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New Product Success and Failure

Factors for New Product Success and Failure in the New Zealand Electronics Industry

A thesis presented in partial fulfilment of the requirements for the degree of
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ABSTRACT

The study identified the factors that influence new product success and failure in the New Zealand electronics industry. Thirty-two factors, which described the nature of the products, the market characteristics, company resources and skills, and product development activities, were analyzed to determine their influences on new product success and failure in the New Zealand electronics industry. Data for the analysis were collected from forty electronics companies, including manufacturers and distributors, in New Zealand by using a mail survey. Each company chose two products that were recently developed or launched, one success and one failure. A total of seventy-five products, forty successes and thirty-five failures, were tested to assess the impacts of the factors.

The survey showed that new product success and failure were significantly influenced by the synergy of market need and product specification. The most important factors in separating new product success and failure were good understanding of buyer behavior, good value for money, made to meet users' needs, less after-sales problems, the customer had great need for product type, and allowed greater pricing flexibility. Market competition including competitors and price competition in the market, the experience of the project team, and a multi-functional development group, showed slight or no differences between new product success and failure.

Group analysis showed that manufacturing companies and distribution companies had different sets of important factors in separating new product success and failure. The manufacturing companies emphasized pricing flexibility and first on the market to new product success and failure, while the distribution companies stressed the importance of technology fitness between the company and the new product, and technical superiority of the new product. Company size affected the new product performance in the company. Small companies were likely to concentrate on providing specific solutions to customers' problems, and large companies relied on sufficient financial and distribution resources to offer customers strong technical support and services.

A series of face-to-face interviews with the new product development practitioners from seventeen New Zealand electronics manufacturing companies assessed their new product

development activities. Most of these companies utilized a formal or semi-formal process for new product development. They focused on providing niche products for export markets, and many of them were very successful in the international environment although they were much smaller than their competitors. They put effort into the up-front stages of the new product development process to make sure the new product concept met customer requirements. Some of them invested more resources in developing and marketing new products, and subcontracted the production of new products. Consequently contract manufacturing companies emerged to meet their requirements. A small number of companies with very compact structures developed new products only in response to the customer's particular requirements. These companies did not have a formal process of new product development, but they were very flexible and had very close relationships with customers to meet their needs.

The study recommended several suggestions for the New Zealand electronics companies to enhance their ability of successfully developing superior new products to meet customer requirements quickly. They need to apply a well-planned process for new product development, look for suitable niche markets to avoid intense competition, and have an appropriate organizational structure to support effective new product development.

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Chapter 1 The Electronics Industry and New Products

1.1 Introduction

In this chapter, the electronics industry, products and innovation are briefly described. The range of electronic products is classified as three main sectors: capital goods, consumer goods and electronic components. As well as looking at the innovation in the electronics industry, examples of electronic products are given to demonstrate that the electronics industry plays an important role in economic development and social changes.

An overview of the New Zealand electronics industry describes the product ranges and services. The industry restructured in the early 1980s due to the government policy change, with decrease of consumer production and increase of industrial production. Also it had rapid growth in exports and the focus on new product development and product improvement.

New product success and failure is reviewed with an assessment of previous studies in this area, particularly those conducted in New Zealand. This review helps to highlight the purpose of the current study which has to do with new product success and failure in the New Zealand electronics industry.

1.2 The Electronics Industry

The electronics industry is one of the largest industries in the world economy[Ernst and O'Conner, 1992]. Products from related industries have electronic technology added to them for enhancement. More and more industries are incorporating electronic technology into their existing products. The application of electronic functions is rapidly encroaching on every aspect of our society and that makes it very difficult to describe the range and extent of the heterogeneous activities grouped under the term 'electronics industry'.

Electronic products can be divided into three major sectors: capital goods, consumer goods and electronic components[McLean, 1980]. The first of these sectors provides electronic equipment for the utility services and the industrial market. It has been described as 'electronic

capital goods' in distinction to the 'electronic consumer goods' sector. The consumer goods, such as television sets and audio equipment, are perhaps more well known because of their involvement with people's daily life. The electronics components sector provides devices for the systems and sub-systems of the other two sectors. Table 1.1 illustrates the range of electronic products in the three sectors.

The electronics industry is a dynamic industry characterised by shortening product life cycles, increasing market segmentation, and growing technological complexity. The higher frequency of new product introductions in the electronics industry makes the matter of new product success and failure more critical than many other industries.

The electronics industry is very competitive. It utilises a distinctive raw material: knowledge. It relies not only on highly creative scientific and engineering expertise for its initial development, but also depends on continuing technological innovation as the primary basis of its competitive edge[Henderson, 1991]. Competition in the electronics industry increasingly cuts across national and sector boundaries. In order to compete in the electronics industry, a company must be able to internalise on a global scale specialised assets and capabilities, such as technological knowledge, organisational competence, finance, production experience, market intelligence, supplier and customer networks. This corporate structure can lead to the development and to the effective commercialisation of a wide variety of electronic goods and services[Ernst and O'Conner, 1992]. In such a competitive environment, new products play an increasingly important role for a company to survive. Due to the shortening product life cycles, which is one result of the increasing pace of change, coupled with changing market demands, new product introductions in the electronics industry occur more often than in many other industry sectors.

Table 1.1 Electronic Products Classified by Sector

Product Sector	Sub-Sector	Examples
Electronic Capital Goods	Computer and Peripherals	Personal Computers Data Transmission Equipment Input/Output Equipment
	Telecommunications Equipment	Public Switching Equipment Transmission Equipment Customer Premises Equipment
	Office Equipment	Data Processing Word Processing Audio Equipment
	Test, Measuring and Analytical Instruments	Tes /Analytical Instruments Medical Equipment Nuclear Equipment Automatic Test Equipment
	Industrial Control	Sequence Controls Supervisory Control Systems Monitoring and Data Recording Systems Industrial Robots
	State-Purchased Equipment	Military and Aerospace Systems Education Systems Health Systems
Electronic Consumer Goods	Household Domestic Appliances	Washing Machines Ovens Sewing Machines
	Entertainment Products	TV Hi-Fi Equipment Video Games
	Personal Products	Cameras Calculators Language Translators
	Car Products	Engine Controls Braking Systems Petrol Pump Controls
Electronic Components	Passive Components	Resistors, Inductors, Capacitors Switches Wires and Cables Filters Transducers
	Active Devices (Semiconductors and Tubes)	Discrete Devices (Transistors, Diodes, and Rectifiers) Integrated Circuits (Linear, Digital, Optical and Microprocessors)

Source: [McLean, 1980]

1.3 Innovation in the Electronics Industry

The electronics industry continues to grow faster than most other industries, thus making it an important 'engine of growth' for production and trade of industrial products, consumer products and services[Ernst and O'Conner, 1992]. The importance of this industry goes well beyond its direct contribution to world trade and output growth. There is a broad consensus among industrial economists and policy-makers that the electronics industry, or at least the information processing goods and services it generates, are central to the process of industrial transformation. As an incubator of pervasive technological and organisational innovations, this industry is supposed to submit outdated industrial and market structures to so-called 'creative destruction'[Schumpeter, 1950], thus paving the way for their modernisation.

- **Electronic Capital Goods**

Applying computer processing to industrial manufacturing and services has opened up a significant potential for improving productivity and competitiveness. Computer-based information technologies can help to increase the flexibility of production and improve the quality and reliability of products and services. Through computer networks, suppliers may be able to respond to customer needs and to changing patterns of demand. Such networks may also allow them to improve their access to important materials, components and production equipment. In short, due to the spread of new information technologies, and of related organisational innovations, basic parameters of designing, producing and marketing products and services are currently being redefined, with a trend towards increasing the mobility of capital, and new possibilities are emerging for improving the co-ordination of complex international sourcing and marketing networks.

Telecommunications are an example of how the information industry affect people's lives. Telecommunications is a global industry interconnecting the world and contributing to a significant part of world economic activity[OECD, 1991]. The industry is also an important link in support of international trade in goods and services. The role of telecommunications has changed from a public utility providing simple telephony, to an industry responsible for creating a range of new service activities and products. This industry is increasingly viewed as a key factor in international competitiveness and productivity, and an industry with the potential to alter economic and social patterns of interaction. The industry plays a major role in

the changes which are shifting economic structures in the world toward an information economy. The foundations of these new economic structures will be based on communications networks, telecommunications equipment and information services. Recognising this, many corporations have taken strategic decisions increasing their involvement in telecommunication-led development.

- **Electronic Components**

The electronic components industry has experienced changes from mainly making simple components such as resistors, capacitors and electron tubes, to producing a broad range of goods which includes semiconductors, printed circuit boards(PCBs), and high-tech based integrated circuits(ICs). Integrated circuits have relatively low power consumption, are highly reliable, cheap to produce, and most importantly are tiny devices which perform more quickly the functions of earlier generations of electronic machines. They provide the basic logic, memory and other functional building blocks of virtually all advanced electronic systems.

The technical change in the manufacture and design of ICs is the principle technical factor underlying most of the changes taking place in the electronics industry as a whole. Integrated circuits are by far the largest and fastest growing segment of the electronic components industry world-wide[Ernst and O'Conner, 1992]. Microprocessors, which are the key components forming the operation of a personal computer, can be used in any situation which historically utilised some form of information processing technology, whether electronic, mechanical, pneumatic or hydraulic in nature. Examples of using microprocessors can be found in every industry sector, from industrial control to home entertainment.

- **Electronic Consumer Goods**

Products in the consumer electronics sector can be roughly divided into household domestic appliances, entertainment products, personal care products and car systems products. Since the introduction of ICs, most traditional household products are equipped with 'silicon chips' to improve performance and add more functions. Today's household appliances, like washing machines, refrigerators, sewing machines, and dishwashers, have built-in electronic control to make them easy to use and with versatile features. There are streams of new household products emerging every year thanks to the new electronic technology. The concept of environmental control in the home led to new products of water and air purification, e.g. water

filters and air cleaners. A new washing machine which saves 30% in water and detergent is viewed as having a significant impact on the environment.

Products for personal use like shavers, hair dryers, and toothbrushes, have all added electronic functions. Since the invention of the electronic calculator, a wide variety of PA(Personal Appliance) equipment has been developed. An electronic organiser, with superior organising capabilities including a 'To-Do-List' for priority scheduling and an 'Action Planner' for co-ordinated access to relevant data, can perform the role of a competent personal secretary.

The shift of visual entertainment, beginning with television, and the subsequent introduction of new visual media such as video tape and video disks continues to advance people's levels of knowledge and understanding. Today wide-screen television, High Definition Television (HDTV), and Liquid Crystal Display(LCD) Television give people more choices of enjoyment from home theatre to pocket-size products. Since the first home CD player was introduced to the world in 1982, digital technology has made it possible to develop even more sophisticated audio products. Mini Discs(MDs) and Digital Compact Cassettes(DCCs) are two examples of them. Karaoke is an exciting mixture of audio, video and active participation. Video games have become favourite toys of the younger generation.

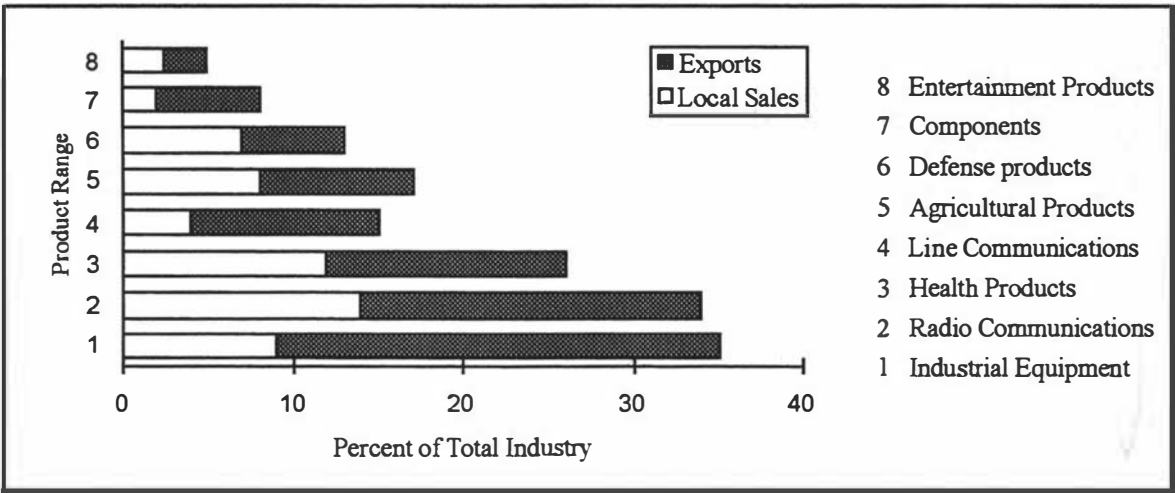
1.4 The New Zealand Electronics Industry

The electronics industry in New Zealand has two major segments: manufacturing and distribution. The distribution companies mostly provide imported products and services to the local market. Their product range comes from all over the world and normally these companies do not undertake any new product development activities, but are involved in launching the new products into the local market.

The electronics manufacturing sector is based on the innovation, development and manufacture of products which use the latest electronic semiconductor components. There are no semiconductor component manufacturing firms in New Zealand because of the huge investment required, but the local companies are able to source the technology from overseas at reasonable cost because competition between overseas suppliers keeps prices

down[Cornwall, 1994]. The New Zealand industry produces printed circuit boards, transformers for use in electronic equipment, and temperature compensated crystals(Figure 1.1).

Figure 1.1 NZ Electronics Industry Structure



Source: [Cornwall, 1994]

The major product segments of the New Zealand electronics manufacturing industry include a wide range from health care to communication equipment, from agricultural to defence products[Cornwall, 1994]. The industrial sector produces a considerable amount of equipment for application in New Zealand industry and exports are growing. This area includes such items as motor speed controllers, industrial control and monitoring equipment, petrol dispensing equipment, access control devices, point-of-sale equipment and electronics for use in home appliances.

Radio communications has always been an area of high interest in New Zealand. Many innovative technical contributions have been made in this sector. Products are mainly commercial two-way mobile communications equipment and microwave antenna systems. Products of another sector, line communications, supply most of the local needs of telecommunications networks that are well developed by world standards.

New Zealand companies began to develop commercially viable health care products involving electronic equipment in the 1970s and 1980s. Major products include respiratory humidifiers, nerve stimulators and aids for the handicapped, especially for the blind. The prime target for

this equipment is the international market because of the small population base in New Zealand.

In the 1980s, deregulation of the economy significantly affected the electronics industry in New Zealand because many locally produced products at that time were not competitive with those manufactured overseas. Since 1983, the ending of import licensing has resulted in drastic reductions in the manufacturing of consumer electronics products. As New Zealand markets opened to competition, the larger local electronics companies had to re-orient their operation towards other products, become importers, or go out of business. The rapid growth of smaller companies involved in the development and manufacture of internationally competitive industrial products has been largely responsible for the expansion of the New Zealand electronics industry.

A survey in this industry, conducted by the Trade Development Board in 1991[NZ Trade Development Board, 1992], showed that the New Zealand electronics industry's exports increased at the rate of 20 percent per year for ten years. Very few other industries in New Zealand exhibited comparable performance. A more recent study in 1994[Cornwall, 1994] indicated that the industry achieved an average increase in exports of about 30 percent per year during the six year period from 1988 to 1993, and the annual average is escalating. If this growth continues, by the year 2000 the electronics industry will make a contribution to New Zealand exports worth over \$1 billion.

The electronics industry in New Zealand is largely focused on the development of new products and the improvement of existing ones. Recent information shows that about 11 percent of employees are involved in research and development activities, a level comparable with overseas electronics companies[Cornwall, 1994].

1.5 Factors in New Product Success and Failure

In today's highly competitive economic environment, new products are playing a more and more important role in a company's operation. New products contribute a significant proportion of the revenues and profits to a company. This percentage is expected to increase in the future, as technological advances shorten the product life cycle, forcing firms to introduce new products at a faster rate.

Effective new product development is virtually synonymous with success in a high-technology industry, such as the electronics industry. The fate of leaders and followers in the industry is likely determined by the performance, quality and timing of their new product offerings. For leaders, new products are the vehicles through which new markets are created and old ones revolutionised. For followers, new products provide an opportunity to set new standards in cost and quality and to make minor enhancements which may later result in considerable competitive advantage. The ability to develop and launch new products successfully and quickly is the key to business success[Booz Allen-Hamilton, 1982].

But what makes a new product a success? The last 30 years have witnessed a number of studies into new product success and failure. One focus has been the study of the factors that successful new products shared in common. The first extensive study by Meyers and Marquis(1969) showed that most successes were market-pull projects, and only 21% of successes were technology-push.

1.5.1 Common Factors in New Product Success and Failure

The studies of new product success and failure were mostly conducted in North America and Europe, but recently a few were done in the Asia-Pacific region[Link, 1987; Song and Parry, 1994; Mishra, Kim and Lee, 1996; Song and Parry, 1997]. Some factors were found in common despite the different countries and industries involved. Some common factors identified as influencing new product success are shown in Table 1.2.

There are slightly different findings due to the different research methods and industry sectors. For example, a study on the USA electronics industry found that the profit margin of new

products is related to new product success, and products which are first to the market are very likely successes[Maidique and Zinger, 1984].

