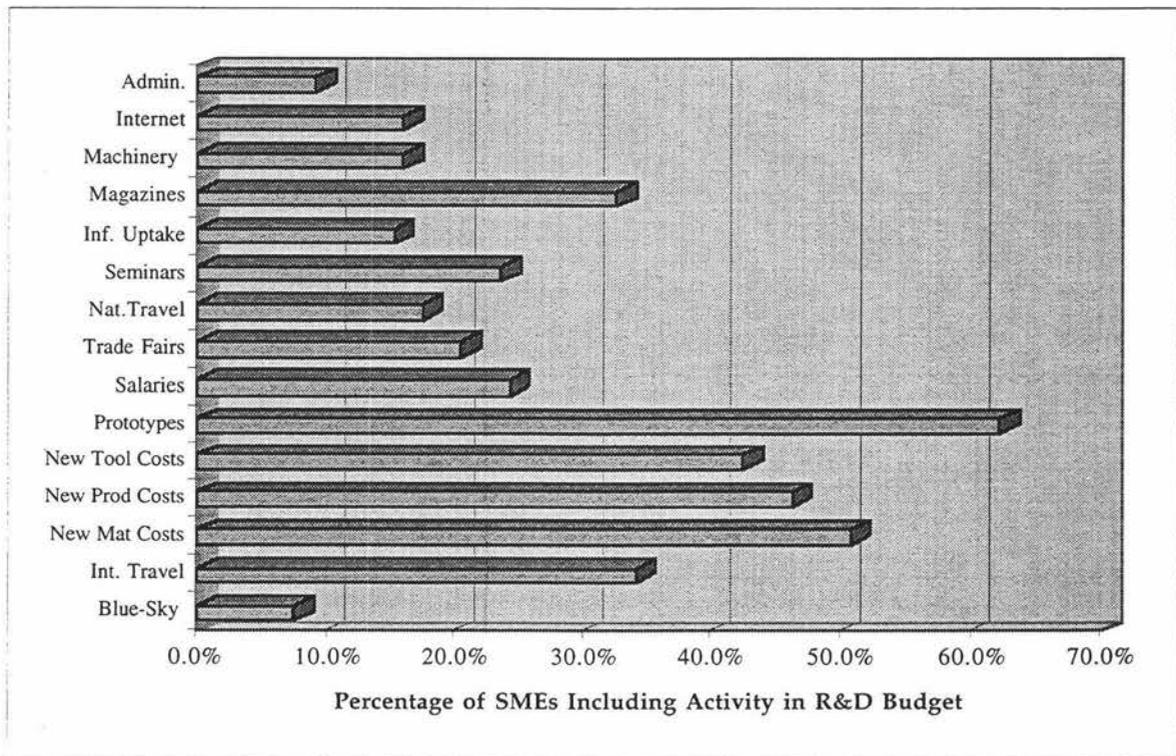
same as those frequently sourced for information acquisition. Figure 14 highlights the fact that *Customers* were the main stimulus for innovation within the sample SMEs, followed by the Sales and Product Development teams. In comparison with the main resources sourced for information acquisition, (Managements' personal experience, periodicals, suppliers and customer feedback) there appears to be little similarity between the resources sourced for information acquisition, and the resources sourced for innovation. In fact, information acquisition was not actually identified by any of the sample SMEs as a resource used for innovation. A future research direction to determine whether any correlation exists between information infusion and innovation, could be studied through monitoring whether an increase in market and technological knowledge provides enough perceived competitive advantage to stimulate innovation.

Figure 14
Sources of SME Innovation



It is evident from the previous data set that the sample SMEs do not tend to associate innovation with information acquisition. Therefore, the second pertinent question is whether SMEs incorporate information acquisition within the scope of their companies' research and development. Each respondent SME was therefore asked to summarise what their R&D budget actually covered. The findings outlined in Figure 15 show that the majority of the sample SMEs spend the bulk of their R&D budget on prototype developments, material and production costs.

Figure 15
Allocation of R&D Expenditure



Only 20 (15%) of the 132 sample SMEs had an R&D budget that incorporated information acquisition. Comparing these figures to the earlier findings, which identified an additional 22 sample SMEs allocating a separate budget toward information infusion, accounts for a total of only 42 SMEs (or 32% of the entire SME sample) actively investing in information acquisition. These findings appear exceedingly low, if one assumes a positive correlation exists between information acquisition, knowledge expansion and competitive advantage.

However, the following section will determine whether any significant relationships exist between information infusion and enhanced SME performance.

5.6 Information Acquisition Correlations

Further analysis of the *information resource* statistics, identified a natural three way division of the total sample data. Group 1 is formed from those SME owner/managers who acknowledged that they used less than four different resources when searching for new information, Group 2 between four-five sources (sample average) whereas, the third group accessed more than five variable information resources. The purpose of these classifications was to determine whether there was any evidence to suggest that the level of export performance, innovation, competitive strategy, R&D or turnover varied between companies practising proactive information acquisition, as opposed to those SMEs who were more reliant on past experience and internal erudition.

Contingency tables (Refer Tables 16-19) were developed for the four performance variables, to determine whether any significant patterns/trends emerged within the data. The chi-square test was performed on the four contingency tables to determine if there was enough evidence (greater than could be reasonably due to chance) to infer that a relationship exists between the volume of information resource variables used and the performance variables.

Export Performance

The chi-square test for the information resource count vs. export performance, indicates that the number of information resources utilized does not appear to influence the SMEs export performance ($\chi^2 = 5.360$, $df = 6$, $p = 0.499$). However, further analysis of Contingency Table 16 indicates a pattern within the data set. That is, 52% of the SMEs employing less than three information resources were manufacturing product for export, compared to 68% in the four-five information resource group and a high of 70% in the six+ information resource group.

These findings suggest that a greater proportion of the companies sourcing more than four information resources engage in exporting contracts more frequently than those companies which tap fewer resources. However, there is little statistical evidence to suggest whether the quantity of export volume differs across the three resource groups.

Table 16
Contingency Table of Export Performance Vs Information Resource Count

N° Inform Resources	0% Export	Less than 10% Exports	Between 10-50% Exports	Greater than 50% Exports	Total
Less than 4	17	5	10	4	36
Between 4-5	14	10	13	8	45
Greater 5	14	6	15	11	46
Total	45	21	38	23	127

Innovation Performance

The chi-square test for the information resource count vs. innovation index, (percentage of turnover as a result of products or processes developed during the previous five years) indicates that the number of information resources utilized marginally influences the SMEs innovation performance ($\chi^2 = 11.309$, $df = 6$, $p = 0.080$).

Further analysis of Table 17, identified that 38% of those companies employing less than four information resources had an innovation index greater than 50%. This compares with 58% in the four-five resource group and 60% in the six+ resource group. It should be acknowledged at this point that the innovation index is highly likely to be a biased estimate of the actual rate of innovation within the SME, due to the measurement's extreme variability. Therefore, in order to determine whether the volume of information resources has a significant influence on the SMEs innovation index, a more effective measure of innovation is required.

Table 17**Contingency Table of Innovation Performance Vs Information Resource Count**

N° Inform Resources	0% Innovation	Less than 25% Innovation	Between 26-50% Innovation	Greater than 50% Innovation	Total
Less than 4	4	8	11	14	37
Between 4-5	2	12	5	26	45
Greater 5	0	9	9	27	45
Total	5	29	25	67	127

Strategic Performance

The chi-square test for the information resource count vs. competitive strategy, indicates that the number of information resources utilized does not appear to influence the SMEs competitive strategy ($\chi^2 = 2.254$, $df = 6$, $p = 0.895$). Further analysis of Contingency Table 18 and the chi-square expected vs. observed frequencies, did not reveal any evident trends within the data set.

Table 18**Contingency Table of Competitive Strategy Vs Information Resource Count**

N° Inform Resources	Offensive Strategy	Defensive Strategy	Imitative Strategy	Dependent Strategy	Total
Less than 4	15	6	12	14	47
Between 4-5	19	4	11	15	49
Greater 5	23	8	10	20	61
Total	57	18	33	49	157

R&D Performance

The chi-square test for information resource count vs. R&D budget, (percentage of turnover allocated to research and development) indicates that the number of information resources utilized, marginally influences the SMEs level of research and development ($\chi^2 = 8.368$, $df = 4$, $p = 0.080$). Despite this marginal acceptance of variable dependence, a more significant finding from Contingency Table 19, was the identification that 30% of those companies employing less than three resources were not allocating any expenditure toward R&D, compared with only 9% of the four-five resource group and 10% in the six+ resource group.

Table 19

Contingency Table of R&D Performance Vs Information Resource Count

N^o Inform Resources	0% R&D Investment	Less than 2.5% R&D Investment	Greater 2.5% R&D Investment	Total
Less than 4	10	9	16	35
Between 4-5	3	16	15	34
Greater 5	4	19	17	40
Total	17	44	48	109

Turnover Performance

The final performance chi-square test for information resource count vs. turnover, indicates that the number of information resources utilized, is significantly related to the SMEs turnover ($\chi^2 = 25.462$, $df = 6$, $p < 0.001$). More specifically, the number of information resources used within the SME, is likely to influence the turnover of the company.

Table 20

Contingency Table of Turnover Performance Vs Information Resource Count

N^o Inform Resources	Less than \$1 Million	Between \$1-\$5 Million	Between \$5-\$10 Million	Greater than \$10 Million	Total
Less than 4	17	14	6	0	37
Between 4-5	8	22	8	5	43
Greater 5	6	17	11	12	46
Total	31	53	25	17	126

The results of Contingency Table 20 reflects that a large contribution to the χ^2 value, have come from the higher than expected counts in cell one and twelve. That is, 46% of those SMEs who sourced less than four information resources (Group 1) had a turnover less than \$1 million, as opposed to only 13% in Group 3 (sourced more than five information resources). In contrast, 26% of the Group 3 SMEs had a turnover greater than \$10 million, whereas not one company from Group 1 had a turnover exceeding \$10 million. This variability of company earnings could clearly be associated with the range of company sizes (employees levels from 5-110) within the sample. However, the evident patterns within Table 20 suggest that even with the removal of these two outlier counts, the null hypothesis of independence should still be rejected.

The impact of information acquisition on SME success was not directly measured, but the author concludes from the previous identified correlations, that companies collecting information on a regular basis (one - six months) from a variety of sources (more than five information resources) have a greater volume of export contracts, tend to invest more in R&D and subsequently reap higher turnovers.

The implication of these research findings is that the volume of information infusion undertaken by SME owner/managers and its potential influence on company performance, provides a useful future research direction at a time when New Zealand SME

owner/managers are suffering from increasing international competition and environmental pressures.

CHAPTER SIX

COMPARISON OF RESULTS & DISCUSSION

Information Resources

The results from the New Zealand SME information acquisition research, indicate that SMEs on average, investigate five variable information resources when searching for new technological and/or market knowledge. Subsequently, owner/managers rely heavily on their own experience or personal judgment when making decisions, and tend to use easily accessible and inexpensive external resources when seeking new information. These initial research findings identify a potentially *insular focus* of many SMEs, by reason of their strong emphasis on internal stimulation, limited information networks and an extensive reliance on local knowledge sources, such as suppliers and customers.

International studies by Johnson and Kuehn (1987, USA), Julien (1995, Canada) and Johannessen and Dolva (1995, Norway) acknowledge that the top five information resources used by these three sets of sample SMEs, were equivalent to those sourced by the New Zealand manufacturing SMEs. In addition, the key features enticing these international SMEs toward external information resources, were again ease of access and cost effectiveness. However, an extensive reliance on internal sources (in-house staff and managerial input) was still highly prevalent.

The evidence suggesting SMEs have a potentially insular information acquisition focus, indicates that owner/managers may in fact, be unaware of how and where to find relevant information when investigating undeveloped territories; or more specifically, the owner/manager may lack the necessary skills in narrowing a field of inquiry, so the task of information collection is not so daunting. The significance of identifying this lack of awareness in tapping information resources, provides an opportunity for future government-funded assistance programmes, to educate SME owner/managers of the available means to access effective national and international information. For example, the minimal use of universities, research institutions and national databases for information

acquisition, suggests these service facilities are not effectively targeting the New Zealand small business sector.

Before a research programme can be initiated, one must determine whether the SME sector would be receptive to improving their information infusion. The researcher has adapted the frame of Atuahene-Gima and Lowe's (1994) International Technology Licencing Model, to develop the SME theoretical 'information-infusion responsiveness' classification system. The categorisation headings have been composed from the sample company's visible information behaviour. SMEs are by no means evenly dispersed within this model, in fact very few of the sample companies could be positioned within the proficient SME frame, whereas a high proportion of the progressive companies could be classed in the receptive SME frame. Categorising the personal disposition of the SME owner/managers would be an effective application of this model, in order to determine which company's are most likely to be receptive toward improved information acquisition, as well as identifying those SMEs which require further education regarding the benefits of effective information uptake.

The basic proposition of this model (Refer Figure 16), is that in order to improve the SMEs information acquisition behaviour, one must determine whether the owner/manager is even receptive toward the concept of improved information infusion. That is, in order to transform the SME with a limited personal information network, toward a more innovative information acquisition process, the company must fall into either the *receptive* or *latent* categories. SMEs within these two frames are the most susceptible toward information education, that is, learning to bring more information from the external environment into the boundary of their organisation. *Proficient SMEs* have established an effective information infusion programme, whereas *complacent SMEs* are inclined to find external input threatening rather than beneficial.

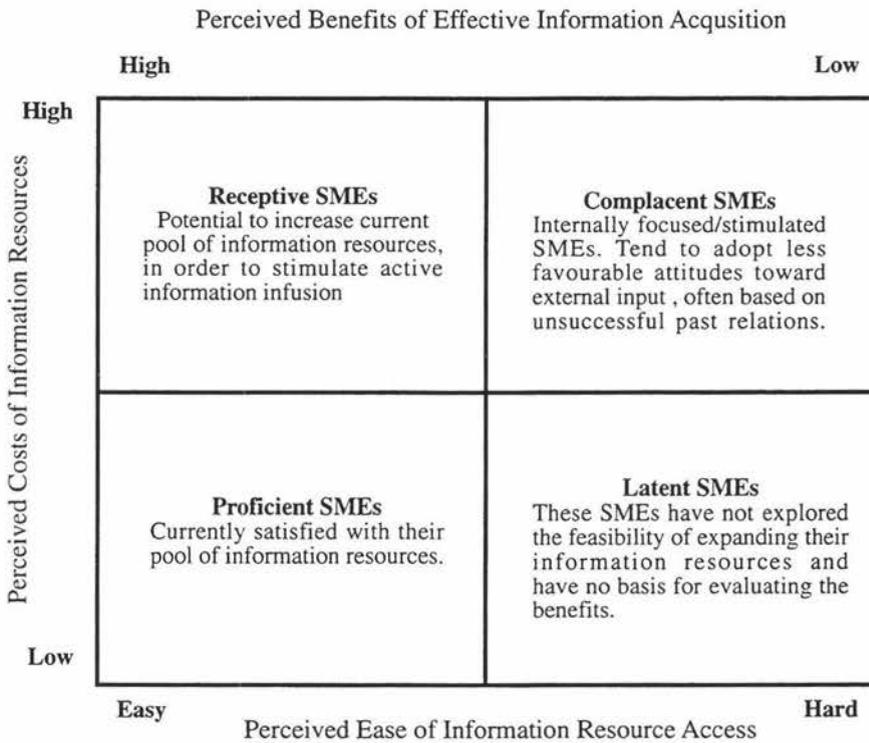
Receptive SMEs: These companies may have investigated the possibility of expanding their current pool of information resources and are therefore aware of and able to evaluate the associated ease of access, costs and potential benefits. However, the SME may not have

actively used this information resource because of a lack of time or resources and have therefore not become involved despite their positive attitude.