Table 1.2 Some Common Factors in New Product Success and Failure

Nature of New Products	Product Uniqueness Product Advantage Product Quality Product Meets Users' Needs
Product Development Process	Product Idea Screening Formal and Logical Development Plan Efficiency of Development Management of Product Launch
Market Characteristics	Market Knowledge Market Potentials Marketing Proficiency
Skills and Resources	Top Management Support Understanding Buyer Behaviour Proficiency of Technological Activities Effective Use of Outside Information Technological Synergy

Source: [Cooper and Kleinschmidt, 1987b; Link. 1987; Song and Parry, 1997]

1.5.2 New Product Success and Failure in New Zealand

Research on new product success and failure in New Zealand has been conducted since early 1980s. One example was West's study in the New Zealand food industry[1980]. This study investigated twenty-four New Zealand food companies and found that several factors contributed to new product success:

1. Innovative and technological company orientation
2. Supportive company structure
3. Consideration for the consumer
4. Security for development
5. Well-rounded company marketing

Kerr's study [1995] on New Zealand small-sized companies found several factors in product development important to new product success:

- Top management support and commitment
- Good customer research and marketing
- Creative company environment

No such research on new product success and failure has been found solely conducted in the New Zealand electronics industry. The New Zealand electronics industry has grown rapidly in the last 20 years, especially in the export section. This industry is very innovative and new product development is becoming even more important compared with other industries. It is necessary to look at new product development performance in the New Zealand electronics industry.

1.6 Purpose of the Study

The purpose of this study was to find factors that influence new product outcomes in the New Zealand electronics industry, and to investigate the current situation of new product development practices in the companies of the industry. The study was conducted at the project-level that was looking at the individual projects rather than at the company's program-level.

This research was a project-level study which focused on the successful and failed new products in the New Zealand electronics companies. A list of factors, that were thought might influence new product success and failure, was analysed statistically to determine their importance to new product success and failure. To investigate new product development processes that were applied by the New Zealand electronics companies, a series of face-to-face interviews with product development practitioners in the companies was conducted. The management practice for technological and marketing conditions were identified. The study attempted to identify the importance of product development activities in achieving new product success, addressing suitable niche markets, and seeking effective organisation structures for these companies.

With respect to the second major aim, it investigated any differences in new product development performance between manufacturing companies and distribution companies, since these groups of companies had different business emphasis, it was assumed they had different key factors affecting new product development. The impacts of company sizes in new product development performance were analysed as well.

This study investigated new product success and failure in fifty-seven companies in New Zealand. Mail survey and in-depth interviews were used to collect information from the companies. These companies were located all round New Zealand, but mainly in Auckland, Wellington and Christchurch. The sizes of these companies, mostly less than 100 employees and turnovers between \$3 to \$10 million (NZ), were small to medium by overseas standards. They included manufacturing and distribution companies.

The result of this study is expected to provide useful information and guide to the companies in the New Zealand electronics industry, which is currently in a growth situation, but is suffering some problems, such as managing growth and financial resources. The results of the study will enable the companies to evaluate their own performance in new product development and then to apply a more effective product development process to enhance the competitiveness of their new products.

Chapter 2 Success and Failure of New Products

2.1 Introduction

In this chapter the literature on new product success and failure was reviewed, and the variety of study designs and methodological approaches were observed. First of all, concepts of new product, new product development process, new product success and failure, and the levels in new product success and failure research were reviewed. Then, measures of success and failure in new products were summarised from both academics and companies, and a list of core measures was developed to evaluate new product outcomes.

Next, the factors found in the previous research related to new product success and failure were analysed, and the most important factors separating new product success and failure were summarised from previous studies. The focus then was turned into the more specific research fields of new product success and failure in the electronics industry. Related studies in New Zealand were also reviewed comparing with the results in other countries. Finally the factors for use in the current research were listed.

2.2 Concepts of New Product and New Product Development Process

2.2.1 New Product

A *new product* is a multi-dimensional concept with need-satisfying capabilities not previously experienced by the stakeholders interested in it[Thomas, 1993]. Some authors defined new product as “any product that is new to the sponsoring organisation”[Souder, 1987], while others gave detailed categories of new product classifications[Booz Allen-Hamilton, 1982; Pessemier, 1982, Scheuing, 1974]. It depended on the perspective from which the product is viewed. Normally there are three perspectives:

- The newness of the product for the developer or the firm;
- The newness of the product for the marketplace;
- The newness of the product as perceived by users or buyers.

Crawford(1983) summarised from these criteria that “a new product is one which is new to the firm”. This definition means that the newness of a product is unaffected by the fact that other firms are marketing an identical product, or that consumers fail to perceive that the product is

new, or that there are only minor changes in packaging or merchandising. According to this definition, an old product marketed under a new brand should be viewed as a new product[Crawford, 1983].

Pessemier(1982) described a new product as “any product that users treat as an addition to available market offerings.” A new product involves time-dependent purchase risk; time must pass before the consumer can see how widely the product is accepted and how well it performs.

Scheuing’s definition(1974) of a new product classified largely to the marketplace’s view:

1. An unchanged product that is marketed in a new way;
2. An existing product whose features are altered;
3. Variations of existing products are marketed;
4. Addition of new product lines;
5. An existing product where there is use of different modes of promotion and distribution to stimulate higher sales volume in the present market;
6. An existing product where new markets that are different from existing ones in a personal, geographical, or functional way are located and developed.

Booz Allen-Hamilton(1982) classified six types of new products based on the level of newness to the company and to the market:

1. *New-to-the-world products*: new products that are the first of their kind and create an entirely new market. They only represent 10 percent of all new products.
2. *New product lines*: new products that are quite new to a particular firm, but not new to the marketplace. They allow a company to enter an established market. 20 percent of all new products fit into this category.
3. *Additions to existing product lines*: new products that supplement a company’s established product lines. They may represent a fairly new product to the marketplace. This is one of the largest categories of new products, about 26 percent of new product launches.
4. *Improvements in and revisions to existing products*: new products that offer improved performance or greater perceived value, and replace existing products. Such new products also make up 26 percent of all new products.

5. *Repositioning*: existing products that are targeted to new markets or market segments. They are essentially new applications for existing products. Only 7 percent of all new products represent this category.
6. *Cost reductions*: new products that offer similar benefits and performances at lower costs. They are not new to markets, but they could represent significant changes to the firm. Cost reductions account for 11 percent of all new product launches.

It needs to be noted that most companies feature a mixed portfolio of new products. Additions to existing product lines and improvements in or revisions to existing products account for more than half of all new product introductions. By contrast, the most innovative products, those new-to-the-world and new-to-the-firm product lines constitute 30 percent of all new products, but represent 60 percent of new products viewed as most successful. Researching in moderate-to-high technology industries, Cooper and Kleinschmidt(1991) found 58 percent of new products launched were in these two product categories. It means that higher technology industries launch proportionately more products that are innovative.

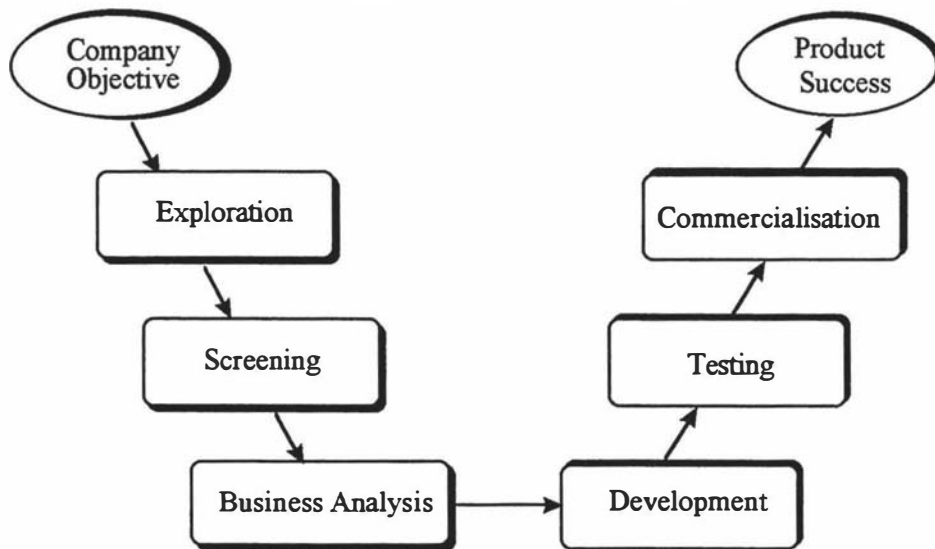
2.2.2 New Product Development Process

New product development is often used, especially in management and marketing circles, to describe the process that transforms technical ideas or market needs and opportunities into a new product launched onto the market. Despite many differences in the details of what individual firms did, what is striking is the similarity in the overall new product development process between firms and across sectors. In virtually all cases a familiar pattern of stages was found:

- *Planning*, which includes development of the initial idea; analysis of potential demand; feasibility assessment and briefing.
- *Design and development*, which includes market and technical specification; concept design; prototype development and testing; detailed design and production engineering.
- *Manufacture and sales*, which includes production planning, tooling, test manufacture, full scale production and market launch.

Perhaps the most cited and enduring view of new product development is the six-step process described by the consulting firm Booz-Allen & Hamilton(1982). Since the 1950s, this firm has assisted corporate management in meeting the requirements of growth through new product development within the companies themselves. The six-step process developed by Booz-Allen in the 1950s identified the activities performed in bringing new product ideas to the marketplace (Figure 2.1).

Figure 2.1 Six-Steps New Product Development Process

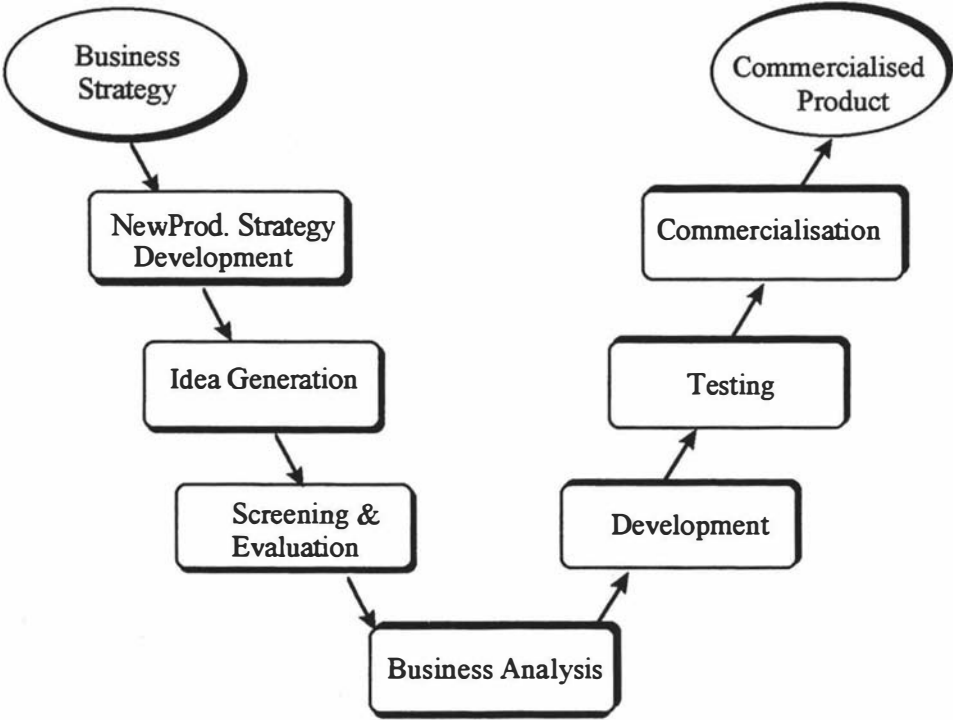


Source: [Booz Allen-Hamilton, 1982]

Because the mortality of new product ideas is often high, organizations need to generate a sufficient flow of them to achieve their growth objectives. After screening and evaluation, the ideas are submitted to a business analysis that evaluates the remaining product concepts for estimated sales, costs, profitability, and other financial indicators. If a new product idea meets business analysis criteria, then the project develops prototypes and then operational products. Because these activities often require heavy financial commitment, the business analysis step is all the more important. Ultimately, the product is submitted to testing, such as use testing, various forms of marketing, and other procedures that will facilitate measuring market response to the new product. Finally, commercialization involves the launch strategy for the new product, as defined by the target market segment, the marketing program, and launch timing.

Since the late 1970s, a new step, developing an explicit new product strategy, has been the major addition to the previous process(Figure 2.2). This step has changed the nature of the beginning of the process. The purpose of the step to develop new product strategy is to identify the strategic business requirements that new products should satisfy. The requirements, which can be market and company driven, determine the roles to be played by new products. The strategic roles played by new products are influenced by both individual industrial needs and the type of new product. This increased attention given to the new product strategy development reflects a general increase in management attention to the early steps in the new product development process.

Figure 2.2 Seven-Steps New Product Development Process



Source: [Booz Allen-Hamilton, 1982]

Souder(1987) examined 80 new product projects and revealed eight identifiable stages of innovative activities:

- 1. Exploratory
- 2. Concept Development
- 3. Prototype Development
- 4. Prototype Testing
- 5. Market Development

6. Manufacturing Start-up
7. Marketing Start-up
8. Technical Service

These stages are not mutually exclusive, some overlaps may be found in a real process of new product launch.

Cooper's seven-stage new product process model(1984a) was based on the study of previous processes. Each stage contains a number of activities, and is separated from the previous or the following stage by an evaluation point or 'go/kill' decision node. The seven stages are:

1. Idea
2. Preliminary Assessment
3. Concept
4. Development
5. Testing
6. Trial
7. Launch

New product development changed dramatically in the 1980s. Globalization, marketing strategy and cross-functional interfaces, quality and customer satisfaction are some of the issues involved in today's new product development process. A well managed new product process is essential to successful new product launch[Cooper, 1990]. The current new product processes still have weaknesses: too time consuming and too many time wasters, too bureaucratic, and no provision for focus. Cooper(1994) speculated about the nature of an emerging next generation of new product processes. He proposed fundamental changes to today's new product development systems:

- They will be fluid and adaptable;
- They will incorporate fuzzy gates which are both situational and conditional;
- They will provide for much sharper focus of resources and management of portfolio of projects; and
- They will be much more flexible than today's process.

Such a process will provide more efficiency to speed up the process and be better focused. It is a 'smart system' more tailored to the needs and specifics of each project. The decision makers

are required to be more sophisticated and thoughtful. The process will have overlapping, fluid, and difficult-to-define stages.

Johne and Snelson(1990) summarised five key product development activities in a manufacturing business:

- Planning product changes
- Idea exploration
- Screening and evaluation
- Physical development
- Launch

Regardless of their ordering, these key activities need to be performed, either implicitly or explicitly, in every product development, because companies undertake product development activities in parallel rather than in sequence to speed up the development process.

Rothwell(1992) classified industrial innovation processes as four generations from 1950s to early 1990s. The first two generations were the simple linear 'technology push' and 'market pull' models in 1960s and early 1970s. The 'coupling model' of third-generation innovation processes dominated in the period of early 1970s to mid-1980s, and it could be described as a logical sequential process contained a series of functional distinct but interacting and interdependent stages. The basis of the fourth-generation innovation model were 'integration and parallel development', which were the key factors contributing to high Japanese product efficiency.

Rothwell(1994) described the upcoming fifth-generation innovation process as the 'strategic integration and networking' model. It was accompanied by the booming of information and communication technology. There were major impact of new technologies, high rates of technological change, intense competition and rapid product cycles, which required time-based strategies. The key aspects of the fifth-generation innovation process were:

- integration;
- flexibility;
- networking;

- parallel (real time) information processing.

Griffin(1997) summarised the results of research efforts undertaken during the past five years and presented the findings from her survey on new product development best practices. The findings indicated that new product development(NPD) processes continued to evolve and become more sophisticated. NPD process use had moved from functional and sequential approaches to multi-functional approaches, with formal stages and gates for moving from one stage to the next. The 'best-practice' companies in this study used a number of NPD practices more effectively simultaneously, and more likely started the NPD process with a strategy, and included some particular steps in their NPD process. They used more multi-functional teams, were more likely to measure NPD processes and outcomes, and expected more from their NPD programmes.

Research in product development started in New Zealand as early as the 1960s. Earle outlined a seven-stage product development process for the food industry[Earle and Anderson, 1985]:

1. The project aim
2. Project constraints
3. Product idea generation
4. Product idea screening
5. Development of a prototype product
6. Development of the process
7. The market plan and product launch

In this process the knowledge of market and consumer, and the knowledge of modern scientific discoveries and technological development were equally important. And there should be integration of different research techniques, such as consumer research, marketing research, product research and process engineering research, implemented into the process. By reviewing the changes in the food product development process in the past 30 years, Earle predicted the product development process for the next decade[Earle, 1997]. The four main stages of the new product development process are still valid:

1. Product strategy and planning
2. Creation, design and development of the product

3. Design and development of production, marketing and quality assurance processes
4. Organisation of production, launch and post-launch evaluation of the product

The details of each stage may vary from project to project, but each stage has several activities which produce outcomes, on which management decisions are made.

2.2.3 New Product Success and Failure

New product success and failure is defined from the point of view of the company, and in terms of profitability. For new product performance in industry, the criterion of 'success' is commercial[SPRU, 1972]. A failure is an attempted new product which failed to obtain a worthwhile market share and/or make a profit, even if it 'worked' in a technical sense.

Often a failure is relatively clear, e.g. a company withdraws a product or closes a plant down, but success is not always so self-evident. A product may achieve a worldwide market, but take a long time to show a profit[SPRU, 1972]. New product success can be defined in a number of ways, including[Cooper, 1993]:

- a simple success/failure measure: whether the product's profits met or exceeded the company's financial or profitability criterion for success;
- the profitability level;
- the new product's market share after three years in the market;
- the degree to which the product met company profit and sales objectives.

There are obviously varying shades of 'gray' between the 'white' success and the 'black' failure, and only those cases where the contrast was sharpest are worth investigating.

A simple measure of new product success and failure was used by many researchers and industrial practitioners, e.g. whether the product's profitability exceeded or fell short of the minimum acceptable profitability for the type of venture[Cooper, 1979a; Link, 1987; Maidique and Zinger, 1984].