Proficient SMEs: These companies have higher perceived benefits and lower perceived costs regarding information acquisition. These SMEs would tend to use more than six information resources and have identified the correlation between increased benefits, derived from a broader knowledge base, with improved performance.

Figure 16

Theoretical SME Classification Model Based on Information Acquisition Behaviour



(Figure 16 was adapted from Atuahene-Gima & Lowe's (1994) International Technology Licensing Model)

Complacent SMEs: Companies in this frame have less experience or knowledge of sourcing information resources and tend to have acquired less satisfaction from the sources they have previously used. Subsequently, the owner/managers are more likely to highlight the associated costs and lack of accessibility of external information acquisition - diminishing the potential benefits that could be realised. Generally, these companies are focused on internal stimulation, relying predominantly on the owner/manager for direction.

Latent SMEs: This frame categorises companies that have not explored the feasibility of expanding their knowledge base, and therefore have no basis of evaluating variable information resources or the benefits associated with improved information infusion. This group of SMEs have the potential to let the negative association of high cost and access difficulty over-ride the positive association of performance benefits. However, this frame of SMEs would gain the greatest benefit from external information acquisition guidance.

Information Budgets

Seventeen percent of the total SME sample allocated a separate budget for information acquisition. It was apparent from further analysis of these 22 companies, that each firm had a higher than average innovation index, exported a greater percentage of product overseas and the majority of these SMEs operated under an offensive competitive strategy.

A feasible conclusion drawn from these trends could indicate that companies dedicating specific financial and human resources toward information infusion, have identified the association between increased knowledge - generating a greater volume of product concepts/ideas, (demonstrated by way of a higher innovation index) and the increased access to foreign markets (through product differentiation and competitive strategic planning). A future research direction to determine the causal links of these findings, would be an in-depth analysis of associated performance improvements within SMEs that practice proactive information acquisition.

Information Personnel

It is evident from the data collected on information personnel, that the owner/manager, or management team within an SME, is primarily responsible for information acquisition. These findings confirm that the responsibility of remaining abreast of trends and new technologies, is not a task for the entire staff, rather an additional duty within the management domain. Further analysis of this data, does indicate that as the SME grows in

size, so do the number of staff allocated to information collection. However, 62% of the total sample still dedicated only one or two personnel to information acquisition.

A logical summation of these results needs to incorporate an element of human resource management theory. That is, the more responsibility invested in a staff member, regardless of their status, the more valued the employee feels. Therefore, an effective means to absorb a greater variety of new information within a company, is ensuring that the entire staff are responsible for information infusion. A motivational reward system is an effective means of introducing this concept into the SME, whereby, the benefits of an increased knowledge base, potentially leading to cost efficiencies or new product concepts, would far exceed the cost of an employee reward system.

Information Acquisition

Determining whether information acquisition is an ad-hoc process undertaken whenever the need arises, or whether it is a conscious procedure to monitor the market and technological environment, can define whether the SME has a reactive or proactive attitude toward information acquisition and subsequently competitive advantage. The sample results suggest that the majority of the respondent SMEs were in fact undertaking *reactive* (information acquired to solve a specific problem) information acquisition (43%), as opposed to *proactive* (environmental scanning or surveillance) exploratory information searches (12%).

Detecting problems and opportunities before they arise, is the fundamental idea behind information acquisition. However, it is apparent that most SMEs do in fact use information to solve problems. These findings promote the basis for future research attention, to determine the relevance of the information resources used relative to the activities they support. Clearly, SMEs would save a lot of time and financial outlay, if they were more aware of when and how to use the appropriate information resource tools. Again, this research direction proposes the development of an educational tool, identifying effective information resources and their associated benefits.

Information Dissemination

Information transmission processes, refer to the degree to which information is diffused among relevant users within an organisation (Moorman, 1995). Findings from the sample study indicate that SMEs informally disperse collected information to the management team and those interested staff. Few SMEs have formal information transmission processes; of the 132 sample companies, not one mentioned the use of an information gatekeeper.

An English study by Court et al., (1997) of large design orientated companies, identified that over 50% of these sample companies formally documented research findings in either logbooks or within project files. Only 8% of these sample respondents did not formally document any of their collected information. The significant difference between this design and the SME study, aside from the size of the company, is the lack of formality in recording information/research findings prevalent within New Zealand manufacturing SMEs.

It is apparent from these results that New Zealand SME owner/managers are *again* either unaware of the benefits effective information infusion can contribute, or alternately SME owner/managers simply perceive information dissemination as too time consuming. However, the process of decision making or new product development, results in numerous decisions being made that directly relate to the resultant information or market intelligence sourced (Court et al., 1997). Therefore, the documentation of these findings are highly valuable as an important source of future information. If this data cannot be obtained at a later stage of the design/decision process, valuable time will be lost in rectifying errors, understanding why such decisions were originally made and possibly re-sourcing the information. Therefore, in order to prevent information over-kill, while ensuring that all relevant information is distributed, owner/managers should instigate a low cost information storage system which effectively catalogues internal research findings. Either an accessible filing cabinet or a simplistic Excel database, is an effective starting measure.

Determining how SMEs effectively convert their market intelligence into knowledge and understanding, when formal information transmission processes such as training sessions, research presentations or company memos are not undertaken is a monumental task. Therefore, a more worthwhile research direction would be to investigate the influence of SME owner/managers attitudinal variables and their relationship with the SMEs information dissemination. The underlying question here, is whether an effectual programme could be developed to assist SMEs make better use of external information in order to add-value internally?

Knowledge Requirement

Understanding how people search through and combine information, before making decisions, is an important concern in the study of SMEs and in the design of effective information acquisition processes. In addition, identifying what information companies actually require, also confirms the strategic focus of the SME and is likely to determine future behaviour.

Examination of the respondent SMEs knowledge requirements, identified that the majority of SMEs search primarily for market knowledge (competitor product analysis and future trends) followed by technical knowledge (new machinery or equipment information). Further analysis of these findings outlined that the furniture industry tends to rely heavily on the market sector for new knowledge, whereas the electronics sector accumulates a broader range of information from each identified knowledge sector. These findings coincide with the earlier stated phenomenon that the furniture industry is driven by market-demand and focused on cost-efficiencies, as opposed to the electronics sector which tends to be technology driven, which subsequently directs the market.

In comparison with international studies, these findings support those of Johnson and Kuehn's (1987) research, which identified market-based and technological information as the two main types of knowledge required by small firms. Choudhury and Sampler (1997)

also refer to four previous studies which outline that the majority of information acquisition time is spent scanning the market sectors.

The significance of these findings, is that the sample SMEs tendency to absorb market knowledge over technical, production or technological information, signifies a potentially incomplete representation of the company's external environment, which is likely to shape future behaviour. Successfully absorbing knowledge from a range of knowledge sectors is an effective measure to avoid overlooking a wealth of opportunities and threats in potentially undiscovered markets. Further observations from Day and Nedungadi's (1994) SME business strategy research indicates that:

“Businesses that focus largely on competitors are likely to form representations of their position that are rich in competitive information, giving them an enhanced ability to anticipate competitive actions and reactions. Conversely, businesses that focus on customers, form mental models that are abundant in customer information. They base their marketing actions on anticipated customer reactions. Clearly, managerial representations of comparative advantage dominated by one or the other dimension are incomplete in that they consider only particular information about the market or competitors capabilities” (p.33).