On the other hand, a new product might achieve a limited financial return, yet be considered a great success because it had a major impact on its market, or introduced a new technology to

the industry, or opened up a new window of opportunity to the company. It seems that financial terms was not the only measure of success and failure. In fact, there were many measures of new product success and failure used in previous research[e.g. Cooper and Kleinschmidt, 1987b].

2.2.4 The Level of Research on New Product Success and Failure

Research on new product success and failure can be conducted at the project level or at the program level. Project level, also known as product level, is based on the investigation of the new product development process at the level of the individual project. It means when a project-level study was conducted, the respondents were asked to answer questions with respect to specific successful or failed new product projects. Program level research, on the other hand, focuses on generalisations regarding a company's 'usual' process of new product development. It is also called company level or firm level research.

Both types of research have their advantages and limitations. Project-based studies normally identify success factors at project level, such as product advantage, project synergy, as well as a number of vital process-related activities. These findings have considerable impact on new product management, and they can be useful for companies as screening or project selection and prioritisation criteria. The limitation of project-level research is that, company characteristics that may be important to success are often missed when pairs of successes and failures are selected from each company, as they could be common to both the success and the failure[Cooper and Kleinschmidt, 1995]. Program-level studies look at a company's overall new product performance and identify the critical success factors that set the most successful companies apart from their competitors, and they have the potential for uncovering success factors that are not readily apparent through examination of specific projects. But picturing the company as a whole, program-based research, may be too general and neglect some specific factors of individual projects within the company, which could be helpful in selecting new product strategy. A highly successful company might have unsuccessful new projects, while a less successful company could successfully launch some new products.

Montoya-Weiss and Calantone(1994) reviewed 47 new product success and failure studies, and 78.7% of them were project-based. It was believed that new product success at company level was somewhat different from that at project level[Cooper, Kleinschmidt, 1995].In most project-level studies, success was gauged via numerous metrics, including the new product profitability, time to market, market share achieved. At program level, success was gauged by percentage of current sales by new products[Griffin and Page, 1993], or percentage of resources going to successful versus failed ventures[Booz-Allen Hamilton, 1982]. It is necessary to investigate these measures and find proper ones for new product success and failure studies in different levels.

2.3 Measures of Success and Failure in New Products

Research in the area of new product success and failure extends back to the 1960s[Meyers and Marquis, 1969]. Each research project used different measures for analysing success and failure in new product development. While that may be because of the nature of studies(project-level or program-level), it makes it difficult to draw generalisations across the investigations.

Cooper and Kleinschmidt(1987b)developed 11 different measures of new product success for their project-level research:

1. financial success/failure;
2. profitability level;
3. pay back period;
4. domestic market share;
5. foreign market share;
6. relative sales;
7. relative profits;
8. sales vs. objectives;
9. profits vs. objectives;
10. opportunity windows on new categories;
11. opportunity windows on new markets.

Griffin and Page's research(1993 and 1996) which looked at studies on new product success and failure, as well as at the perspectives of managers from companies, tried to identify all currently used measures. Seventy-seven research articles were reviewed and 46 different success and failure measures were identified. From an open-end survey of industries, thirty-four success and failure measures that were currently used, and 45 measures that were desired to be used, were obtained. A total of 75 measures of new product success and failure were generated; and they were statistically grouped into five independent categories:

- Customer Acceptance Measures
- Financial Performance Measures
- Product-Level Measures
- Firm Benefit Measures
- Program-Level Measures

Only 16 of the 75 measures were common across academics and company sources, and they were identified as the “core” success and failure measures. The core measures in each category are shown in Table 2.1. Note that there was no core measure belonging to the program-level category. The possible answer is that most research projects reviewed in this research were project-level rather than program-level[Griffin and Page, 1993].

The categories of measures showed that measuring new product success and failure was multi-dimensional, but most previous research projects in this area only investigated a portion of this structure of categories. The study also indicated that academic researchers used about three measures of success and failure per study, and firms used about four measures on average. Academics tended to investigate product development performance at firm level, whereas companies focused on the success and failure of individual projects.

The results of this study suggested the most appropriate sets of success and failure measures for determining the individual success of different types of product development projects, and for judging the overall success of product development programs at companies with particular business strategies.

Table 2.1 Core Measures of New Product Success and Failure

Customer Acceptance Measures	Customer Acceptance Customer Satisfaction Meet Revenue Goals Revenue Growth Meet Market Share Goals Meet Unit Sales Goals
Financial Performance Measures	Break-even Time Attains Margin Goals Attains Profitability Goals Internal Rate of Return/Return on Investment
Product-Level Measures	Development Cost Launched on Time Product Performance Level Meet Quality Guidelines Speed to Market
Firm Benefit Measures	% of Sales by New Products
Program-Level Measure	(None)

Source: [Griffin and Page, 1993]

A project strategy typology formed by Booz Allen and Hamilton(1982), based on newness to the market and newness to the company, was used to assess the hypothetical measures. The recommended measures for project-level product development success varied by project strategy(Table 2.2), however there were some measures commonly important in most project strategies. For example, ‘degree to which the project met profit goals’, and ‘degree to which the project provided a competitive advantage’ were two of the most useful measures which indicated the level of success of project’s financial and marketing performance. Customer satisfaction and/or acceptance were also very important measures.

On the other hand, the useful program-level success and failure measures for judging overall product development performance were upon the company’s strategic approach toward innovation. Companies with low innovative strategies focused on measuring the efficiency of their product development program, and companies with moderately innovative strategies measured both the efficiency and effectiveness of their product development program, while

highly innovative companies assessed the program's contribution to company's growth[Griffin and Page, 1996].

Table 2.2 Suggested Success and Failure Measures for Project-level Research

	Newness to the Market		
	Low		High
Newness to the Company	High	New to the Company	New to the World
		Market Share Revenue Customer Satisfaction Met Profit Goal Competitive Advantage	Customer Acceptance Customer Satisfaction Revenue Met Profit Goal Competitive Advantage
		Product Improvements	Additions to Existing Lines
		Customer Satisfaction, Market Share Revenue Growth Met Profit Goal Competitive Advantage	Market Share, Revenue Growth Customer Satisfaction Customer Acceptance Met Profit Goal Competitive Advantage
		Cost Reductions	Product Repositioning
		Customer Satisfaction Customer Acceptance Revenue Met Margin Goal	Customer Acceptance Customer Satisfaction Market Share Met Profit Goal
	Low	Performance or Quality	Competitive Advantage

Source: [Griffin and Page, 1996]

2.4 Factors on New Product Success and Failure

Research on new product success and failure can be categorized into three domains: research on factors leading to success, factors leading to failure, and factors that distinguish between success and failure. Early research mostly looked at either successful or failed new products. Meyers and Marquis(1969) investigated 567 successful new products developed by 121 firms representing five manufacturing industries, and concluded that most were *market-pull* projects; only 21% were *technology-push*. Rubenstein (1976) published a study aimed at defining the barriers and facilitators in the innovation process and identified a number of myths. He noted that there was no one factor governing success and in some cases one company's facilitator was another barrier. Hopkins' study(1981) focused on failed new products, and the findings

pointed out that the causes of new product failure were: poor marketing research, technical problems in design or production, and bad timing.

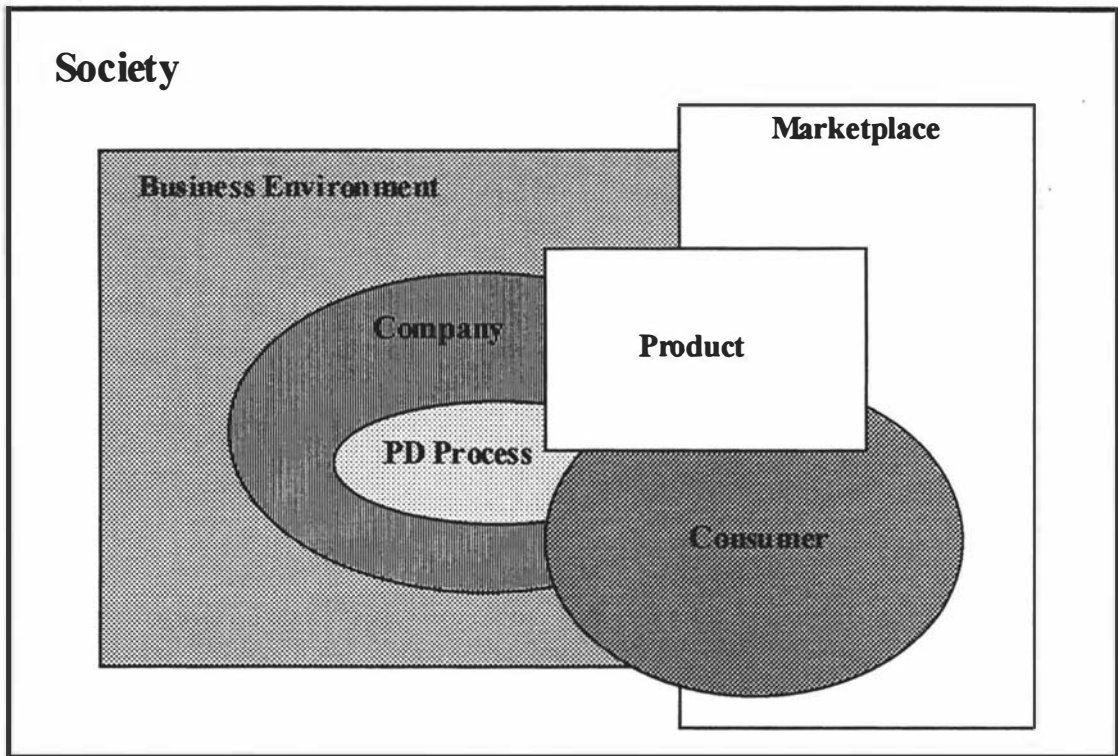
There was a fundamental flaw in these investigations: they looked at only either success or failure of new products, but not both in the same study. Simply because a characteristic is found to be common to a group of successes does not mean that this characteristic is a factor in success; had a group of product failures been studied as well, this characteristic might have been equally true of them. In order to identify the keys to new product success, one must identify the factors that separate winners from losers. That is why dyadic comparisons between new product successes and failures have become popular in an effort to discover principal discriminating factors. The British Project SAPPHO (Scientific Activity Predictor from Patterns with Heuristic Origins) (SPRU, 1972), was the first comparative study of product success and failure. A stream of studies using similar methodology were then carried out all-around the world.

2.4.1 General Areas Related to New Products Success and Failure

All the research projects, reviewed in this study, investigated different sets of factors in new product success and/or failure, due to the methods of research and the level of the research project. A summary of those factors studied in previous research, showing the relationship of each factor in terms with new products is shown in Figure 2.3. All of the factors investigated in previous studies can be grouped into each of these six sections.

The definitions of each section are:

- **Societal Forces:** The rules, regulations, and values that a society holds. Such societal forces are: global influences, national influences, social influences and culture influences.
- **Business Environment:** Includes competitors, financial and technological liquidity and it is affected by activities of these sectors, e.g. the rate at which a company brings new products to market dictates the corresponding response from competitors, the availability and cost of investment capital can dictate investment growth of industry.
- **Marketplace:** The combination of influences that together produce constraints that shape the nature of business response.

Figure 2.3 General Areas Related to New Product Success and Failure

- **Company:** The managerial structure for implementing a product development project. The nature of a company determines the sensitivity to various inputs to the development processes.
- **Consumer:** The end-users of a product, the distributors who indirectly reflect end-users' requirement to products, and in the case of reproduction and assembling, the manufacturers who require products.
- **Product Development Process:** The process with a sequential set of activities that transform technical ideas or market needs and opportunities into a new product launched onto the market[Thomas, 1993].
- **New Product:** Any product that users treat as an addition to available market offerings [Pessemier, 1982].

These factors can be used to measure new product success and failure. In other words, the factors can be studied in new product development to see how important they are to new product success and failure. Measurement of the degrees of new product success and failure

can be related to the levels of these factors, to determine the ranking in importance of the factors in new product success and failure.

2.4.2 Specific Factors that Impact on New Product Success and Failure

The review of previous research summarized a large number of factors that influenced new product success and failure. They are grouped in Table 2.3 in sections: market, company, consumer, product development process, and new product.

Of those factors, product advantage and product development process execution were widely viewed as critical determinants of new product success[Cooper, 1979a, 1984b; Cooper and Kleinschmidt, 1987a; Link, 1987; SPRU, 1972]. Not surprisingly, new products would be more successful in the market, if they had superior quality, offered unique features that benefited the customers, solved a problem that the customer had with existing products, or reduced cost compared with competitive products. Thus creating a superior new product is the top priority in a project screening model or checklist[Cooper, 1993]. A strong relationship between product superiority and product development process execution was found in previous research[Cooper, 1984b; Link, 1987]. In fact, developing a new product with real advantages and customer benefits was a top objective in the new product process. So the development team needed to build in extensive market research and work closely with customers/users to identify customer needs, wants and preferences.

“Simply being ‘equal to competition’ or having a ‘good product/market fit’ is not enough; rather, the goal must be superiority and advantage. ... And the superiority must be in the eyes of customers.”[Cooper and Kleinschmidt, 1990a].

There is strong evidence of the relationship of a formal new product development process to new product success. A complete and high quality new product development process leads to faster new product introduction, less recycling to re-do steps, and a higher rate of launched products[Cooper, 1993].

Table 2.3 Common Factors in New Product Success and Failure

Market:	Marketing proficiency(6) Market knowledge (6) Marketing synergy(3) Market potential - market size and growth(3) Marketing competitiveness(3) First on market - speed to market(2) Market attractiveness
Company:	Top management support(5) Technological synergy(4) Organizational communication(3) Technical and marketing skills and resources(3) Effective use of outside technology and science resources Cross-functional development team Proficiency of technological activities Marketing and managerial synergy Actions and attributes of company as a whole Seniority of responsible managers Perceived risk Timing
Consumer:	Consumer needs, wants, and specification(4) Customer price sensitivity
Product Development Process:	Management of launch execution(5) Efficiency of development(6) Good product idea screening(3) Up-front homework prior to the development phase(2) Logical plan(2) A high quality new product development process Prototype test with customer Test market Individuals in development Structure of new product organization Understanding buyer behavior and purchase decision forces
Product:	Product advantage(superiority)(7) Product quality(3) Product uniqueness(2) Product fits with internal functional strength(2) Technical superiority of product Price of product

Note: Numbers in brackets after statements indicate the number of studies that found the factor is important to new product success and/or failure.

Source: [Booz Allen-Hamilton, 1982; Cooper, 1979a, 1984b, and 1991; Cooper and Kleinschmidt, 1995; Edgett, Shipley and Forbes, 1992; Hopkins, 1981; Lester, 1998; Link, 1987; Mishra, Kim and Lee, 1996; Rubenstein, 1976; Song and Perry, 1994; Song and Perry, 1997; Song, Montoya-Weiss and Schmidt, 1997; SPRU, 1972]

There were several activities in the new product development process underlying the more important impacts on new product success. For example, the definition of the product prior to commencing the development phase was a cornerstone of successful product development. A pivotal step in the new product process was to define the target market, product concept, customer needs and wants, product requirements and benefits to be delivered before development gets under way. This definition also served as a communication tool and guide[Cooper, 1984c].

A strong market orientation was critical to new product success[Cooper, 1979a]. A thorough understanding of customer needs and wants, the competitive situation and the nature of the market were found to be a major ingredient in new product success. A market orientation began with idea generation, and prevailed throughout the entire new product project. And market research was used as an input into the design decisions, not solely as an after-the-fact check[Cooper, 1993].

It was also found that synergy was vital to new product success[Mishra, Kim and Lee, 1996; Cooper, 1984b]. Two types of synergy were relevant: technological synergy and marketing synergy. Technology synergy showed the degree to which the new product project was compatible with the company's existing technological resources. Successful projects featured strong fit between the needs of the project and the firm's R&D or product development resources, its engineering resources and skills, and its production resources and skills. When new technology arenas seem exciting and replete with new opportunities, the risks and odds of failure can be high[Mishra, Kim and Lee, 1996]. Market synergy means project/company fit in terms of sales forces, advertising resources and skills, customer service capabilities, and market intelligence resources and skills. It was worthwhile to pay attention to marketing synergy when launching a product in a new or unfamiliar market[Mishra, Kim and Lee, 1996].

It was notable that there were no factors belonging to the environmental and the societal section in the list of important factors to new product success and failure. In Cooper's study(1984c), he divided all factors into environmental factors, which related to the setting in which a new product was developed, and controllable factors, which related to the characteristics of new product activities that were controlled by the company. The results of the study revealed that environmental factors did not play a critical role in deciding new

product success. The controllable ones had a decided and strong impact on new product success. Those environmental factors which had no or little influence on new product success included market competitiveness and market attractiveness.

The possible reason for this rather surprising result is that an attractive market would be noticed by many competitors, and then become highly competitive. The positive and negative aspects cancel each other, and new product performance is neither heightened nor diminished by these factors[Montoya-Weiss and Calantone, 1994]. The conclusion thus is that “new product success is not so much a matter of what technology, market or product, but how well the project is undertaken.”[Cooper and Kleinschmidt, 1990a]. Balachandra and Friar’s review(1997) also did not find clear link between new product success and environmental aspects. By contrast, a study in South Korea found market competitiveness and attractiveness important to new product success[Mishra, Kim and Lee, 1996]. Similar findings appeared in a Chinese study[Song and Perry, 1994], and it was suggested that is because of different levels of industrialization and sophistication of customers.

Balachandra and Friar(1997) noticed that the list of significant factors for new product success and failure was very long, and the factors were contingent because depending on the situation, different factors became more or less important. The lack of clear definitions of factors might lead to confusion, as in some cases the factors were considered self-evident.

2.5 Several Key Research Projects on New Product Success and Failure

2.5.1 SAPPHO Project in UK(1972)

The British project SAPPHO (Scientific Activity Predictor from Patterns with Heuristic Origins) conducted in 1971, was the first comparative study of product success and failure. SAPPHO sought a pattern of differences between a sample of 43 pairs of successful and unsuccessful innovations in the chemical and scientific instruments industries. The products were selected from two unrelated industries in order to identify possible effects. Of the 122 variables measured, 41 discriminated between successes and failures. The five most important factors were:

- understanding of users’ needs;
- attention to marketing and launch publicity;

- efficiency of development;
- effective use of outside technology and external scientific communications;
- seniority and authority of responsible managers.

The SAPPHO findings introduced two new success factors both of which were related to characteristics of the organization and the team that developed successful products. The first one was that the R&D team must be efficient and effective in their development efforts. R&D efficiency and effectiveness was defined as the ability to:

- identify product defects prior to the product launch;
- assess the feasibility of projects and select the most promising ones;
- appropriately allocate both capital and labor resources; and
- efficiently utilize the available resources.

The second factor was the need for an executive champion, a senior member of the firm with power and authority who fought for the product. The product champions facilitate the allocation of resources to the development effort, and stimulate co-operation and communication between the functional groups, other important factors in product success. The researchers concluded that many variables leading to product outcomes were amenable to better management control, particularly in the area of marketing.

2.5.2 Booz Allen-Hamilton's Project in the USA(1982)

Booz Allen-Hamilton(1982) investigated new product practices in 700 companies in the USA, and the characteristics that contributed to higher new product success rates were:

- product fit with market needs;
- product fit with internal functional strengths;
- technological superiority of the product;
- top management support;
- use of a formal new product process;
- favorable competitive environment; and
- structure of the new product organization.

The study determined the existence of common characteristics in companies which were more successful with their new products. For example, successful companies were more likely to have a strategic plan that included a certain portion of company growth from new products. They were likely to have had a formal new product process in place for a longer period of time. They were also more likely to house the new product organization in R&D or engineering and to keep the senior new product executive in the same position for a longer period of time.

The study concluded a list of “best practices” for new product management:

- make the long-term commitment needed to support innovation and new product management.
- implement a company-specific approach driven by corporate objectives and strategies.
- capitalize on accumulated experience to achieve and maintain competitive advantage.
- establish an environment (management style, organizational structure, and degree of top-management support) conducive to achieving company-specific new product and corporate objectives.

2.5.3 Cooper’s Projects in Canada(1979 ~ 1993)

Cooper started to study new product success and failure in mid-1970s, and his first project on new product success/failure using a success versus failure comparison method was Project NewProd(1979a). Data of 195 projects (102 successes and 93 failures) from 103 companies were received by mail survey to investigate each of the 77 variables in six blocks. Factor analysis was used to reduce the 77 variables to 18 underlying dimensions. This research provided an insight into the factors which separate the successes from the failures in industrial product innovation. The complex problem of new product outcomes was greatly simplified by identifying 18 underlying dimensions that capture much of the new product situation.

According to the results of this project, the three most important dimensions leading to new product success were ranked as:

1. a unique and superior product in the eyes of the customer, one with a real differential advantage in the marketplace;

2. a strong market orientation, built on solid market knowledge and sound market inputs, and undertaking the market research and marketing launch tasks well;
3. technological synergy(both development and production technology) and competence in the technological tasks in the project.

New products that were high in all of these three dimensions had a 90% chance of success. Conversely 93% of products that were low on all the three dimensions failed.

Secondary factors that also contributed to new product success included marketing and managerial synergy; positive value-in-use for the customer; dynamic market situations; large, high-need growth markets; strong market communications, sales force and launch effort. On the other hand, some strong dimensions leading to new product success did not differentiate between success and failure. 'First to market' was one of them, in spite of 'Product Uniqueness' being identified as an important dimension in new product success.

The Project NewProd III, conducted in 1990, was a retrospective analysis of 203 new product projects in 125 industrial product companies. It tried to seek a pattern to new product success and found that new product success was most strongly decided by ten key factors in rank order:

1. a superior product that delivers unique benefits to the user;
2. a well-defined product prior to the development phase;
3. quality of execution of technological activities;
4. technological synergy;
5. quality of execution of predevelopment activities;
6. marketing synergy;
7. quality of execution of marketing activities;
8. market attractiveness;
9. the competitive situation;
10. top management support.

When looking at the quality of execution of new product development activities, NewProd-III found that the greatest differences between success and failure lay in the first few steps of the new product process. Initial screening, preliminary market assessment, preliminary technical assessment and detailed marketing research were critical, and made all the difference between

winning and losing. This study also found that successful new product projects spent more financial and human resources in these early steps, while failed ones spent more in customer test, trial sell and trial production. The reason was that by that stage in the process, troubles had already appeared in the project, and people resources were allocated in a desperate attempt to fix the project. But it was too late. Had some of this energy been applied much earlier in the project, the evidence suggested that the results would have been more positive.

More recently, Cooper and Kleinschmidt(1993) conducted another NewProd study of product development in the North American and European chemical industries. They replicated some of their earlier findings. Product advantage, once again, was most strongly associated with financially successful products. New findings that influenced new product success included: sources of idea, order of entry, product life cycle, benefits delivery, and organisational structure. Contrary to their earlier study, they found in this case that market competitiveness had no relationship with product success. These results suggested that the effect of market competitiveness on project outcomes needed further investigation.

2.5.4 Link's Project in Australia (1987)

Link studied new product success and failure in 135 of Australia's largest industrial marketing companies(mainly manufacturers). Nineteen variables were given to the participants to indicate what extent they had contributed to the success or failure of new products that had been launched in the last 5 years and been clear-cut successes or failures. Six significant underlying factors were ranked determining industrial new product success or failure:

1. management of launch execution;
2. synergy of new product with existing business;
3. completeness of market intelligence;
4. production/market attractiveness;
5. novelty of product;
6. quality of product.

And there were additional reasons that were not in the 19 variables, but were stated by the respondents to influence the success or failure. For example, "Existing credibility or image of the supplier of the new product" was identified to contribute to success, while "Level of

company resources devoted to the new product project - staff, facilities and management support” was another reason of failure.

The findings were compared with those of Cooper's research(1979b) and, obvious differences appeared. The Australian study showed a wider set of factors to explain success or failure than Cooper's Canadian study. The Australian study revealed more situation-specific factors, like product/market attractiveness. And in the Australian study, launch execution factors seemed to be more important than synergy and product uniqueness to new product success. The possible answer given was that Australian new product programs were highly reactive, imitative and less innovative, 85% of all new products involving this research were 'Me-too' and line-extension products which may be more dependent for their success on launch execution than other factors. It might be also because a wider sample size was used in the Australian study[Link, 1987].

2.5.5 Projects in Asian Countries (1993 ~ 1996)

In recent years, a number of studies were conducted in Asian countries, while most early research was focused in North America and Europe. This trend somehow reflected the economic boom in this area.

Parry and Song(1994) conducted a survey in state enterprises in the People's Republic of China(P.R.C.) to examine the generalizability of the work of Cooper regarding the correlates of new product success and failure. Their principal components analysis of 258 reported product successes and failures yielded 16 significant components. Stepwise discriminant analysis was performed to determine which dimensions were significantly correlated with project success and failure. Six dimensions emerged as the most important predictors of new product success in China:

- market potential and marketing proficiency;
- competitive intensity and relative lack of product advantage;
- production start-up proficiency;
- perceived risk;
- market determinateness;
- technical synergy and proficiency.

A research project of Mishra, Kim and Lee(1996) studied factors that contributed to the success or failure of new product development efforts in South Korean companies. 288 successful and unsuccessful products from 144 Korean companies were investigated. The results indicated that the factors most closely related to new product success and failure in Korea were:

- market intelligence;
- product/firm compatibility;
- the nature of the new product idea(e.g. whether the product idea was market derived);
- launch efforts;
- general characteristics of the new product venture(such as the product's innovativeness to the market and its technical complexity).

To explore the question of whether a global set of success factors can be identified , they compared their findings with those of similar studies conducted in Canada[Cooper, 1979a] and China[Parry and Song, 1994]. Several important factors in the Korean project were emphasized in the studies of Canadian and Chinese new product success, though findings of those studies also highlighted the importance of the product offering and proficiency of formal new product development activities. The differences might be caused by the different stages of economic development. Temporal differences in data collection or the industries and companies represented in the sampling frame are also some possible reasons.

Song, Montoya-Weiss and Schmidt(1997) investigated the role of marketing in developing successful new products in South Korea and Taiwan. These two countries have successfully transformed themselves from producing mainly low-value, labor-intensive goods to producing many high-value, high-technology products that require significant marketing savvy and proficiency. Over six hundred new products recently developed in South Korea and Taiwan were tested to reveal the interrelationships among marketing resources, skills, activities, and new product performance. It was found three important similarities across South Korean and Taiwanese companies:

- Marketing resources synergy did not directly increase the level of new product success. Rather, marketing resources synergy aided in the development of appropriate marketing skills.
- Marketing skills synergy was important for new product performance.
- Proficiency in marketing activities enhanced new product performance.

One major difference between South Korea and Taiwan was uncovered in this research. In Taiwanese companies, marketing activities mediated the efforts of marketing resources and skills on new product performance. In Korean companies, marketing skills and marketing activities directly impacted new product performance. It was argued that this was because of culture differences in human resources practices.

Song and Parry(1997) reported the results from a three-year study of new product development practices in Japanese companies. There were eight hypotheses tested on 788 new products that were developed and commercialized by Japanese companies in the past four years. The 'best practices' identified in this study suggested that Japanese new product success was positively influenced by:

- the level of cross-functional integration and information sharing;
- the company's marketing and technical resources and skills;
- the proficiency of the new product development activities undertaken;
- the nature of market conditions.

Cross-functional integration was a key driver in diffusing market and customer knowledge among all members of the project team. This integration ensured that an understanding of market needs, desires, and behavior in the early stages of development constituted the foundation for technological applications valued by customers. It was also found the importance of selecting projects that fitted a company's technical and marketing skills and resources. Product competitive advantage was another key determinant of new product success.

2.5.6 Projects in New Zealand

Research on new product success and failure in New Zealand can be traced back as early as the beginning of 1980s. One study in New Zealand food industry was carried out by West(1980). Twenty four companies in the New Zealand food industry participated in this project. The reasons for successful product development were:

- consumer research/knowledge of consumer;
- a unique product;
- consumer demand for the product;
- attitude of senior management;
- good idea generation and evaluation;
- staff market and/or development strength;
- good communications between marketing and technical staff;
- price of the product;
- packaging of the product.

The reasons for failed product development were:

- failed to fill a consumer need;
- market segment too small to support the product;
- shortage of new material;
- insufficient planning;
- wrong time of launch;
- lack of senior management support.

Factor analysis was applied in this study and the final results presented five important factors in new product development in New Zealand food industry:

1. innovative and technological company orientation;
2. supportive company structure;
3. consideration for the consumer;
4. security for development;
5. well-rounded company marketing.

The study suggested that for more success, product development must be seen and understood as a team effort involving cooperation between design technology and marketing personnel.

Another project by Putt(1993) investigated barriers to innovation in New Zealand food industry, and determined the main problems affecting the operation of product development in the company were:

- poor attitudes and culture of company;
- managers' lack of knowledge of product development;
- low industry profitability and small export market;
- lack of R&D incentives.

Kerr's study(1995) investigated the practice of product development in small-sized companies in New Zealand and the effects of the New Zealand environment on the attitudes and undertaking of product development. When looking at the participating managers' perceptions of the importance of success factors, several factors in product development were found important to new product success:

- top management support and commitment;
- good customer research and marketing;
- creative company environment;
- company technology synergy;
- product with relative advantage.

The newest project conducted in New Zealand was a comparison of U.S. and New Zealand small entrepreneurial high technology companies[Souder, Buisson and Garrett, 1998]. This study compared the relative new product development proficiency of small, technology-based companies in the United States and New Zealand. These companies(26 from U.S. and 29 from New Zealand) operated in rapidly growing, highly competitive markets characterized by evolving customer needs. They shared similar goals: creating technically superior products with unique features for emerging markets, with the ultimate goal of become the product and market leaders within their respective industries.

The results of the study indicated that respondents from the two countries differed in terms of the focus of their new product development management systems and the manner in which they strove to achieve success. New Zealand respondents placed greater emphasis on marketing skills and new product development proficiencies than their U.S. counterparts, and they achieved higher levels of new product development performances.

The group of New Zealand companies in the study had possibly unique export marketing skills, developed in response to an unusual government policy 'experiment', and therefore were more proficient in product development than their American counterparts. It somewhat indicated that the culture of today's New Zealand economy, the youthful vigor of its companies, and the government policies toward innovation were intertwined matters that could not be neglected in assessing the performance of New Zealand companies.

2.6 Factors on New Product Success and Failure in the Electronics

Industry

While many studies on new product success and failure generally looked at mixed industries, others were focused on a certain industry to identify more specific factors in new product success and/or failure.

A few research projects investigated new product success and failure in the electronics industry[Maidique and Zinger, 1984, 1990; Yap and Souder, 1994; Loch, Stein and Terwiesch, 1996; Souder and Song, 1997; Terwiesch, Loch and Nieferkofler, 1998]. A number of factors were identified to be important for new product success and failure. These factors are shown in Table 2.4. These factors reflected, in some level, the characteristics of the electronics industry. Products that contribute high margins to the companies are a unique feature for the electronics industry, as electronic products usually have higher profit margins than other products. Market environment was emphasized, where intensity of competition correlated with success[Maidique and Zinger, 1984].

Zinger and Maidique's recent study(1990) revealed the importance of excellent internal organization, which means smooth execution of all phases of the product development process by well-coordinated functional groups. The firm's existing technological and organizational

competencies were the foundations of new product success, but strengths of marketing and manufacturing departments did not contribute to success.

In a research project on small high-tech firms it was noted that niche market identification was highlighted. Niche means smaller market size and less profit, and these markets are often ignored or overlooked by big companies. It provides good opportunities for small companies to introduce customer-responsive products. For the same reason, the limited potential of a small or mature market can protect small companies from emergent competition[Yap and Souder, 1994].

Table 2.4 Important Factors in New Product Success and Failure in the Electronics Industry

Market:	Market competition(2) Market potential(2) Marketing proficiency Niche Market
Company:	Market Synergy(3) Technology Synergy(3) Top management support through the whole process(2) Well interfaced relationship with customer(2) Well coordinated functions of development and marketing High quality interdepartmental communications Existing technological and organizational competencies Avoiding technology modifies customers behavior dramatically Recruiting influential product champions
Consumer:	Select users who are eager to adopt
Product Development Process:	Well planned and executed R&D process(2) Applying high quality resources
Product:	Technically superior and feature strong product uniqueness (4) Product introduced into the market early(3) Product provided significant value to customer(2) Product has high performance-to-cost ratio(2) Product provides a high contribution margin to the firm

Note: Numbers in brackets after statements indicate the number of studies that found the factor is important to new product success and failure.

Source: [Loch, Stein and Terwiesch, 1996; Maidique and Zinger, 1984; Souder and Song, 1997; Yap and Souder, 1994; Zinger and Maidique, 1990]

Loch, Stein and Terwiesch(1996) developed a two-step model for measuring the performance of the new product development(NPD) function, and applied it to a sample of companies operating in the international electronics industry. This study found that development productivity was the clearest predictor of business success. It indicated the importance of NPD efficiency. It was also found that in the computer industry, design-to-cost and design quality had positive effect on profitability growth, and in the industrial measurement/large system industry, technical product performance was emphasized.

When examining the relationship between product success and several product design and market choice strategies in the electronics industry, Souder and Song(1997) found successful new product strategies differed under perceived high and low market uncertainty conditions. For small U.S. companies, under high market uncertainty, a focus on design compatibility with a purchaser's installed base was emphasized; and under low market uncertainty, performance and technical superiority were key factors. For large U.S. and Japanese companies, under high market uncertainty, performance superiority, technical superiority, and radical design were highlighted as important factors to success. And under low market uncertainty, radical design had a negative effect on success, and compatibility was emphasized.

2.7 Factors on New Service Success and Failure

In recent years, the industrial services sector represents an increasingly important growth sector in economy. It is not surprising that relative research on service success and failure has become popular.

One of the studies was de Brentani's(1989) investigation in a broader range of industrial services, including financial, management, transportation and communication services. Business service companies evaluated new service performance in multi-dimensional terms. Of the four independent performance measures identified in this research(sales and marketing share, competitive performance, cost performance and 'other booster'), of overwhelming importance in gauging success was the sales and marketing share achieved by a new service.

Different factors impacted on each form of success. To be a winner on sales and market share, required a strong marketing orientation by the company, and good understanding of customer

needs, a proficient marketing and service delivery system, and a successful internal marketing program. For another important measure, competitive performance, service innovativeness and providing customers with superior quality were the key to a successful new service. Success on cost performance was primarily accomplished through project synergy.

Cooper and de Brentani(1991) studied the industrial financial services. Using a self-administered questionnaire, data on 56 successful and 50 failed service products was obtained. Five factors were viewed as determinants of new industrial financial service success and failure:

- Business synergy
- Product/market fit
- Quality of execution of launch
- Unique/superior product
- Quality of execution of marketing activities

There were other factors influential: market size and growth, service expertise, and quality of execution of technical activities.