A future research question which has therefore emerged from this analysis, is whether SMEs rely too heavily on market information when more accurate findings could be sourced through economic, policy or technological information sectors. A second area which is also worthy of future research consideration, is whether a relationship exists between the number of knowledge sectors investigated when searching for new information and the innovation index of the SME. The underlying question here, is whether an expanded knowledge base stimulates innovation?

Technology Acquisition

The research findings indicate very few SMEs purchase technology from an external source. Once again, this suggests a potentially insular focus of the SME owner/managers - particularly with the increasing volume of international competition facing many small business owners. Nevertheless, this observation provides an excellent opportunity for future government-funded assistance programmes, to develop a benchmark tool outlining how successful and internationally competitive SMEs acquire new technology. Simplistic and cost-effective examples of technology up-take, may stimulate a greater volume of SMEs to investigate new markets or opportunities previously un-tapped, due to limited technological capabilities.

Barriers to Information Acquisition

“The ability of a firm to recognise the value of new external information, assimilate it and apply it to commercial ends is critical to a firm’s innovative capabilities” (Leonard-Barton, 1995, p.136). Unfortunately, this process appears to be a significant hurdle for most SMEs.

Findings from the research study, coupled with evidence stated in the literature review, suggests a deficit of adequate resources, time and management competence are the greatest barriers to effective information acquisition. However, further analysis of the data indicates that the lack of personnel and financial commitment toward information acquisition, suggests that SME owner/managers are unaware of the performance benefits of effective information infusion. Alternatively, the associated benefits of information acquisition may appear intangible to many SMEs, due to the foundation or preparatory nature of information. Another plausible reason why this lack of awareness may be prominent within SMEs is a cognitive deficiency whereby owner/managers seek out information guided from hindsight.

Research in cognitive psychology demonstrates that managers pay particular attention to environmental variables their past experience has taught them they cannot afford to overlook (Day & Nedungadi, 1994, p.33).

These findings provide an interesting point for future research attention, as programmes designed to improve information acquisition and technology up-take within SMEs, must initially endeavour to diminish the *attitudinal barriers* prevalent within the company. Once again, these barriers may be lessened through an educational programme highlighting the benefits information acquisition can offer:

- Lower new product development costs
- Reduced financial, R&D, marketing and legislative risks
- Enhance speedy market entry for new products
- Obtain competitive advantage
- Acquire new technical skills
- Keep abreast with new developments in external technology
- Added-value
- Stimulate innovation

Information Acquisition Correlations

The three significant findings from the correlation analysis identified:

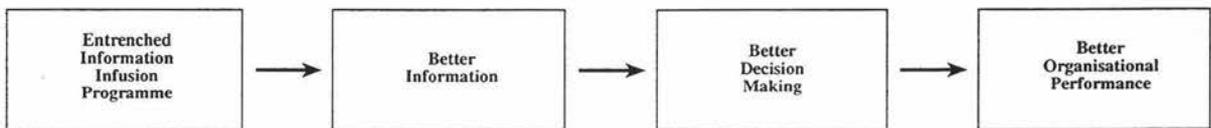
- A greater proportion of SMEs sourcing more than four information resources, engage in exporting contracts more frequently than those SMEs which source fewer information resources
- A greater proportion of SMEs sourcing more than four information resources, invest on average, a higher proportion of turnover in research and development.

- A greater proportion of SMEs sourcing more than four information resources, produce a higher turnover than those SMEs which source fewer information resources.

The implications from these statistical correlations, suggest that information acquisition does in fact have associated performance benefits. These findings confirm those of Hansen et al., (1994), who determined that within their Danish SME sample, those “establishments which had a relatively high degree of information-oriented-investment had more than expected changes in production processes and technology, in response to changes in foreign demand for their products” (p.22). Further support for these findings can be seen in Cragg and King’s (1992) IT model, which concedes that producing a wider scope of efficient information, improves decision making and thus organisational performance. This original IT model has been modified by the researcher to fit the more simplistic information systems prevalent in the SME sector.

Figure 17

The Information Process



The researcher acknowledges that a multitude of external stimuli can influence a company’s performance. However, common-sense prevails in the notion that if a company has a wider knowledge base, through effective information acquisition, they are more likely to be prepared for competition and environmental change. The overall research findings from this study, coupled with outputs from previous related studies, suggest that New Zealand SMEs do not appear proactive in searching for new information, specifically regarding new technology. This finding indicates a significant inward looking tendency with respect to information acquisition and external stimulation. If this is so, New Zealand SMEs may be denying themselves opportunities to use external information to complement internal capabilities. Subsequently, this may hinder some SMEs ability to provide new

products or added-value to existing lines, at the required rate, to compete effectively in the domestic market - especially with the rising volume of international competition.

Identifying the correlation between the extent of information resource use and performance benefits, indicates the potential for future research to determine causation. However, due to the complicated control environment required, a more effective research direction could compare SME industry growth rates with information acquisition intensity levels and determine whether those SMEs who invested heavily in information infusion in the past, grow at a faster rate over a sustained period of time, than those SMEs that invested limited resources in information acquisition.

CHAPTER SEVEN

CONCLUSION

The goal of this research was to build a holistic picture of information acquisition behaviour within New Zealand's small and medium sized manufacturing companies. The turn of the Information Era, New Zealand's turbulent economic environment and dwindling government support for SMEs, has made this subject highly topical and relevant.

The most appropriate methodology to accumulate the required data and accommodate the focused and concise research objectives, was a tailored questionnaire. The structure of this survey tool was designed to absorb the qualitative response variables through either nominal or numerical scales. In total, 132 of the 240 SME sampling frame completed the questionnaire, revealing a significantly high response rate of 55%.

Although previous studies have provided valuable insights into information acquisition, with few exceptions, little effort has been devoted to understanding how information acquisition and knowledge dissemination influences SME behaviour. The literature review therefore focuses on those aspects of scholarship which address the principle research questions and investigates comparative international studies.

To broadly summarize - the literature review defines what constitutes information, and identifies the relationship between data, information and knowledge. It progresses to outline the significance of SMEs within an economy. However, the author acknowledges the limitations of using comparative international scholarship, due to the significant difference in cultural norms, independence and autonomy prevalent among New Zealand SME owner/managers. The review proceeds to outline the distinction between information acquisition behaviour in small and large firms, and delineates three characteristics which may impede the process of information acquisition in SMEs. These include: the inhibiting feature of individualism, a lack of managerial competence, and a deficiency of financial and human resources.

The literature follows with case-study analysis of international SMEs. This section identifies that SMEs probe for information in response to external stimuli, rather than the generalised scanning undertaken by their larger counterparts. Further scholarship suggests that while in theory small firms need greater assistance in finding information, the limitation of company size inhibits the owner/manager from defining what information is needed to improve the business beyond answers to immediate problems. The literature review's culmination is an overview of the New Zealand information acquisition climate. This appraisal highlights that a history of protectionism and manufacturing safeguards has reduced the incentive for SMEs to seek out new knowledge on foreign technological developments, which could solve local problems and expand local opportunities. In addition, it is evident that New Zealand SMEs have an over-reliance on familiar information resources and appear to be unaware of where *new* information can be found.

The fundamental aim of this research was to address how SMEs currently up-take information. It was evident from the results, which corroborate international findings, that SMEs rely heavily on their owner/managers personal experience when making decisions. Alternately, when SMEs are searching for *new* information, on average they source five variable resources (compared to international averages of 12). However, these resources tend to be easily accessible and inexpensive, which subsequently limits the company's information networks. This strong emphasis on external stimulation, coupled with an extensive reliance on local knowledge sources such as suppliers and customers, indicates an insular focus within many SMEs and has the potential to isolate these firms from progressive technology, and subsequently competitive advantage.