In general, the success factors for financial services paralleled those for new manufactured products but had different potency. Obviously, the number one success factor for new products, unique/superior product was well down the list for new service success. Similarly, quality of execution of technical activities appeared relatively more important for new products[Cooper and de Brentani, 1991]. There was evidence to indicate that new financial business services were significantly more expert- and operation-driven than customer- or marketing-driven.

Atuahene-Gima(1996) compared innovation activities of Australian manufacturing and services companies. The study explored managers' perceptions of the factors necessary for successful new product development(NPD) and new service development(NSD). Services and manufacturing companies focused on similar factors for improving innovation performance. However, the relative importance of those factors depended on the type of company.

The ranks order for the most important factors impacting on success and failure for new product and new service are in Table 2.5.

Table 2.5 Important Factors in Success and Failure for Products and Services

Rank	New Product	New Service
1	Product innovation advantage/quality	Importance accorded innovation activity in human resource strategy
2	Management support and teamwork	Management support
3	Firm size	Service innovation advantage/quality
4	Importance accorded innovation activity in human resource strategy	Proficiency of market launch activity
5	Technological synergy	Marketing synergy
6	Marketing synergy	Technological synergy

Source: [Atuahene-Gima, 1996]

The number one factor for services, the importance accorded innovation activity in human resource strategy, ranked fourth in importance for manufacturers. The most important factor for manufacturers was product innovation advantage and quality, and in contrast, service innovation advantage and quality was ranked third in importance for service companies. Compared to manufacturers, successful service companies placed greater emphasis on selection, development, and management of employees who worked directly with customer. These personnel’s close contact and potentially long-term relationship with customers made them an important source of new ideas in the company’s NSD process.

2.8 Conclusion and the Factors on New Product Success and Failure in the New Zealand Electronics Industry

Previous research uncovered a great diversity of variables which are related to new product outcomes. The review of the literature suggested that new product success and failure is a very comprehensive issue. There were common factors among the reviewed studies, and because of different research methods, different research interests, and variety of research area(in business and geographic), different or even contrast findings are not surprising.

A review of those factors in previous studies led to a list of factors that could hypothetically impact new product outcome in the New Zealand electronics industry. There were several issues considered to form the factors:

1. Factors from project-level studies were selected. Because of methodology of research, it is necessary to use factors in the same level of research for later valuable comparison.

2. Common factors found important to new product success and failure in more than one research project were chosen to examine the generality.
3. Factors found particularly influential in the studies in small-sized companies, as most New Zealand companies are small to middle size.
4. Factors found only in research in the electronics industry(including information industry and computer industry).
5. Factors revealed from studies conducted in the countries(regions) similar to New Zealand, such as Australia, South-east Asian countries, and Pacific Region.

These factors were divided into four main groups according to their descriptions of the marketplace, the company resources, the new product development process, and the new product.

This is a project-level study aimed to determine what separates new product success and failure in the New Zealand electronics industry, and compare what differences are between New Zealand electronic companies and overseas counterparts.

There are generally three domains of research in new product success and failure, as reviewed in this chapter. They are research on factors leading to new product success, factors leading to new product failure, and factors distinguishing between new product success and failure. New product success studies identify characteristics and factors leading to success, whereas failure studies provide retrospective analysis of past failure to identify the determinants of failure or common pitfalls and problems in the development process[Montoya-Weiss and Calantone, 1994]. They both have limitations as only one side of the projects is probed at one time. So the comparisons between new product success and failure have become popular in an effort to discover principal discriminating factors from both sides of experience in new product development. Three methods are all used in this study.

In this study, the simple measure of new product success and failure, e.g. whether the product's profitability exceeded or fell short of the minimum acceptable profitability for the type of venture, was used. This measure was used by many previous studies and was recommended as the most common measure of new product success and failure at project-level[Griffin and Page, 1996].

Chapter 3 Comparing New Product Success and Failure: the Methodology

3.1 Introduction

In this chapter the methodologies of this study are described. From previous research reviewed in Chapter 2, common factors to new product success and failure were selected for the surveyed electronic companies in New Zealand to determine the relative importance of these factors on new product success and failure. These companies were chosen from a cross section of manufacturers, distributors, and manufacturers/distributors. A mail survey was used for collecting information from these companies to assess the impacts of these factors on new product success and failure. It was followed by in-depth face-to-face interviews to confirm and explain the results of the mail survey, as well as to identify any unique factors brought out in the survey.

Detailed topics in research methodology are presented. Mail survey, as first part of the project, is discussed in details about the sampling, questionnaire and organization method. Next the data processing method is presented to show the process of which data collected from survey was analyzed. In-depth interviews were the second part of the project. The method of face-to-face interview, and topics covering during the interviews are described.

3.2 Definition of terms used in the Research

□ New Product was one which was new to the firm developed and/or commercialized by the respondent's company in the last two years(1992 ~ 1994). It was easy for respondents from companies to select clear-cut successful and failed new products for answering questions in the survey.

□ New Product Success and Failure was defined in terms of profit, i.e. whether the product's profitability exceeded or fell short of the minimum acceptable profitability for the type of venture. Because of selection errors that could result from difficulties or the use of this operational definition of new product success and failure, participants in this survey were asked to select products that were unmistakably clear-cut success or failure.

3.3 Selection of Factors for New Product Success and Failure

Factors that were used in the survey were selected from a number of previous research projects on new product success and failure(See Chapter 2). A review of these factors led to structure a list of factors that may impact new product outcome in New Zealand electronics industry. These factors were accordingly classified into four main groups to make it easy for respondents to answer questions (Table 3.1):

Table 3.1 Four Main Groups of Factors for the Current Study

• Nature of Product	the characteristics of the new products.
• Project Activities	How well the activities were undertaken during the new product process, from idea generation to launch. This group was designed for those companies that are carrying out new product development, and normally are manufacturers.
• Market Characteristics	the nature of the new product's market environment
• Skills and Resources	the compatibility of the resource base of the firm with the requirements of the project, and the information required during the new product process

According to the relevant issues under consideration which were described in section 2.8, and to the factors shown in Table 2.3 and Table 2.4, a total 32 variables were selected as the factors that impact on new product outcomes(Table 3.2). They were designed to throw light on hypotheses previously advanced to explain new product success and failure.

While most of these factors were clearly stated, some of them might lack clear definitions. Because they were all tested by previous studies without clear definition[Balachandra and Friar, 1997], they were considered self-evident. Therefore despite the different statements or methods used in the previous studies, it may be possible to compare results of this study to those of previous ones. In case of any extra factors emerging as new findings that were not revealed in previous research, the survey provided spaces to respondents to give their own opinions on the topic of new product success and failure, either a factor or comments.

Table 3.2 Factors on New Product Success and Failure for the Current Study

Nature of Product
1. Superior in quality
2. Technically superior to competitors
3. Better suited to our firm's technology
4. Attractive in appearance
5. First on the market
6. Made to meet users' needs
7. Allowed greater pricing flexibility
8. Good value for money
9. Less after-sale problem

Project Activities
1. Product concept was developed using idea-generation techniques
2. Undertook sound technical assessment
3. Undertook preliminary market assessment well
4. Undertook financial analysis well
5. Undertook prototype development well
6. Undertook prototype test well
7. Undertook in-depth consumer evaluation
8. Developed with a clear market strategy

Market Characteristics
1. Market size was large
2. Market growth was high
3. The consumer had great need for product type
4. Intense price competition in market
5. Many competitors in market
6. Customers satisfied with existing products
7. Frequent new product introductions in market

Skills and Resources
1. Very experienced project team
2. Multi-functional development group
3. Good understanding of buyer behavior
4. Project supported by senior executives
5. Adequate financial resources
6. Strong sales force launch effort
7. Adequate advertising skills
8. Adequate distribution resources

It should be noted that these factors were listed randomly in each group, not in the order of importance as previous studies identified, or in the order of repeating times appearing in previous research projects. This way the respondents would not gain the impression that some factors were more important than others. Of these factors, it was also recognized that some would probably prove unimportant in the sense that they might not be applicable to a part of the cases in this study.

3.4 Mail Survey: New Product Success and Failure in the New Zealand Electronics Industry

3.4.1 Objectives

This was a nation-wide survey to gather information on new product success and failure in the New Zealand electronics industry. The objective of the survey was to determine the opinions of senior managers in the New Zealand electronics industry, on the selected factors that influenced a new product's performance in the market.

From the survey, the following information was collected:

1. Information on new product success and failure, which was based on the participants' own past experiences in new product development. A list of factors was provided for respondents to indicate how well they thought they described the successful and failed new product. The respondents were also asked to give extra comments on this topic. The data collected were used to analyze the influence of the factors in new product success and failure.
2. General information and demography of companies in the New Zealand electronics industry, which included product ranges(industrial or/and consumer), manufacturing or distribution, annual sales, export market, R&D activities. It was important to also get information on the frequency of new product introduction, as this research is about new product development. From this information, it was possible to divide the companies into groups for comparison, to see if there were different findings because of the companies' nature and size.

3.4.2 Sampling Design

Samples in this survey were taken by non-probability sampling. Although a probability sampling method is statistically more representative, it was impossible to conduct a random sampling from an unknown exact population of New Zealand electronics companies. Non-probability sampling means that samples may not statistically representative of the whole population. But this sampling method was easy and low-cost, and suitable for exploratory research.

The result was a judgment sample using a non-probability sampling method. Theoretically they have no statistical relationship to the whole population. There is no way of knowing whether the sample results are accurate, simply because they are not randomly selected. Non-random samples may be perfectly representative, but one cannot be sure. The standard errors and confidence intervals are only valid within the samples, not the population.

Directories are the most widely used source for choosing an industrial sample. They provide the lists from which the selection is made. Companies that participated in this survey were selected from *New Zealand Export Year Book(1993)*. The reasons for using the Export Year Book were:

- Companies listed in the *Export Year Book* are likely exporting their products, therefore they were expected to be more or less situated in the international environment, where the market is highly competitive, and technology is changing rapidly.
- The classification of companies in the *Export Year Book* is according to product range. It is easy to locate companies dealing with electronic products, and for some companies, there are even lists of products.
- Every company in the *Export Year Book* provides a contact phone number, and some give the name of senior manager. This gives a direction for contacting potential participants

The companies listed under 'electronics, computing and communication' in the Export Year Book(1993) were screened. Companies that listed product ranges related to electronics, which included electronic equipment, telecommunication devices, computer hardware, and electronic components, and companies listed under 'industrial, electrical and building' section who were dealing with products like electric switches, equipment, and electromotors were selected. They

were all of the companies in Export Year Book that could be defined as electronics companies, with total number over one hundred, and they could be viewed as a specified population of electronics companies in New Zealand. These companies included manufacturers, distributors, and manufacturer/distributors.

According to a research report, in 1992, there were about 200 companies in New Zealand engaged in electronic product manufacturing, and about 100 of them exported [New Zealand Trade Development Board, 1992]. Therefore, it was believed that the specified population of electronics companies would be indicative of the real circumstances of the New Zealand electronics industry.

The next stage was to contact these companies by telephone and ask them whether they were willing to participate this survey. There were over 100 companies selected from *Export Year Book*. But a few companies did not want to take part in the survey because, a suitable person was not available at the time, or they were 'too busy'. A total of 98 companies were then selected as a sample for the mail survey. It was also expected that there would be 'no response' in the mail survey, and the acceptable response rate is 20 to 40% [Green, Tull and Albaum, 1993]. Because the sample size was quite small, it was aimed to get the minimum of 40% of response rate, i.e. have about forty useful questionnaires returned.

3.4.3 Questionnaire Design

This was a mail survey focused on new product success and failure in the New Zealand electronics industry, therefore questions asked were expected to collect data that were adequate for analysis on this topic. There were two major parts in the questionnaire, one for the extent specific factors contributed to new product success and failure, the other for general information collection.

- **Impacts of the Factors on New Product Success and Failure**

This was the core part of the survey. As the study was a comparison research between new products success and failure, data from both successful and failed products were needed. Respondents were requested to select two products developed and/or commercialized by their

companies in the last two years(1992 ~ 1994), one a clear ‘success’, and the other a clear ‘failure’ in terms of minimum acceptable profitability. They were not asked to identify the product because it might be a sensitive question. This part of the survey was divided into two sections, one requested respondents to think about the successful product and answer the questions, and the other asked respondents to think about the failed product and answer the same questions as in the first section.

The questions, that were actually the the factors, were designed as short statements in plain language, which were divided into four groups to describe nature of product, project activities, market characteristics, and skills and resources. These questions used Likert scales to measure respondents’ attitudes by asking them to agree or disagree with these statements. The scales were designed as following:

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree	Not Applicable
(Statement)	1	2	3	4	5	6	NA

Respondents were requested to circle the number that best represented how strongly they agreed or disagreed with each of the statements. ‘Not Applicable’ was added, as there may be some statements not applicable to certain products. A space was provided at the end of each group for the respondent to add additional variable(s). Then respondents were asked to state the most important factor in new product success and failure in each group of factors. Space were left for respondents to write their comments.

The same questions were asked twice, first for successful products, then for failed products, in same order. It was easy to compare the scores of each factor on successful and unsuccessful new products, and assess the difference between them.

• **General Information about companies**

Questions on general information were divided into two parts. One was arranged at the beginning of the survey, which contained only two questions, product type, and frequency of new product introductions. It was aimed to get initial knowledge about companies, and lead

respondents to focus on the topic of new products. The other part was at the end of the survey, which was used to classify the company demographics. Since some of these questions were sensitive that respondents may be reluctant to answer, it was suggested to locate them at the end[Hague, 1985].

The questionnaire contained both close-ended, and open-ended questions. The open-ended questions were used on some issues that were difficult to guess answers. For example, 'how many new products are developed in your company each year?' and 'the export market location', were given a blank space for respondents to fill. A few questions simply asked 'yes' and 'no', such as 'does your company export?', 'Does your company carry out R&D activities?'.

The rest of the questions were multiple selective, such as 'annual turn-over', and 'product type', and 'main business'. Product type was divided into 'industrial' and 'consumer' or both; main business was divided into 'manufacturing', 'distribution' and 'retailing'. Another blank space was gave as 'other' for respondents to specify. Annual turn-over is a sensitive question that may involve the company's confidential information, so a range of amounts of money, which were according to a normal New Zealand company's size, were listed. As a mail survey, the number of choices was limited, so none of those questions had more than five choices. A copy of the questionnaire was in Appendix II.

3.4.4 Organization of Survey

The ideal respondent in a company was the person who was at senior managerial position, knowing the company's overall structure, and familiar with new product performance within and outside the company. General managers and managing directors of companies were selected as participants. In a few cases with the larger companies, technical managers, R&D managers, and industrial or engineering managers were selected.

First, a telephone call was made to the company's reception, stating that a survey in the electronics industry was going to be conducted, whether their company was willing to participate. Then asking about the name and title of the general manager, or anyone else in charge of new product development if the general manager was not suitable. Next, the survey

form, attached to a covering letter expressing the purpose of the survey, was sent to the participant. A free-post envelope was enclosed for returning the questionnaire. One week later reminding telephone calls were made to those companies which had not returned the questionnaires. The answers mostly were 'too busy', 'no interest'. Some said lost the form so a second survey form was sent.

The survey was conducted in November 1994, and it was attempted to gather the responses before the end of 1994. In fact, there were two questionnaires received after New Year 1995, because the respondents were away in the period.

After all the efforts on reducing 'no response', forty completed and partly-completed survey forms were received. Partly-completed forms mostly came from two groups of respondents. One group of them claimed they did not have failed products during the requested period(two years prior November 1994), so they did not fill the part of the questionnaire for failed products. Another group of respondents were from those distribution companies who were not doing product development, they skipped the questions in the section on project activities. The respondent rate was 41%(40 from 98), which met the initial expectation, and was acceptable for a mail survey[Pavia, 1991].

3.4.5 Data Processing Methods

Data obtained from the survey were tabulated to establish appropriate categories for the information on new product success and failure. The raw data were organized as a general data set, which could be used in the computer program for statistical analysis. The computer program Excel was applied as the analyzing tool; the principle analysis included two parts: one for information on new product success and failure, and the other for general information. The general information gave the classification of the companies that the survey covered. Percentage was used to describe the structure of each question. The result was simply a set of diagrams of percentages for demographics information.

The analysis of information on new product success and failure was conducted in several ways. First, the set of data was used to calculate distributions of scores for each factor. Second,

means and variances of factors were calculated. Finally, the significant level of difference between success and failure for each factor was obtained using the t-test.

- **Percentages of scores for the factors**

For each factor, there were six possible scores to describe the level of agree or disagree by respondents; percentages of respondents choosing each score for every factor were calculated to illustrate the distribution. From these distributions, the importance of the factors perceived by respondents were ranked.

The percentage P_a of a score a for a factor was:

$$P_a = c/(C-n)$$

Where, c is number of respondents who ticked score a for the factor, C is the total number of respondents for the factor, and n is the number of respondents who ticked 'Not Applicable'(NA) for the factor. Removing the numbers of respondents on 'NA' was to make all percentages for a factor round up to 100%. Because 'Strongly Agree' and 'Agree', and 'Strongly Disagree' and 'Disagree' very clearly expressed the trends of respondents, they were combined to make it easier to understand the distribution. Factors with a higher percentage of 'Agree' for successful products and lower percentage of 'Agree' for failed products were assumed to separate new product success from failure. Then the rank of percentages for the factors showed the levels of importance in new product success and failure.

The distributions of scores were processed in the whole data set to assess the factors' impacts on new product success and failure. The distributions were calculated for successful and failed products separately. And for each factor, the two distributions of success and failure were compared side by side in one chart. It showed difference of distributions between success and failure. When the difference was obvious, it indicated that the factor had strong impact on new product success and failure. When the two trends of distribution did not appear significantly different, it was likely the factor made little influence on new product outcomes.