Information acquisition within SMEs is predominately a reactive procedure, where information is acquired to solve a specific problem. Furthermore, remaining abreast of trends and new technologies is not traditionally a task for the entire staff, rather an additional responsibility for the management team. Information transmission processes are also highly informal within the SME, with the majority of research findings verbally dispersed, primarily to the management team followed by interested staff. These findings infer that a deficit of time and a resource deficiency do obstruct effective information

infusion, but it is the lack of managerial competence within SMEs, which is primarily the greatest barrier to information acquisition. This conclusion is further confirmed by the resistance of owner/managers to source a broad base of scholarship, as opposed to their confounding search for market knowledge, and the significant reluctance to acquire technology from external sources.

Traditionally, small business owner/managers have held a myopic view of management which focuses on their day-to-day survival challenges. However, it is evident from the research findings that those companies which regularly undertake conscious information acquisition engage in exporting contracts more frequently, undertake more refined R&D, reflect a high innovation index and produce a greater turnover, than those companies which rely on internal stimulation. These findings indicate that if the SME has a wider knowledge base, through effective information acquisition, they are more likely to be prepared for competition and environmental change and subsequently are more capable of business forecasting and strategic thinking beyond the day-to-day running of the company.

The preparatory nature of this research mainly highlights the evident problems and shortcomings SMEs face regarding information acquisition. The significance of these findings is primarily the foundations laid for further research. It is evident that New Zealand SMEs may be denying themselves the opportunity to use external information to complement internal capabilities. The imminent recommendation, is therefore the development of a much needed government-funded "SME Information Assistance" programme. This scheme should highlight the benefits information acquisition can provide the small business sector and the cost-effective means for accessing relevant national and international knowledge sources. With the sweeping economic reforms facing New Zealand's small business sector, coupled with the elimination of tariffs and rising international competition, it is an ideal environment and time, to educate owner/managers of the assistance extended information networks can provide.

Two evident limitations were prevalent within this research design and they should be acknowledged in future methodologies. The 'innovation index' which is a traditional

international measurement, does not appear to be suitable within the small business environment. A more effective measure of innovation, would be to determine the number of *new* products developed and commercialised within the last three years, as opposed to total product numbers and subsequently resolve whether this measure is increasing or declining. The second limitation of the study, involved the 34 unidentifiable questionnaire responses - however, this conscious action to provide confidentiality to the respondent may have contributed to the high response rate. Nonetheless, a concealed code identification would be advised in future questionnaires to eliminate any possible analysis confusion.

The essence of this research was to provide a much needed New Zealand perspective of small business information acquisition behaviour. Given that international literature tends to be preoccupied with either large firms or small highly successful companies, this research is unique in it's examination of a variable range of national manufacturing SMEs. In addition, the researcher has attempted to determine whether information acquisition has any relationship with increased performance benefits, as well as identifying the procedures for information dissemination within the small business sector. This thesis topic recognises the importance of a successful small manufacturing sector, in a country where the focus of the national economy is changing from a strong agriculture commodity backbone to an industrial climate of added-value boutique manufacturing. The challenge for governments wanting to harness the potential of this small and medium sized manufacturing sector, lies in providing owner/mangers with a better understanding of information infusion and harnessing this knowledge to improve performance.

BIBLIOGRAPHY

- Acs, Z., & Audretsch, D. (1988). Innovation in Large and Small Firms: An Empirical Analysis. *The American Economic Review*, 78(4), 678-690.
- Ahire, S. (1996). An Empirical Investigation of Quality Management in Small Firms. *Production and Inventory Management Journal*, Second Quarter, 44-50.
- Alvarez, A. (1998). Small Business: A Vital Building Block to Economic Growth. *Economic Perspectives: An Electronic Journal of the US Information Agency*, 3(1), 11-12.
- Anderson, J. (1997). Technology Foresight For Competitive Advantage. *Long Range Planning*, 30(5), 665-677.
- Atuahene-Gima, K., & Lowe, J. (1994). The Role of External Technology Acquisition in Product Development: Attitude-Behaviour Inconsistency Among Small Firms. *Asia Pacific Journal of Marketing and Logistics*, 6(3), 26-46.
- Balachandra, R. (1996). International Technology Transfer in Small Business: A New Paradigm. *International Journal of Technology Management, Special Issue*, 12(5/6), 625-638.
- Barber, J., Metcalfe, J., & Porteous, M. (eds.) (1989). *Barriers to Growth in Small Firms*. Routledge, London.
- Bijmolt, T., & Zwart, P. (1994). The Impact of Internal Factors on the Export Success of Dutch Small and Medium-Sized Firms. *Journal of Small Business Management*, 32(2), 69-83.
- Birley, S., Cromie, S., & Myers, A. (1991). Entrepreneurial Networks: Their Emergence in Ireland and Overseas. *International Small Business Journal*, 9(4), 56-74.
- Bookfind, Compact World [CD-ROM]. (1998). Bookdata Limited, Newton, Auckland.
- Buchanan, S., & Gibb, F. (1998). The Information Audit: An Integrated Strategic Approach. *International Journal of Information Management*, 18(1), 29-47.
- Buckley, P. (1997). International Technology Transfer by Small and Medium Sized Enterprises. *Small Business Economics*, 9, 67-78.

- Cameron, A., Massey, C., & Tweed, D. (1997). New Zealand Small Business: A Review. *Chartered Accountants Journal of New Zealand*, 76 (9), 4 - 12.
- Capital Planning Information. (1986). *The Information Needs of Smaller Business*. Proceedings of a Seminar Jointly Organised by Capital Planning Information Limited and HERTIS Information for Industry at St.Albans College of Agriculture, 21st November, 1985, Stamford.
- Chaston, I., & Mangles, T. (1997). Core Capabilities as Predictors of Growth Potential in Small Manufacturing Firms. *Journal of Small Business Management*, 35(1), 47-57.
- Chiesa, V., Coughlan, P., & Voss, C. (1996). Development of a Technical Innovation Audit. *Journal of Product Innovation Management*, 13, 105-136.
- Chisnall, P. (1997). *Marketing Research. (Fifth Edition)*. McGraw-Hill Publishing Company, Berkshire, England.
- Choudhury, V., & Sampler, J. (1997). Information Specificity and Environmental Scanning: An Economic Perspective. *MIS Quarterly*, 21(1), 25-53.
- Christie, R., Arnold, S., Holdsworth, B., Townsend, G., Buwalda, J., & Lucas, Y. (1996, December). *Technology Innovation Working Group. Report to The Minister of Research, Science and Technology*. New Zealand.
- Churchill, N., & Lewis, V. (1983). The Five Stages of Business Growth. *Harvard Business Review*, 30-34, 38-50.
- Colgate, P., & Featherstone, K. (1992). *Changing Patterns of Foreign Direct Investment in the Pacific Region: Working Paper*. New Zealand Institute of Economic Research, Wellington.
- Committee of Inquiry on Small Firms. (1972). *Bolton Committee Report*. Committee of Inquiry on Small Firms. Cmnd 4811, London: HMSO.
- Cooper, R., & Kleinschmidt, E. (1991). The Impact of Product Innovativeness on Performance. *Journal of Product Innovation Management*, 8(4), 240-251.

- Council for Industry and Higher Education (CIHE). (1997, July). *Small and Medium Enterprises and Higher Education: A Framework for Future Policy*. Council for Industry and Higher Education (CIHE), London.
- Court, A., Culley, S., & McMahon, C. (1997). The Influence of Information Technology in New Product Development: Observations of an Empirical Study of the Access of Engineering Design Information. *International Journal of Information Management*, 17(5), 359-375.
- Cragg, P., & King, M. (1992). Information Technology Sophistication and Small Firm Financial Performance. *University of Waikato, Department of Management Systems, Research Report Series*, Hamilton.
- Crawford, M. (1991). The Dual-Drive Concept of Product Innovation. *Business Horizons*, 34(3), 32-38.
- Crick, D., & Chaudhry, S. (1995). Export Practices of Asian SMEs: Some Preliminary Findings. *Marketing Intelligence & Planning*, 13 (11), 13 - 21.
- Daft, R., & Weick, K. (1984). Toward a Model of Organisations as Interpretative Systems. *Academy of Management Review*, 9, 284-295.
- Day, G., & Nedungadi, P. (1994). Managerial Representations of Competitive Advantage. *Journal of Marketing*, 58(2), 31-44.
- Dean, J., Holmes, S., & Smith, S. (1997). Understanding Business Networks: Evidence From the Manufacturing and Service Sectors in Australia. *Journal of Small Business Management*, 35(1), 78-84.
- Deeter-Schmelz, D. (1997). Applying Teams to Logistics Processes: Information Acquisition and The Impact of Team Role Clarity and Norms. *Journal of Business Logistics*, 18(1), 159-178.
- DeMontfort Quality Centre. (1996). *Company Audit: Guided Self Assessment*. DeMontfort Quality Centre, Leicester.
- Dixon, J. (1991). Information Infusion is Strategic Management. *Information Strategy: The Executive's Journal*, 8(1), 16-21.

- Dutton, J., & Jackson, S. (1987). Categorizing Strategic Issues: Links to Organisational Action. *Academy of Management Review*, 12, 76-90.
- Eden, L., Levitas, E., & Martinez, R. (1997). The Production and Spillover of Technology: Comparing Large and Small Multinationals as Technology Producers. *Small Business Economics*, 9, 53-66.
- Edmunds, H. (1996). *AMA Complete Guide to Marketing Research for Small Business*. NTC Publishing Group, Lincolnwood, Illinois, USA.
- El-Sawy, O., & Pauchant, T. (1988). Triggers, Templates and Twitches in The Tracking of Emerging Strategic Issues. *Strategic Management Journal*, 9(5), 455-473.
- Ewing, I. (1998, March). *Economic Survey of Manufacturing - March 1998 Quarter*. [The Internet]. Statistics New Zealand, Wellington.
- Fann, G., & Smeltzer, L. (1989). Communication Attributes Used by Small Business Owner/Managers for Operational Decision Making. *The Journal of Business Communication*, 26, 305-321.
- Frater, P., Stuart, G., Rose, D., & Andrews, G. (1995, May). *The New Zealand Innovation Environment*. The Business and Economic Research Limited Foundation (BERL). Wellington.
- Frizelle, G., Gregory, M., Harris., & Ridland, G. (1991). Developing Tools for the Management of Change in SMEs. *Un-identified Publication*, 66-71.
- Garud, R., & Nayyar, P. (1994). Transformative Capacity: Continual Structuring by Intertemporal Technology Transfer. *Strategic Management Journal*, 15, 365-385.
- Griffin, A. (1997). New Data on New Products. How 'Best Practice' Innovators Differ From Also-Rans. *Executive Summaries of ISBM Research Projects*, 7(5).
- Goulden, C., Bradford, M., & Peak, S. (1996). *Survival You Choose: A Self-Analysis & Self-Help Guide for Management*. Leicester Quality Centre, DeMontfort University, Leicester.
- Hagedoorn, J., & Schakenraad, J. (1994). The Effect of Strategic Technology Alliances on Company Performance. *Strategic Management Journal*, 15(4), 291-309.

- Hamilton, R., & English, J. (1997). *The Small Business Book. A New Zealand Guide*. Bridget Williams Books Limited, Wellington.
- Hansen, N., Gillespie, K., & Gencturk, E. (1994). SMEs and Export Involvement: Market Responsiveness, Technology and Alliances. *Journal of Global Marketing*, 7(4), 7-26.
- Harper, D. (1993, July). Information and Information Processes: Conceptual Issues, Framework and Policy Insights. *New Zealand Ministry of Commerce, Contract No:583*. NZ Institute of Economic Research (Inc), Wellington.
- Holmstrom, J. (1994). The Relationship Between Speed and Productivity in Industry Networks: A Study of Industrial Statistics. *International Journal of Production Economics*, 34, 91-97.
- Hope, J., & Hope, T. (1997). *Competing in the Third Wave. The Ten Key Management Issues of The Information Age*. Harvard Business School Press, Boston. In 1998. Book Review. *The Academy of Management Executive*, 12(1), 91-92.
- Horton, F. (1979). *Information Resources Management: Concept and Cases*. Association for Systems Management, Cleveland, Ohio.
- Huber, G. (1984). Organisational Information Systems: Determinants of Their Performance and Behaviour. *Management Science*, 28(2), 138-155.
- Ilori, M., & Irefin, I. (1997). Technology Decision Making in Organisations. *Technovation*, 17(3), 153-160.
- Inkpen, A. (1996). Creating Knowledge Through Collaboration. *California Management Review*, 39(1), 123-140.
- Jennings, P., & Beaver, G. (1997). The Performance and Competitive Advantage of Small Firms: A Management Perspective. *International Small Business Journal*, 15(2), 63-75.
- Johns, B., Dunlop, W., & Sheehan, W. (1989). *Small Business In Australia. Problems and Prospects*. Allen & Unwin Australia Pty Ltd., Sydney.

- Johannessen, J-A., & Dolva, J. (1995). Innovative Companies' External Information Search in Russia. *International Journal of Information Management*, 15(5), 367-376.
- Johannisson, B., & Johnsson, T. (1988). *New Venture Network Strategies*. Working Paper No.18. University of Vaxjo. {Quoted by Julien, 1995}.
- Johnson, J., & Kuehn, R. (1987, July). The Small Business Owner/Manager's Search for External Information. *Journal of Small Business Management*, 53-60.
- Johnston, R. (1991). *Technology Strategy in New Zealand Industry*. Ministry of Research, Science and Technology, Report No: 12. The Centre for Technology and Social Change, Wollongong.
- Jones, O., & Tang, N. (1996). Networks for Technology Transfer: Linking HEIs and SMFs. *International Journal of Technology Management, Special Issue on Access to Technological and Financial Resources for SME Innovation*, 12(7/8), 820-829.
- Julien, P-A. (1995). New technologies and technological information in small businesses. *Journal of Business Venturing*, 10, 459-475.
- Keane, D. (1994, March). *Unravelling the Mind of the CEO: An Information Management Study of Ten Chief Executive Officers*. Unpublished Ph.D. Thesis. Victoria University of Wellington.
- Kirk, C., & Cunningham. J. (1996). *The Business Technology Link Handbook*. Prepared for the New Zealand Trade and Development Board, Wellington.
- Kleinknecht, A. (1989). Firm Size and Innovation. *Small Business Economics*, 1(2), 215-222.
- Kleinschmidt, E., & Cooper, R. (1991). The Impact of Product Innovativeness on Performance. *Journal of Product Innovation Management*, 8, 240-251.
- Koniger, P., & Janowitz, K. (1995). Drowning in Information, But Thirsty For Knowledge. *International Journal of Information Management*, 15(1), 5-16.
- Kotey, B., & Meredith, G. (1997). Relationships Among Owner/Manager Personal Values, Business Strategies, and Enterprises Performance. *Journal of Small Business Management*, 35(2), 37-64.