The distributions of scores were also calculated in the groups of data of manufacturing and distribution companies respectively to investigate if there was any difference on a single factor's impacts between manufacturing and distribution companies.

- **Means and standard deviations of the factors**

Means and Standard deviations were calculated to show the trends and spread of scales of factors for successful and failed products respectively . The scale was 1 to 6, representing from 'strongly agree' to 'strongly disagree'. It was assumed that this was a linear scale. The smaller the mean score of a factor, the more likely that the factor was agreed by more respondents. By ranking the means from low to high, the relative importance on new product success and failure of all factors were arranged in order of levels of agreement by respondents. The ranking was conducted for the whole sample, and then in groups of manufacturing and distribution companies to assess the difference between groups.

- **Significance levels of difference between successful and failed products**

The significance level of difference was used in this study to assess the importance of a factor in distinguishing between new product success and failure, and the difference of a factor's impact on new product outcomes for manufacturing and distribution companies.

Significance level of difference was obtained from the two-tail t-test. When used for observing a factor's importance in product success and failure, the two samples in the t-test were the two sets of scores for a factor, one for successful products, another for failed products. When assessing a factor's different impact on manufacturing and distribution companies, the two sets of scores for a factor from the two groups of companies represented the two samples in the t-test.

The level of significant difference between two samples is represented by the probability that observes the likelihood of two samples. Obviously, the smaller this probability, the more likely it is that the two samples are significantly different.

3.4.6 Factor Analysis

Factor analysis is a method that can be used to analyze interdependence among a set of variables [Holbert and Speece, 1993]. These variables are measures of some underlying concept of dimension, and sometimes there are many measures for one concept. By examining how

variables depend on each other(interdependence), one can determine which variables measure the same and which ones measure something different. It is also used to determine which variable can represent underlying dimensions. By seeing which set of variables associate with each other, it is possible to identify a few variables that present the underlying dimensions well.

Factors are built by taking linear combinations of the variables with coefficients. The coefficients, representing factor loading, are the correlation of a set of factor scores with an original variable. A high factor loading indicates that the variable has a big influence on the factor, while a low factor loading mean not much influence. Typically, most of the influence from the variable is concentrated in only a few factors, and the rest are all discarded.

Factor analysis was employed because underlying dimensions were sought from the set of the factors that were tested in the survey. The set of the factors were used as the original variables in the factor analysis. Statistical analysis software 'SPSS for the Mac' was used to conduct the factor analysis. The analysis used a varimax rotation with communality value greater than 0.5. Only those factors with eigenvalues greater than 1.0 were extracted as significant underlying factors.

Factor analysis was used to the whole sample to find important independent factors for new product success and failure, and for manufacturing and distribution companies respectively to see if there were different factors determining success and failure in the two groups.

3.5 In-depth Interview: New Product Development and New Product Success and Failure

3.5.1 Objectives

The in-depth interview, which was the second part of the study, was the face-to-face meeting between the researcher and respondent for the purpose of collecting more detailed information on new product development within the company. Based on the mail survey results of important factors in new product success and failure, the in-depth interview was used as a case study to gather further and detailed information on new product development in New Zealand

electronic companies. It was also used to validate the findings of the mail survey and identify additional factors which may have been ignored. Rather than looking at the general attitudes of new product outcomes in the companies, the interview was more focused on the new product development process and relative issues. R&D managers, technical managers, or the person in charge of new product development in companies therefore, were the respondents for the face-to-face interview.

There were several issues of interest in the in-depth interview:

- **New product development activities in the companies**

It was to probe the actual PD process applied by a company, from initial idea generation to market launch; also any problems during the process were identified. Examples of successful and failed products were used to find out the key points of success and/or failure. It was valuable to see from the respondents' point of view about their products' advantages and weaknesses. This information was compared with the results of the mail survey.

- **The effects of new product outcomes and relative events on a company's prosperity**

The information included the company's competitive situation in local and international environment, the human and financial resources, and the information channels. The respondents' opinions of the New Zealand electronics industry, their company's future, and influence of government policy were also of interest. They were helpful in discovering the growth potential of the industry, suggesting the ways to improve product development management, and finally to create an 'ideal' model process of successful new product development for New Zealand electronics industry to compete in the highly competitive international market.

3.5.2 Selection of Companies for In-Depth Interviews

The companies for the in-depth interviews were selected from *New Zealand Export Year Book*. In order to cover as many companies as possible in the study, the companies who returned mail survey forms were not included. It was aimed to increase the total number of companies in this research. Because this part of the study was focused on new product development, only those

companies doing new product development were considered. *Matrix Directory of Technology* (1995) was use as a reference to ensure that the selected companies were doing manufacturing and R&D activities, as it listed such information on companies. A few small companies were chosen so as to compare their product development activities with that in relatively large companies.

For reasons of cost and travel convenience, more companies in Wellington, which was one of the centers of electronics manufacturing, were selected than companies in other part of New Zealand. The other two main locations of electronics manufacturing companies, Auckland and Christchurch[NZ Trade Development Board, 1992], were also areas from which companies to interview were selected.

It was necessary to test the interview topic in a trial interview with a Palmerston North company. Three other local companies in Manawatu area were selected as interviewed companies. A total of seventeen companies were selected to interview. They were located in:

<u>Auckland</u> :	4	<u>Christchurch</u> :	3
<u>Wellington</u> :	6	<u>Manawatu(local)</u> :	4

3.5.3 Respondents for the In-Depth Interviews

The respondents in the face-to-face interviews, were experts in product development, and very familiar with the product development process. R&D manager, design manager, or industrial manager, who were in charge of the new product outcome and familiar to the whole process of the company’s production and marketing routine, were the ideal respondents. It was an added benefit if the person had knowledge of the company’s history, management structure, and human resources. So the respondent of a company was the R&D manager, design manager, technical manager, and if it was a small company, managing directors were chosen as respondents. In a couple of companies, product development engineer and application engineer were respondents, as they were thought to have more detailed knowledge about new product development.

Firstly, a personal contact by telephone was made to the person to arrange a meeting. As the interviews in one city were restricted to a one-or-two-day’s trip due to the travel costs, the

possible time was limited. It was important to get all respondents in an area available in one or two days, then the meeting time for each interview was arranged. When the meeting time was arranged, a fax was sent to the respondent to confirm the arrangement. A pre-prepared topic sheet which contained the possible questions in the interview was also sent along with the fax, for the respondent to prepare for the interview.

3.5.4 Preparing the Interviewing Topics

This was a type of semi-structured interview[Hague, 1985], made up of a mix of some formal questions of a structured nature and others which were less restrained, so allowing open-end probing. It was flexible to accommodate the varied circumstances existing between companies in different product sectors and of different sizes.

The topics covered in the interview mainly related to the activities of new product development within the company, and some of respondent’s opinions on relevant issues. The topic checklist is shown in Table 3.3 (more detailed questions are shown in Appendix IV):

Table 3.3 In-Depth Interview Topics

<div>1. General Information of Your Company<ul style="list-style-type: none">Brief history of your companyStructure of your company -- R&D department (staff qualifications)The range of products</div>
<div>2. Focus on Your New Products:<ul style="list-style-type: none">Does your company follow any particular process of product development?Examples of successful/failed products you had experiencedSimilar competitive products?</div>
<div>3. Your Company’s Situation Relevant to New Product Development<ul style="list-style-type: none">Distribution channels and product promotionInformation channels(for the newest technology and the competitors)Strengths and weaknessesThe opportunities for your company in the future</div>
<div>4. Your Opinions<ul style="list-style-type: none">The NZ electronic industryThe government policy of supporting the firms to enter international marketThe role of business associations and trade boards in the industryDo you picture a model of an ‘ideal’ company?</div>

The interview was designed to take about one hour. Because of the less restrained nature, it was necessary to record the interviews and summarize the records in the report afterwards for later analysis.

3.5.5 Qualitative Analysis of the Interview

Unlike a mail survey, which obtained quantitative data for statistical analysis, the interview provided qualitative information. The qualitative information does not claim any statistical validity, but is concerned with exploring people's views and feeling in some depth[Gordon and Langmaid,1988]. The analysis of qualitative information is not a scientific and objective process, It answers such questions as 'what', 'why' or 'how' it but cannot answer the question 'how much'.

The meaning condensation method was applied to reduce the text of interview materials into brief summaries[Kvale, 1996]. The analysis began by reviewing the tapes of the interviews, and then recording the complete interviews on paper. Looking at the issues talked about, the contexts were classified under each group of the prepared topics. For each interview, a report was summarized the information under these topics.

The Ad Hoc Meaning Generation approach was used to summarize the comments from the interviews. The quotations that seemed particularly relevant to the events of the study were written down. The areas where participants strongly agreed or disagreed about an issue were noted. Similar comments were grouped to identify participants' preferences. Attention was paid to respect respondent's confidentiality by not to identify any respondent by name.

Chapter 4 The Companies Surveyed in the New Zealand Electronics Industry

4.1 Introduction

This chapter describes the 40 companies of the New Zealand electronics industry who participated in the mail survey. The data collected from the mail survey, which were analysed to give general information about these companies: the size, product range, age, and export market. The description of these companies is compared with a previous report about the New Zealand electronics industry. The manufacturing companies participating in the in-depth interviews were also summarised, and the descriptions of them were similar to those of mail survey.

4.2 Descriptions of the Companies in Mail Survey

4.2.1 Nature of Business

The majority of the 40 participated companies were marketing industrial products (24, 59%); 9(22%) companies both industrial and consumer goods, and 4(11%) only consumer products. The companies in 'Other' section included communication, technology and agricultural industry, which were grouped into the industrial section as they were not selling products to consumers.

4.2.2 Companies' Main Business

Of the companies 29(42%) were involved in manufacturing activities, 12(30%) of them were distributors as well; 11(28%) companies were solely distributors. It also found that most distribution companies were located in large cities such as Auckland(6), Christchurch(2), and Wellington(2). Six companies in other cities were all, except one, purely manufacturing companies.

4.2.3 Company Size and Annual Sales

Twenty-four companies(62%) were fairly small with thirty or less employees. Only 7(18%) companies had one hundred or more employees(See Figure 4.1). Twenty-five of the companies(64%) had annual sales between \$0.5 million and \$10 million dollars, and 12(31%) had annual sales over \$10 million. Only two companies(5%) had annual sales less than half million NZ dollars(See Figure 4.2). One company did not answer this question.

Figure 4.1 Company’s Employees

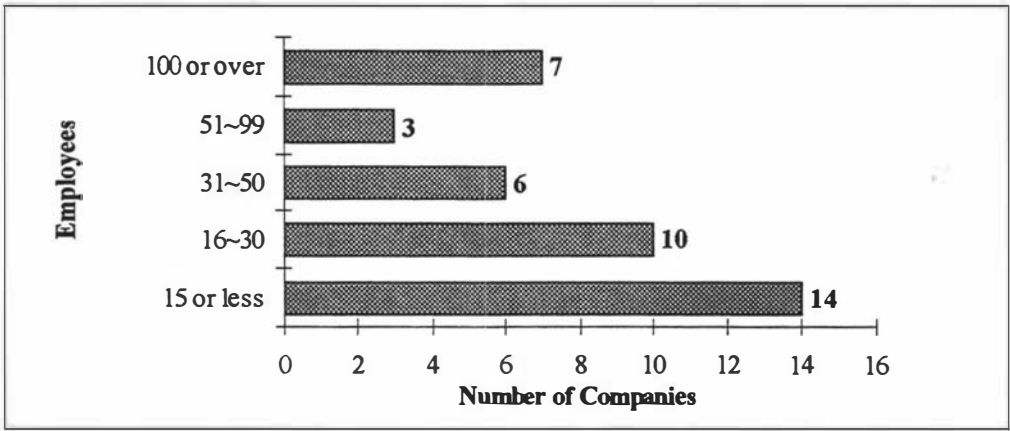
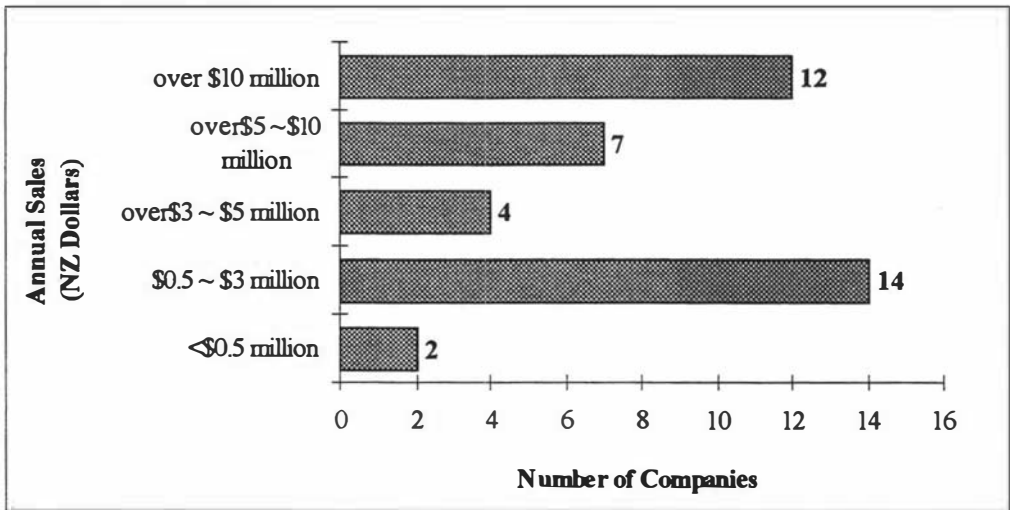


Figure 4.2 Company’s Annual Sales in 1993

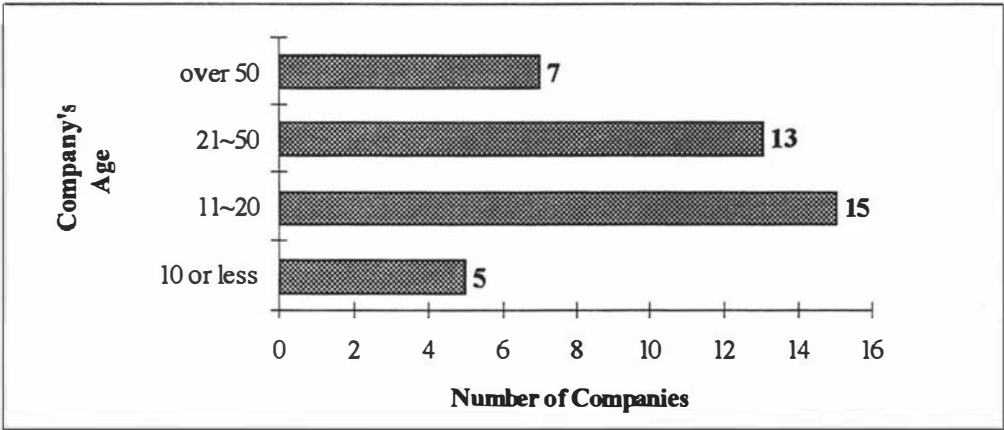


Manufacturing companies’ annual sales was usually related to the employees number, the more employees, the higher annual sales. But for distribution companies there were variations. For example, one distribution company with 15 employees had annual sales over \$10 million, while another with 12 employees had annual sales between \$1/2 million and \$3 million.

4.2.4 Age of Company

Most of the companies had been in business for more than ten years(See Figure 4.3.). Large companies had longer histories, of the 7 companies that were over 50 years, 6 had over \$10 million dollars annual sales.

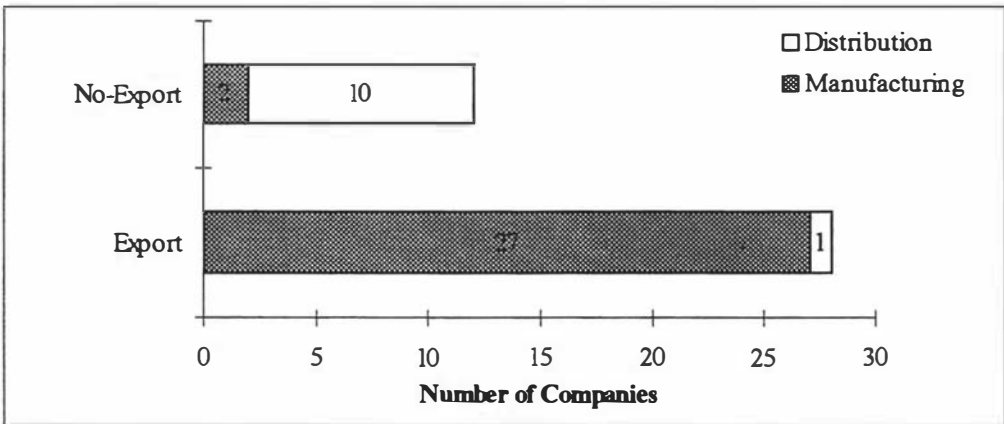
Figure 4.3 Company's Age (Years)



4.2.5 Exporting Products

Although all the selected companies were from the New Zealand Export Year Book, 70% of respondent companies (28 from 40) claimed they were exporting their products. Note that the non-export companies were mainly distributors(10 out of 12). Only one distribution company exported. The main area of export was Australia(19), while some exported their products to Asia (4), Pacific (2), Europe(2), U.S.(1) and Africa(1).

Figure 4.4 Exporting Products



4.2.6 Overseas Subsidiaries

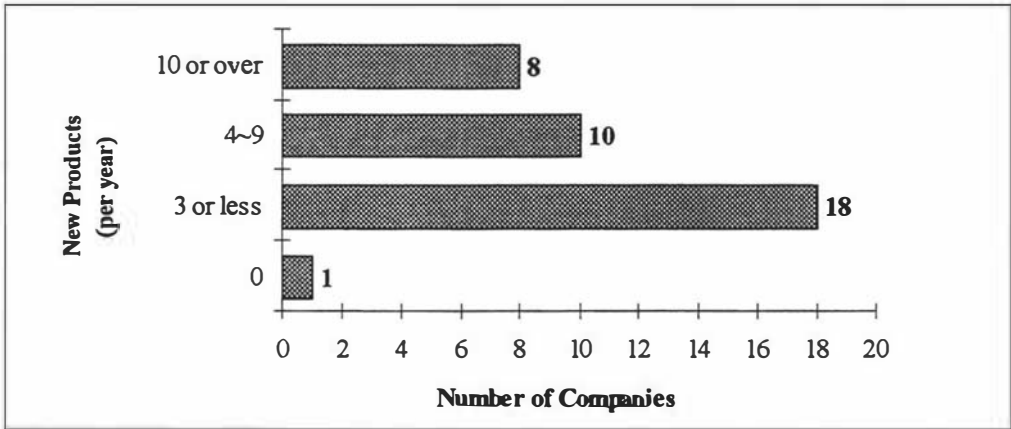
32(80%) of the surveyed companies were New Zealand owned companies and most of them were manufacturing, or manufacturing and distribution companies(27). All except two of these companies involving in manufacturing exported their products. The 8 overseas subsidiaries were all in distribution, and only two of them were in manufacturing as well. Five of these overseas subsidiaries only served the local market.

4.2.7 New Product Activities

1. Frequency of New Product Introductions

Nearly all of the respondents said they launched new products every year. Only one company claimed they had not introduced any new product in the last two years(1992 ~ 1994). The number of new products introduced per year varied from 1 to 96 while most firms launched 1 to 10 new products every year (See Figure 4.5). Three companies did not complete this question, it could be assumed that they had not launched any new products during the period.

Figure 4.5 Frequency of New Product Introductions

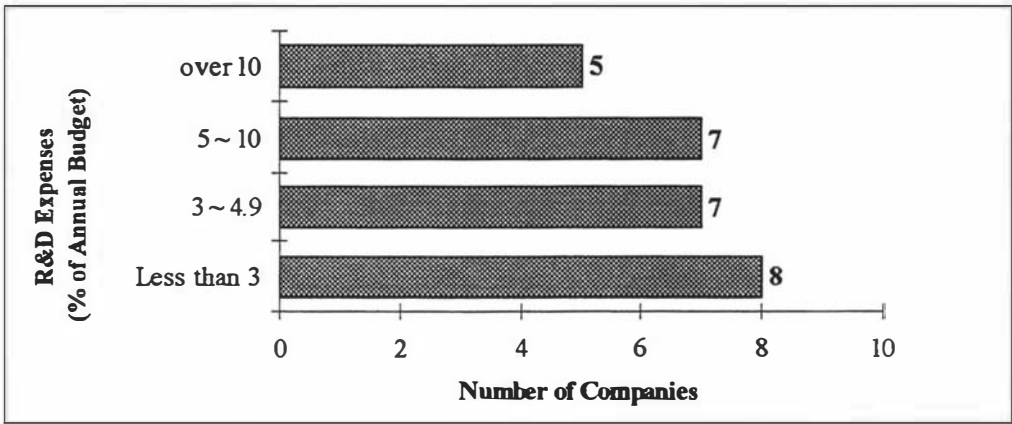


2. Research & Development Activities

Most of the companies carried out R&D activities(31 out of 40). Twenty-six manufacturing companies and five distribution companies conducted R&D activities. Of the companies with no R&D activities, 6 were distributors and 3 manufacturing companies. The R&D expenditure

varied from 0.1% to 20% of their annual budget. Most companies spent 1% to 5% of annual budget(See Figure 4.6.). Four companies conducting R&D did not give figures of R&D expenditure.

Figure 4.6 R&D Expenditure



4.3 Groups of the Companies

The companies participating in the mail survey were grouped in several ways. The grouping is helpful in comparing the differences between groups regarding the factors’ influences in new product success and failure, and discovering the relationships of each feature that described the companies.

4.3.1 Business Nature and Product Type

As shown in Table 4.1, the majority of the companies, either manufacturing or distribution, were making or selling industrial products. There were only five companies in consumer goods, so a quantitative comparison could not be made between industrial and consumer products. The samples of manufacturing and distribution companies were comparable(17 and 11), so it was possible to do a group comparison. For the companies doing both manufacturing and distribution, it was impossible to tell whether the products they chose for the survey were developed or only marketed by their companies. They were not used in the comparison of manufacturers and distributors.

Table 4.1 Companies Grouped by Business Nature and Product Type

Product Type	Manufacturers		Distributors		Both		Total	
Industrial	11	42%	7	27%	8	31%	26	100%
	65%		64%		67%		65%	
Consumer	2	40%	2	40%	1	20%	5	100%
	12%		18%		8%		13%	
Both	4	44%	2	22%	3	33%	9	100%
	24%		18%		25%		23%	
Total	17	43%	11	28%	12	30%	40	100%
	100%		100%		100%		100%	

4.3.2 Business Nature and Company Size

The company size is defined in two concepts: employee number and annual sales. As was shown in Section 4.2.3, a company’s annual sales did not necessarily parallel the number of its employees when it was a distribution company. When grouping the surveyed companies according to employee number and business nature, as shown in Table 4.2, more than half of the companies were small in size. Manufacturing companies were the majority in small and large size groups, while nearly half of the medium-sized companies were doing both manufacturing and distribution.

Table 4.2 Companies Grouped by Business Nature and Employee Number

Employees	Manufacturers		Distributors		Both		Total	
Small (30 or less)	10	42%	7	29%	7	29%	24	100%
	59%		64%		58%		60%	
Medium (31~99)	3	33%	2	22%	4	44%	9	100%
	18%		18%		33%		23%	
Large (100 or over)	4	57%	2	29%	1	14%	7	100%
	24%		18%		8%		18%	
Total	17	43%	11	28%	12	30%	40	100%
	100%		100%		100%		100%	

Table 4.3 grouped the companies by their annual sales. Small annual sales group had more companies than the other two groups, but the numbers of companies in the three groups companies were similar. It may be possible to analyse the group comparison.

Table 4.3 Companies Grouped by Business Nature and Annual Sales

Annual Sales	Manufacturers		Distributors		Both		Total	
Small (\$3m or less)	9	56%	2	13%	5	31%	16	100%
	53%		20%		42%		41%	
Medium (\$3m ~ \$10m)	3	27%	3	27%	5	45%	11	100%
	18%		30%		42%		28%	
Large (\$10m or over)	5	42%	5	42%	2	17%	12	100%
	29%		50%		17%		31%	
Total	17	44%	10	26%	12	31%	39	100%
	100%		100%		100%		100%	

4.4 The Companies in the In-Depth Interviews

Seventeen manufacturing companies were selected for the in-depth interview. One of the objective of the interview was to have insight of new product development performance in these companies. Table 4.4 summarized their demographics. They were all manufacturing companies, and most of them(15, 88%) conducted new product development. The two companies without R&D facility were contract manufacturers who produce products developed and owned by other companies. They were in the contract manufacturing business only few years, much younger than other companies who were nearly all over ten years old and up to 75 years old.

The majority of the companies were making industrial products(13, 76%), while only three companies were making consumer products(18%), and one was making both industrial and consumer products. There were five companies in the telecommunication business, but they had different product ranges so they did not compete each other.

Seven companies had 100 or more employees and annual sales over \$10 million(NZ), while another seven had employees between 20 to 90 and annual sales from \$5 million to \$25

million(NZ). Other three companies were very small with less than ten staff and \$1 million or less turnover.

It was notable that many of these companies had very high percentages of staff involved in R&D. The R&D staff were mostly over 10% of the total employees, a few were as high as over 30%. It reflected that these companies were very strongly R&D orientated. Exception was some very small companies, where the employees did not have clear responsibility, and nearly everyone had the chance involving in the R&D activities. They mainly developed customer-designed products for special customer requirements. The contract manufacturing companies did not have R&D department, instead they had engineers whose main task was customer support.

Table 4.4 The Companies in the In-Depth Interview

Company ID	Age	Product Type	Product Range	Employees	Annual Sales million(\$NZ)	R&D Staff
A	12	Industrial	Telecommunication	120	24	15
B	10	Industrial	Telecommunication	90	25	20
C	8	Industrial	Telecommunication	90	10	12
D	14	Industrial	Industrial Equipment	50	15	
E	32	Industrial	Agricultural Equipment	130	25	14
F	26	Industrial	Telecommunication	730	100	120
G	6	Consumer	Health Equipment	35	7	11
H	40	Consumer	Small Home Appliances	200	23	4
I	56	Industrial	Commercial Equipment	180	34	70
J	28	Industrial	Electronic Components	110	10	10
K	75	I/C	Lighting	60	12	3
L	17	Industrial	Telecommunication	20	5	5
M	24	Industrial	Industrial Equipment	7	0.4	5
N	15	Consumer	Audio Equipment	6	1	1.5
O	19	Industrial	Industrial Control	5	0.4	1
P	2		Contract Manufacturer	100	20	(3)
Q	4		Contract Manufacturer	75	8	(5)

I/C = Industrial/Consumer

The very small companies mostly served the local market, whereas other companies focused overseas markets. Two of the three overseas subsidiaries were currently serving the local market but they were looking at expanding to overseas.

4.5 Discussion

From the descriptions of the general information about the surveyed and interviewed companies in the New Zealand electronics industry, a picture of status in 1994 of these companies can be drawn.

The surveyed companies in the New Zealand electronics industry were mainly small- to medium-sized, employed less than 100 staff and had annual sales less than \$10 million (NZ). Companies with employees over 100 and annual turn-over more than \$10 million (NZ) were about a quarter of the total. There were a small number of subsidiaries of overseas companies included in the survey, and they were mainly undertaking distribution in the local market. Most of the New Zealand owned manufacturing companies were exporting their products, mainly to Australia and Asia/Pacific area.

Most of the companies who were doing manufacturing conducted R&D activities, and frequently introduced new products into the market. Their R&D expenditure, measured by percentage of annual budget, were varied but most of them were small considering these were small-sized companies. Comparing to overseas leading companies, such as Sony, Sharp and Mitsubishi, who spend about 6.5% of annual budget [Sony and Sharp annual reports, 1993], the actual amount of money was not comparable. But the percentages of budget of them were somewhat comparable.

The companies selected for the interview did not appear in the mail survey sample. They were all manufacturers, and many of them were medium to large sized and had large percentage of staff involved in R&D. A number of very small companies were also quite active in developing customer-made new products. Contract manufacturing companies emerged in recent years.

According to a research report of New Zealand Trade Development Board (1992), there are about 200 companies dealing with electronic products, among them more than a hundred export their products. Therefore the companies of current research can be considered representative of the real situations of the companies in the industry.

The results of the current survey and the interview also proved the statement of that the New Zealand electronics industry is largely focused on the development of new products and the improvement of existing ones, which was concluded by a survey conducted by Industrial Research Ltd[Cornwall, 1994].

Chapter 5 Importance of Factors on New Product Success and Failure in the New Zealand Electronics Industry

5.1 Introduction

This survey research was designed to investigate the factors that may have impacts on new product success and failure in the New Zealand electronics industry. The data from three groups of factors, Nature of Product, Market Characteristics, Resources and Skills, are analyzed in this chapter. Data for factors in the group of Product Development Activities, which focuses on new product development processes, are analyzed in Chapter 8, because only manufacturing companies responded to the factors in this group.

Data from the 40 companies participating in the survey are analyzed together. The mean score of each factor for successful and unsuccessful new products was calculated, and the differences between success and failure were determined. The percentages for each score of the factors, the distributions of the scores for successful and failed new products were examined.

A few factors emerged from respondents' comments as important to new product outcomes which were not included in the list of factors. These additional success and failure factor responses served to underline the importance for each company, of understanding fully its own environment and target market, in evaluating new products.

These factors were not all independent, and some reflected the same underlying factor. Factor analysis was then applied to reduce the number of factors that were measured in this study, and to release underlying and independent factors for new product success and also new product failure.

5.2 The Survey Data

The data analyzed were from all respondents, manufacturers and distributors, and included information about the factors on new product success and failure. There were 40 successful products and 36 failed products studied in this survey. Although equal numbers of successful and failed new products were desired, some respondents claimed that they did not have failed

new products. A total 24 factors in three groups, Nature of Product, Market Characteristics, and Resources and Skills, were examined to determine the importance of each factor on new product success and failure.

Mean scores of each of the factors were calculated and the significant differences of factors between successful and failed products were sought. The percentages of each score in the 6 point scale for those factors were calculated. The factors are listed by ranking in percentage of 'Agree' for successful products, to identify the commonly shared factors in the successful products. And they are listed by ranking in percentage of 'Disagree' for failed products, to find out commonly absent factors in the failed products.

While analyzing data of the survey, all of answers of 'NA'(Not Applicable) were removed out of the data to make the final results rounding up to 100%. In fact, there were only a few factors without 'NA' answers. This could be explained in several ways. First, there were a few factors that did not apply to some kinds of products. For example, 'Attractive in Appearance', that some industrial products and components did not have 'appearances' to show off to customer. There were about 12.5% of successful products and 5.7% of failed ones were ticked as 'NA' to this factor. Second, some companies did not have certain functional teams in the organization. Like 'Advertising Skills', if a company was not doing marketing itself, it of course selected 'NA' for this factor.

5.3 The Determinants of New Product Success

Table 5.1 shows factors ranking in the percentage of respondents who ticked 'Agree' on their successful products. The mean scores and standard deviations of the factors are also displayed. The reason to rank factors in the percentage of 'Agree' is that the figure showed the level of which a factor shared within the successful products. The higher of the percentage of 'Agree' for a factor, the more commonly the factor appeared in these successful new products. By ranking factors in that order, the degrees of importance of each factors on new product success are ranked too.

Table 5.1 Factors Ranked by Percentage of ‘Agree’ for Successful Products

Rank	Factors	Percentage				Mean	SD
		Agree	S-Agree	S-Disagree	Disagree		
1	Project supported by Senior Executives	86%	11%	3%	0%	1.84	0.73
2	Made to meet users' needs	85%	15%	0%	0%	1.65	0.74
3	Good value for money	83%	15%	3%	0%	1.88	0.76
4	Less after-sale problems	82%	10%	5%	3%	2.03	0.90
5	Attractive in appearance	74%	26%	0%	0%	2.11	0.63
6	Superior in quality	69%	28%	3%	0%	2.03	0.84
7	Technically superior to competitors	69%	23%	8%	0%	2.03	0.96
8	The consumer had great need for product type	68%	26%	5%	0%	2.18	0.80
9	Adequate distribution resources	65%	22%	11%	3%	2.32	1.00
10	Very experienced project team	64%	19%	8%	8%	2.36	1.20
11	Adequate financial resources	62%	16%	14%	8%	2.49	1.19
12	Good understanding of buyer behaviour	62%	33%	5%	0%	2.28	0.79
13	First on the market	55%	16%	11%	18%	2.66	1.60
14	Intense price competition in market	54%	19%	16%	11%	2.70	1.31
15	Better suited to our firm's technology	50%	42%	6%	3%	2.47	0.91
16	Market growth was high	50%	22%	14%	14%	2.78	1.27
17	Strong sales force launch effort	49%	23%	10%	18%	2.82	1.34
18	Market size was large	49%	24%	11%	16%	2.78	1.40
19	Multi-functional development group	46%	26%	17%	11%	2.80	1.23
20	Adequate advertising skills	44%	22%	11%	22%	3.08	1.34
21	Allowed greater pricing flexibility	42%	32%	13%	13%	2.79	1.28
22	Many competitors in market	35%	30%	11%	24%	3.08	1.40
23	Customers satisfied with existing products	32%	27%	32%	8%	3.19	1.08
24	Frequent new product introductions in market	16%	24%	24%	35%	3.76	1.34

Note: Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
S-Agree = ‘Somewhat Agree’; S-Disagree = ‘Somewhat Disagree’ in the survey scale.
Mean: Mean score; SD: Standard Deviation

There were 16 factors having percentages of 50% or more on ‘Agree’. They are viewed as common factors for new product success. The five most important determinants of new product success were, in order of importance:

1. Project supported by senior executives;
2. Made to meet users’ needs;

3. Good value for money;
4. Less after-sales problems;
5. Attractive in appearance.

They all had mean scores 2.0 or less, and standard deviations less than 1. Not surprisingly senior executives' support for the products was regarded so high in 'Agree' by the respondents as they were in senior positions in the companies. They had subjective thoughts that they supported the new product projects. The other four factors were all related to the product's characteristics, which likely meant that the benefits a product can offer to the customer had tremendous influence on new product success.

Other two product factors, product's quality and technological advantage received high percentages of 'Agree'. Consumer demands, personal experiences of product development, and adequate distribution channels were among those factors emphasized by respondents.

The three factors with the lowest percentages of 'Agree' described marketplace's dynamics and competitiveness. It indicated that products entering a less competitive and less dynamic market with low customer satisfaction with existing products were more likely to succeed.

When asked to identify the most important factors that may have influenced the success of their products, and make comments, the respondents gave a wide variety of statements. The most mentioned factors were:

- Technologically advanced;
- Made to meet users' needs - variety of features;
- Good value for money - appealing prices;
- Customer had great need for product type;
- Product quality;
- Development skills and experience;
- Good understanding of market and customer requirement;
- The effort and experience of sales people.

Several additional factors were in the list of comments added by the respondent, as important contributors to success of their products. They were identified as:

- Niche market;
- Effective delivery;
- Product branding reputation.