- Lang, J. (1996). Strategic Alliances Between Large and Small High-Tech Firms (The Small Firm Licensing Option). *International Journal of Technology Management, Special Issue on Access to Technological and Financial Resources for SME Innovation*, 12(7/8), 796-807.
- Lang, J., Calantone, R., & Gudmundson, D. (1997). Small Firm Information Seeking As a Response To Environmental Threats and Opportunities. *Journal of Small Business Management*, 35(1), 11-22.
- Leonard-Barton, D. (1995). *Wellsprings of Knowledge. Building and Sustaining the Sources of Innovation*. Harvard Business School Press, Boston, Massachusetts.
- Lyles, M., Baird, I., Orris, B., & Kuratko, D. (1993). Formalised Planning in Small Business: Increasing Strategic Choices. *Journal of Small Business Management*, 31(2), 38-50.
- McGregor, J., & Gomes, C. (1998). Technology Uptake in Small-and-Medium-Sized Enterprises: Some evidence from New Zealand. *Journal of Small Business Management*, In Press.
- McGregor, J., & Gomes, C.². (1988). Redefining the Barriers to Export Faced by Small-and-Medium-Sized Enterprises in the Global Marketplace. *Journal of Global Marketing*, In Press.
- McGregor, J., & Tweed, D. (1998). Unemployment to Self-Employment: The Long and Winding Road. *Social Policy Journal of New Zealand*, 10.
- Martin, E., DeHayes, D., Hoffer, J., & Perkins, W. (1991). *Managing Information Technology. What Managers Need to Know*. MacMillan Publishing Company, New York.
- Masten, J., Hartmann, G., & Safari, A. (1995). Small Business Strategic Planning and Technology Transfer: The Use of Publicly Supported Technology Assistance Agencies. *Journal of Small Business Management*, 33(3), 26-37.
- Meyer, O., & Goes, J. (1987). How Organisations Adopt and Implement New Technologies. *Academy of Management Proceedings*, 175-179.
- Milliken, F. (1987). Three Types of Perceived Uncertainty About the Environment: State, Effect and Response Uncertainty. *Academy of Management Journal*, 12, 133-143.

- Ministry of Business Development (1996, April). *Report on the Major Findings of the Business Information Needs Survey*. The Ministry of Business Development, Wellington.
- Ministry of Research, Science and Technology (MoRST). (1996). *The Government's Strategy for Research, Science and Technology in New Zealand to the Year 2010. Strategic Overview*. Ministry of Research, Science and Technology, Wellington.
- Ministry of Research, Science and Technology. (1997, July). *The Government's Policies and Priorities for Public Good Science and Technology*. Ministry of Research, Science and Technology, Wellington.
- Moorman, C. (1995). Organizational Market Information Processes: Cultural Antecedents and New Product Outcomes. *Journal of Marketing Research*, 32, 318-335.
- Mulhern, A. (1995). The SME Sector in Europe: A Broad Perspective. *International Note: Journal of Small Business Management*, 83-87.
- Mutch, A. (1997). Information Literacy: An Exploration. *International Journal of Information Management*, 17(5), 377-386.
- Nakos, G., Brouthers, K., & Brouthers, L. (1998). The Impact of Firm and Managerial Characteristics on Small and Medium-Sized Greek Firms' Export Performance. *Journal of Global Marketing*, 11(4), 23 - 47.
- New Zealand Financial Press Limited. (1998). *New Zealand Business Who's Who. 39th Edition*. New Zealand Financial Press Limited, Auckland.
- Nyamori, R., & Lawrence, S. (1997). Small Business Policy in New Zealand. *New Zealand Journal of Business*, 19(1/2), 73-93.
- OECD. (1992). *Technology and the Economy: The Key Relationships*. OECD. Paris.
- OECD. (1993). *Small and Medium-Sized Enterprises: Technology and Competitiveness*. Paris.

- Pineda, R., Lerner, L., Miller, C., & Phillips, S. (1998). An Investigation of Factors Affecting the Information-Search Activities of Small Business Managers. *Journal of Small Business Management*, 36(1), 60-71.
- Raymond, L., Julien, P-A., Carriere, B., & Lachance, R. (1996). Managing Technological Change in Manufacturing SMEs: A Multiple Case Analysis. *International Journal of Technology Management*, 11(3/4), 270-285.
- Rice, G., & Hamilton, R. (1979). Decision Theory and the Small Businessman. *American Journal of Small Business*, 4(1), 1-9.
- Sandu, S. (1996). Obstacles Faced by Small Firms in the Technology Transfer Process in Romania. In J. Kirkland (Ed) *Barriers to International Technology Transfer*, Kluwer Academic, London
- Sprague, R., & McNurlin, B. (eds.) (1993). *Information Systems Management in Practice*. Prentice-Hall International, Inc. New Jersey.
- Stamper, R. (1973). *Information in Business and Administrative Systems*. Batsford, London.
- Statistics New Zealand. (1997, December). *Key Statistics*. Wellington.
- Statistics New Zealand. (1998, April). *Business Activity Statistics*. February 1997. Wellington.
- Stokes, D. (1992). *Small Business Management. An Active Learning Approach*. DP Publications Limited, London.
- Tipping, J., Zeffren E., & Fوسفeld, A. (1995). Assessing The Value of Your Technology. *Research Technology Management*, 22-39.
- Tomorrow's Company (Enterprises) Limited. (1996). *Your Tomorrow's Company Inquiry*. Centre for Tomorrow's Company, London.
- Trott, F. (1986). *Information For Industry: A Study of The Information Needs of Small Firms and The Relevance of Public Information*. British Library Publications, West Yorkshire.

- Voss, C., Chiesa, V., & Coughlan, P. (1994). Developing and Testing Benchmarking and Self-Assessment Frameworks in Manufacturing. *International Journal of Operations & Production Management*, 14(3), 83-100.
- Walters, P. (1996). International Market Information Infusion: Data Acquisition Behaviour in Norwegian Exporters. *International Journal of Information Management*, 16(6), 437- 444.
- Whitehouse, I. (1998, January). *Science Database and Collection Issues: Oceans of Data, Vulnerable Collection and Terabytes of Power*. [The Internet]. Landcare Research, Lincoln, New Zealand.
- Youngbae, K., & Youngrok, C. (1994). Strategic Types and Performances of Small Firms in Korea. *International Small Business Journal*, 13(1), 13-25.
- Zafarullah, M., Ali, M., & Young, S. (1998). The Internationalization of the Small Firm in Developing Countries - Exploratory Research from Pakistan. *Journal of Global Marketing*, 11(3), 21-41.

APPENDIX

1. Covering Letter
2. Information Acquisition Questionnaire

2nd February 1998

«Owner»

«CompanyName»

«Address1»

«Address2»

Dear «Owner»,

New Zealand is suffering from a significant dearth of information regarding the behaviour of Small and Medium Sized Enterprises (SME). This deficiency affects the policy development targeting national manufacturing SMEs. Therefore, I am requesting your help in completing a short (22 tick the box) questionnaire, which aims to identify potential areas requiring both academic and government assistance.

I am undertaking post-graduate research through Massey University, in conjunction with a Ministry of Research, Science and Technology project: "Improved Technology Adoption, by Small Groups of Manufacturing Enterprises". The purpose of this research is to gather data about the procedures employed for information acquisition and the up-take of technology within your company.

While the New Zealand government and TRADENZ have recognized the importance of adding-value through technology acquisition, they have not identified how to effectively up-take information and apply this to real-life practice within small business. This survey, to the best of my knowledge, is the first to analyze current information acquisition and technology up-take methodologies practised within SMEs. Therefore, your views are very important to provide an accurate and up-to-date picture of this area within New Zealand's small and medium sized manufacturing environment.

I understand that your time is valuable, but it would certainly be appreciated and highly beneficial for my research, if you could take a maximum of 5-10 minutes to complete this short questionnaire. A brief summary of the sample results and analysis, will be sent to you in March.

Once again, thank you for your time.

Yours sincerely

Christina Gomes
(Research Officer)

13th March 1998

«Title»«FirstName»«LastName»

«Company»

«Address1»

«Address2»

«City»

Dear «Title»«LastName»,

Recently I sent you a questionnaire about information uptake within your company. The initial response has been very encouraging, however your views are still needed.

Your company is one of a limited number which were selected to take part in this study. New Zealand is suffering from a significant dearth of information regarding the behaviour of Small and Medium Sized Enterprises (SME). This deficiency affects the policy development targeting national manufacturing SMEs. Therefore, I am requesting your help in completing this short (22 tick the box) questionnaire, which aims to identify potential areas requiring both academic and government assistance.

While the New Zealand government and TRADENZ have recognized the importance of adding-value through technology acquisition, they have not identified how to effectively up-take information and apply this to real-life practice within small business. Therefore, your views are very important to provide an accurate and up-to-date picture of this area within New Zealand's small and medium sized manufacturing environment.

I understand that your time is valuable, but it would certainly be appreciated and highly beneficial for my post-graduate research, if you could take a maximum of 5-10 minutes to complete this short questionnaire. Once again, thank you for your time.

Yours sincerely

Christina Gomes
(Research Officer)

P.S. If you have already returned this questionnaire, thank you for your assistance.

Statement of Confidentiality:

Before we commence, please be assured this survey is strictly confidential. The results from your survey will be assimilated into a pool of responses, whereby individual outcomes cannot be linked to specific companies. Only summarised information will be released when reporting this research and results will only be published in academic and professional journals.

SECTION A

This section concerns the demographics of your company.
(Please tick the appropriate boxes)

Company Name:

Q1. Is your company independently owned, or a subsidiary of an international company?

- Independent
 Subsidiary of _____ Head Office located in: _____

Q2. When was your company formed?

Q3. Please indicate the category for your company's turnover (before tax) during the last financial year?

- Less than \$1,000,000
 Between \$1,000,001 - \$5,000,000
 Between \$5,000,001 - \$10,000,000
 Between \$10,000,001 - \$15,000,000
 Greater than \$15,000,001

Q4. What percentage of your turnover is the result of products or processes developed during the past five years?

Q5. Does your company export product overseas?

- No
 Yes : If yes, what percentage of sales? _____
Where is your main export market? _____

Q6. How many staff does your company currently employ?

Q7. Which of the following four competitive strategies best describes your company?

- Offensive - First to market with new products
 Defensive - Fast follower of technology/processes in growing markets
 Imitative - Focused on proven technology in established markets, cost minimisation
 Dependent - Customer driven product modifications.

SECTION B

This section concerns the uptake of information within your company.

(Please tick the appropriate boxes)

Information Acquisition: *With regard to this survey, information acquisition is the collection of information/knowledge predominantly in the area of technology, to aid your company in the development of new products, or processes.*

Q8. Do you have a separate budget allocated for the retrieval and analysis of information?
(For example: Internet linkage, database purchase, periodical membership, new technology searches?)

- No
 Yes

If Yes, what percentage of turnover (before tax) is allocated to information acquisition? _____

Q9. When your company searches for information, which is the most common procedure?

- Undirected Search: - General information scanning, with no specific purpose.
 Conditioned Search: - Directed exposure of an identified area or type of information.
 Informal Search: - Relatively limited & unstructured to obtain particular information for a specific purpose.
 Formal Search: - Deliberate planned search to obtain specific information for a particular purpose.

Q10. What are the main sources for information acquisition within your company?

- The Internet
 Supplier/Sales Representatives
 Trade Associations
 Libraries
 Periodicals/Magazines
 In-House Staff
 Management's Personal Experience
 Seminars/Conferences
 International Travel
 Patent Information
 Customer Feedback
 Research Institutions: e.g., CRI's
 Universities
 On-Line Databases
 Consultants
 Competitor Analysis
 Information Brokers
 Other *(Please specify)* _____

Q11. What departments/personnel within your company undertake on-going information searches?

- Marketing
 Sales
 Product Development
 Research & Development
 Design
 Finance
 Accounting
 Management
 Administration
 Production
 Quality Management
 External Contractors
 Other *(Please specify)* _____

Q12. Within your company, what happens to information, once it has been collected?

- Remains on file with the researcher
 - Hardcopies are stored in filing cabinets
 - Copies are made and stored in the company library
 - Information is transferred onto a database
 - Information is dispersed among management team
 - Information is dispersed to all interested staff.
 - Other (*Please specify*)
-

Q13. Within your company, how often would you undertake formal information searches ?

Formal Search: Deliberate planned search to obtain specific information for a particular purpose.

- Daily
- Weekly
- Fortnightly
- Monthly
- Six Monthly
- Yearly
- Rarely

Q14. When searching for information, what are the main areas you target?

- Market Sector - Competitor Product Analysis and Consumer Trends
- Technical Sector - New Machinery or Equipment
- Production Sector - New Processes or Methodologies for Increased Efficiency
- Technology Sector - Knowledge for Practical and Theoretical Use

Q15. Are there any staff members within your company dedicated solely to the retrieval and analysis of information?

- No
- Yes

Q16. Do you believe that any of the following issues, are barriers to technology or information uptake within your company?

- Company Size
 - Geographic Location
 - Lack of Internal Funding/Support
 - Lack of Government Funding/Support
 - Limited Internal Support
 - Limited Industry Support
 - Internal Management Style
 - Lack of Awareness for on-going Information Acquisition
 - Other (*Please specify*)
-

SECTION C

This section concerns the uptake of technology within your company.

(Please tick the appropriate boxes)

Q17. When your company is searching for information regarding new technologies, what do you predominantly investigate?

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | Basic Knowledge | - Knowledge of subject area |
| <input type="checkbox"/> | Resource Knowledge | - Knowledge of equipment/software |
| <input type="checkbox"/> | Technical Knowledge | - Knowledge of process applications |
| <input type="checkbox"/> | Organisational Knowledge | - Knowledge of management/quality systems |

Q18. What are the main sources of innovation within your company?

(Innovation is referring to the stimulus for new product development or diversification concepts)

- Equipment Suppliers
 - Customers
 - Sales Team
 - Product Development Team
 - R&D Team
 - Design Team
 - Competitor Analysis
 - Brainstorming
 - International Trade Fairs
 - Seminars/Conferences
 - Universities
 - Research Institutions e.g., CRI's
 - Periodicals/Journals
 - The Internet
 - Other *(Please specify)*
-

Q19. Has your company ever acquired technology through any of the following sources?

- Technology Agreements with parent or affiliated company (e.g., Licensing or Joint Ventures)
 - Technology Agreements with Independent Firms
 - Acquisition of Companies
 - Acquisition of Personnel
 - Purchasing Technology from Independent Firms (e.g., Licensing, Patents, Know-how)
 - Imitation of Other Products
 - Customer or Suppliers
 - Independent Designer/Inventors
 - Universities
 - Research Institutions
 - Other *(Please specify)*
-

SECTION D

This section concerns the allocation of R&D resources within your company.
(Please tick the appropriate boxes)

Q20. What percentage of your turnover (before tax) is allocated to research and development (R&D) expenditure?

Q21. What does the R&D budget cover within your company?

- Blue-sky Research
 - Overseas Travel
 - Material Costs for new developments
 - Production Costs for New Developments
 - Tooling Costs for New Developments
 - Prototype Development
 - Salaries for Research Personnel
 - Trade Fair Participation
 - National Travel Expenses
 - Seminar Attendance & Expenses
 - Information Acquisition
 - Annual Periodical/Magazine Subscriptions
 - Machinery Purchase
 - Internet Fees
 - Administration Fees for New Developments
 - Other *(Please specify)*
-

Q22. The bulk of your R&D budget is generally allocated to which of the following areas:

- Blue-sky Research
 - Overseas Travel
 - Material Costs for New Developments
 - Production Costs for New Developments
 - Tooling Costs for New Developments
 - Prototype Development
 - Salaries for Research Personnel
 - Trade Fair Participation
 - National Travel Expenses
 - Seminar Attendance & Expenses
 - Information Acquisition
 - Annual Periodical/Magazine Subscriptions
 - Machinery Purchase
 - Internet Fees
 - Administration Fees
 - Other *(Please specify)*
-

Thank you very much for the completion of this questionnaire, your cooperation has been extremely helpful.

Please return this form in the freepost envelope.