5.4 The Causes of New Product Failure

Table 5.2 shows factors ranking in the percentage of 'Disagree' ticked by respondents on failed products. The mean scores and standard deviations of factors are also displayed. Ticking 'Disagree' on a factor means that the respondent did not think his(her) product matched the statement of the factor. Therefore, the percentage of 'Disagree' showed the level of which a factor missed within the unsuccessful products. The higher of the percentage of 'Disagree' for a factor, the more commonly the factor missed in these failed new products.

There were 8 factors having percentages of 20% or more on 'Disagree'. These factors' absences were likely to be common causes for new product failure. The five most missed factors in the failed new products were, in order of importance:

1. Allowed greater pricing flexibility;
2. First on the market;
3. Strong sales force launch effort;
4. Less after-sale problems;
5. Adequate advertising skills.

These factors were all but one related to product performance in the market. More than a third of failed products did not have great pricing flexibility, which seemed to reduce competitiveness of products in marketplace. More than 50% of failed products were not first to be introduced to the market. Weak sales and promotional efforts and insufficient after sales service appeared in about half of the failed products. Intensive market competitiveness, and high market dynamics which was indicated by frequent new product introductions, were also very common in new product failure. Misunderstood buyer behavior was another important factor.

Table 5.2 Factors Ranked by Percentage of ‘Disagree’ for Failed Products

Rank	Factors	Percentage				Mean	SD
		Disagree	S-Disagree	S-Agree	Agree		
1	Allowed greater pricing flexibility	36%	30%	18%	15%	3.91	1.23
2	First on the market	29%	23%	23%	26%	3.57	1.48
3	Strong sales force launch effort	26%	23%	39%	13%	3.74	1.44
4	Less after-sale problems	23%	17%	30%	30%	3.27	1.55
5	Adequate advertising skills	23%	29%	26%	23%	3.61	1.26
6	Frequent new product introductions in market	22%	22%	25%	31%	3.19	1.47
7	Many competitors in market	21%	21%	21%	38%	3.21	1.57
8	Good understanding of buyer behaviour	20%	31%	34%	14%	3.60	1.06
9	Better suited to our firm's technology	15%	18%	35%	32%	3.12	1.20
10	Market growth was high	15%	21%	35%	29%	3.18	1.19
11	Good value for money	14%	14%	46%	26%	3.17	1.10
12	Adequate distribution resources	13%	20%	33%	33%	3.20	1.19
13	Customers satisfied with existing products	13%	10%	39%	39%	2.74	1.29
14	Attractive in appearance	12%	15%	36%	36%	2.97	1.21
15	Intense price competition in market	12%	15%	27%	45%	2.79	1.32
16	Project supported by Senior Executives	12%	9%	18%	61%	2.64	1.17
17	The consumer had great need for product type	12%	12%	41%	35%	3.03	1.06
18	Made to meet users' needs	11%	9%	31%	49%	2.71	1.25
19	Market size was large	11%	31%	20%	37%	3.09	1.20
20	Adequate financial resources	9%	15%	32%	44%	2.79	1.01
21	Multi-functional development group	6%	13%	31%	50%	2.63	1.07
22	Superior in quality	6%	18%	26%	50%	2.65	1.16
23	Technically superior to competitors	0%	18%	39%	42%	2.58	0.97
24	Very experienced project team	0%	9%	31%	59%	2.28	0.92

Note: Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
S-Agree = ‘Somewhat Agree’; S-Disagree = ‘Somewhat Disagree’ in the survey form
Mean: Mean score; SD: Standard Deviation

The last two factors in the table had zero percentage on ‘Disagree’, which seemed they had nothing to do with new product failure. Experienced product development team could not save a new product from failure. Advanced technology did not seem to play a solely important role in the game.

The factors summarized from respondents' statements as the most important factors influencing the failures of their products are:

- Failed to meet users' requirement;
- Technical problems;
- Customer need was low;
- High competition in the market;
- Lack of customer evaluation;
- Poor marketing research;
- Inadequate selling and promotion skills.

The additional factors mentioned by the respondents were identified as:

- Bad timing of development and/or launch;
- Product hard to use;
- Problems in components/materials supplies.

5.5 Comparison of Factors' Influence on New Product Success and Failure

The mean scores of all factors for both successful and failed products are shown in Table 5.3. It made possible to compare new product success and failure for each factor side by side. These factors were ranked by significant differences between successful and failed products. These figures were obtained from T-test (two-tailed).

The significance levels of difference (SL) in the table represent probabilities, that the observed differences between successful and failed products on each factor could have been obtained by chance. Obviously, the smaller the probability, the more likely it is that the factor is important in distinguishing between new product success and failure. So the rank in this way illustrates the order of importance of each factor in differentiating new product success and failure.

A low mean score of a factor indicated the factor was perceived to be agreed to the successful product or failed products. For successful products, more than half mean scores were 2.5 or less. While no mean score for failed products was below 2.5, most of them scored between 2.5

to 3.5. It indicated that successful products were viewed more positive to most of the factors than failed ones by respondents.

Table 5.3 Factors Ranked by Significant Differences of Mean Scores for Agreement between New Product Success and Failure

Rank	Factor	Success		Failure		SL
		MS	SD	MS	SD	
1	Good understanding of buyer behaviour	2.28	0.79	3.60	1.06	1.15E-07*
2	Good value for money	1.88	0.76	3.17	1.10	2.12E-07
3	Made to meet users' needs	1.65	0.74	2.71	1.25	5.05E-05
4	Less after-sale problems	2.03	0.90	3.27	1.55	3.32E-04
5	The consumer had great need for product type	2.18	0.80	3.03	1.06	3.51E-04
6	Allowed greater pricing flexibility	2.79	1.28	3.91	1.23	3.65E-04
7	Attractive in appearance	2.11	0.63	2.97	1.21	7.21E-04
8	Project supported by Senior Executives	1.84	0.73	2.64	1.17	1.36E-03
9	Adequate distribution resources	2.32	1.00	3.20	1.19	2.14E-03
10	Strong sales force launch effort	2.82	1.34	3.74	1.44	7.81E-03
11	Superior in quality	2.03	0.84	2.65	1.16	0.0106
12	First on the market	2.66	1.60	3.57	1.48	0.0135
13	Better suited to our firm's technology	2.47	0.91	3.12	1.20	0.0142
14	Technically superior to competitors	2.03	0.96	2.58	0.97	0.0208
15	Frequent new product introductions in market	3.76	1.34	3.19	1.47	0.0997
16	Adequate advertising skills	3.08	1.34	3.61	1.26	0.1001
17	Customers satisfied with existing products	3.19	1.08	2.74	1.29	0.1304
18	Market growth was high	2.78	1.27	3.18	1.19	0.1797
19	Adequate financial resources	2.49	1.19	2.79	1.01	0.2435
20	Market size was large	2.78	1.40	3.09	1.20	0.3274
21	Multi-functional development group	2.80	1.23	2.63	1.07	0.5361
22	Many competitors in market	3.08	1.40	3.21	1.57	0.7261
23	Very experienced project team	2.36	1.20	2.28	0.92	0.7580
24	Intense price competition in market	2.70	1.31	2.79	1.32	0.7874

MS: Mean Score
SD Standard Deviation
SL: Significance level of differences between success and failure mean scores
* E-07 equals to the minus seventh power of ten.

5.6 The Distributions of the Factors Agreement Scores in New Product Success and Failure

Figures showed in this section are percentages of respondents who picked the score for each factor. From these figures one can perceive the distributions of scores picked by respondents, and compare the differences between successful and failed products for every factor directly. These figures are presented in the order of the significant difference between new product success and failure(see Table 5.2 and 5.3). For the full details of data in these figures, please see Appendix VI.

Since 'Agree' and 'Strongly Agree', 'Disagree' and 'Strongly Disagree', in the survey scale expressed similar tendency of respondents, they were combined together, as 'Agree' and 'Disagree', to make the charts easier to read. Factors with higher percentage of 'Agree' for successful products and lower one for failed products would be regarded as separating new product success from failure. The scores of 'Somewhat Agree' and 'Somewhat Disagree' which indicated respondents with no distinct attitudes, were presented to give some ideas about what respondents thought of the factor describing their products between 'Agree' and 'Disagree'.

In order to make it easy to understand the factors' influence in new product success and failure, the 24 factors were divided into three groups based on the significant levels of difference between successful and failed products. They were factors with significant difference, factors with moderate difference, and factors that were identical or slightly different, between new product success and failure. Within each group, the factors were ranked in the order of the significant levels of difference between new product success and failure.

Note: In following figures, the percentages of

Agree = 'Strongly Agree' + 'Agree' in the survey scale.

Disagree = 'Strongly Disagree' + 'Disagree' in the survey scale

S-Agree = 'Somewhat Agree' in the survey scale

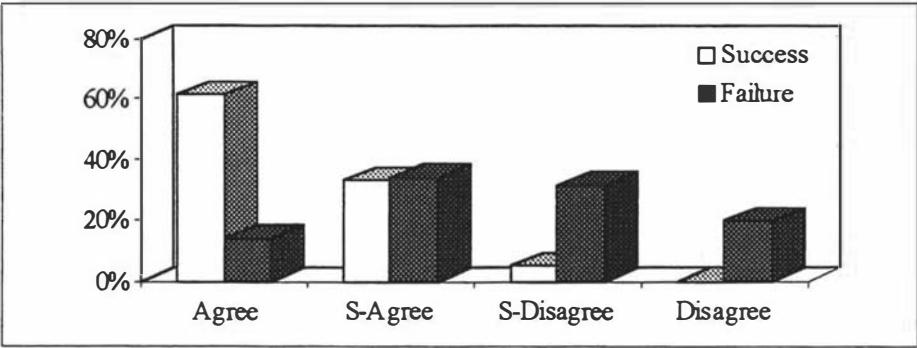
S-Disagree = 'Somewhat Disagree' in the survey scale

5.6.1 Factors with Significant Difference between New Product Success
and Failure

1. Good Understanding of Buyer Behavior

There was a big difference between the distributions of scores for successful and failed products. For 62% of successful products, buyer behavior was understood very well, only 14% of failed ones were able to do so. More than half of failed products misunderstood buyer behavior in varying degrees(51% in total), in comparison only two successful products(5%) somewhat misunderstood buyer behavior.

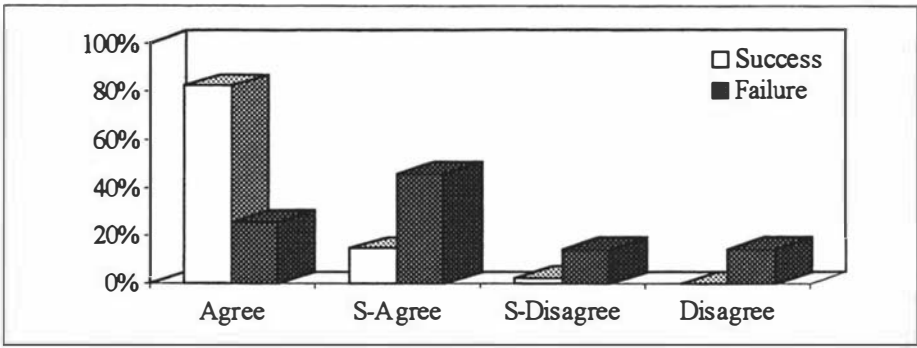
Figure 5.1 Distribution of Scores on ‘Good Understanding of Buyer Behavior’



2. Good Value for Money

The very high percentage of ‘Agree’ for successful products showed that this factor was very common to successful new products. Nearly all the respondents claimed their successful products had good value for money, only one ticked ‘Somewhat disagree’ for this factor; while another 15% of them were less sure about their product’s value, but the trend was very clear. For only 26% of unsuccessful products were claimed they were good value for money, and 46% of them were slightly agreed for this factor. 14% of them failed to provide good value to customer. This factor provided very clear difference between new product success and failure.

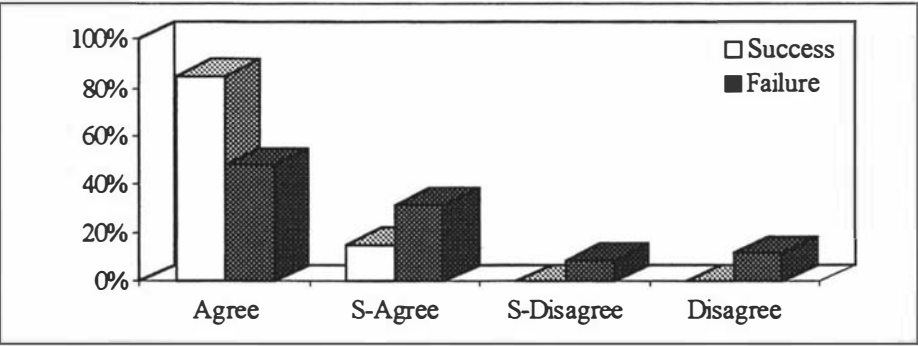
Figure 5.2 Distribution of Scores on ‘Good Value for Money’



3. Made to Meet Users' Needs

This factor was a very one-sided one for successful products. All successful products were 'made to meet users' needs', in which 85% of them were claimed very clearly, and another 15% were somewhat made to meet users' needs. Although 80% of unsuccessful products picked the same scores, the distribution was more level: the amount of failed products with definite claim of 'made to meet users' needs' was about 50%. One fifth of unsuccessful products more or less failed to meet users' needs.

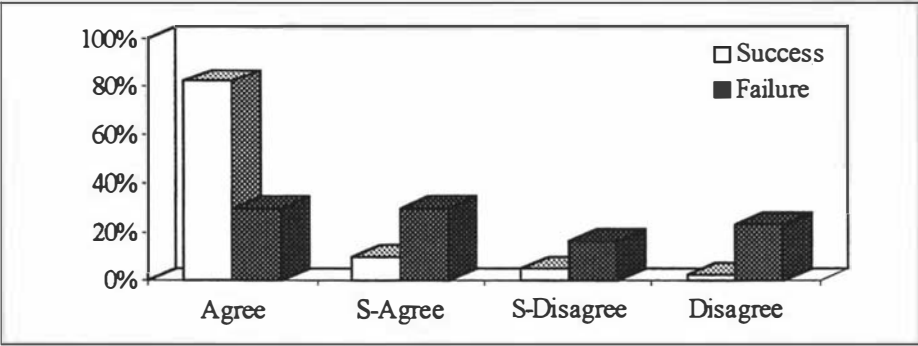
Figure 5.3 Distribution of Scores on 'Made to Meet Users' Needs'



4. Less After-Sale Problems

82% of successful products were thought to have less after-sale problems, another 10 % were thought so but with less confidence. Only three successful products had after-sale problems that were more or less unacceptable. On the other hand, the numbers of failed products split quite close on each scale: 30% of them were definitely claimed less after-sale problems, and other 30% were less sure. 40% of failed products had troubles on after-sale problems, to a greater or lesser extent.

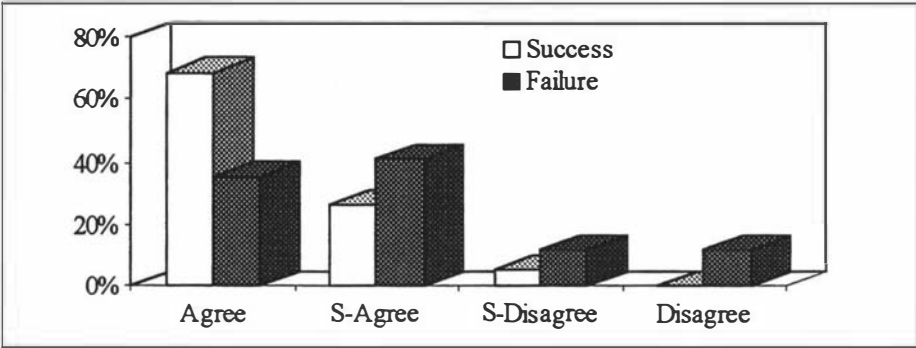
Figure 5.4 Distribution of Scores on 'Less After-Sale Problems'



5. The Consumer Had Great Need for Product Type

This was a one-side factor for the successful products: 68% of them had high consumer needs, 26% had less but still positive consumer needs. For failed products, great consumer needs only occurred to 35% of them, another 41% had reasonable consumer needs. 24% of the failed products were believed not having great consumer needs.

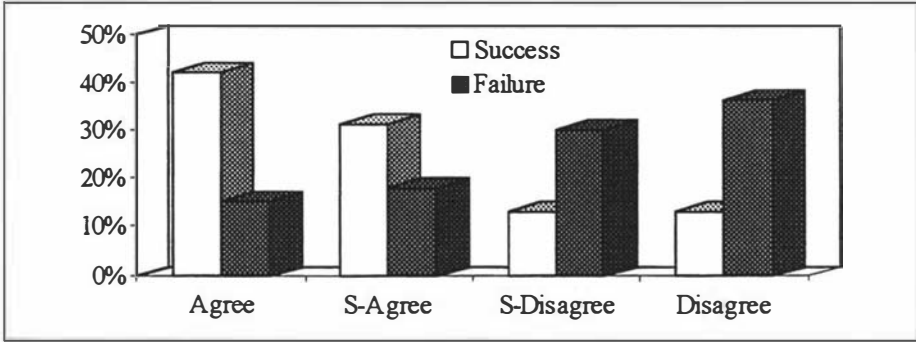
Figure 5.5 Distribution of Scores on ‘The Consumer Had Great Need for Product Type’



6. Allowed Greater Pricing Flexibility

Pricing flexibility seemed to drive new product success and failure apart, the trends of distributions of scales for successful and failed products were opposite. 74% of successful products allowed greater pricing flexibility, percentage of ‘Agree’ was 42%. Only 33% of failed products had this advantage, in which the percentage of ‘Agree’ was just 15%. 36% of them did not allow great pricing flexibility, which was the biggest percentage in the distribution of scores for failed products. And another 30 % of failed products had less flexibility on pricing.

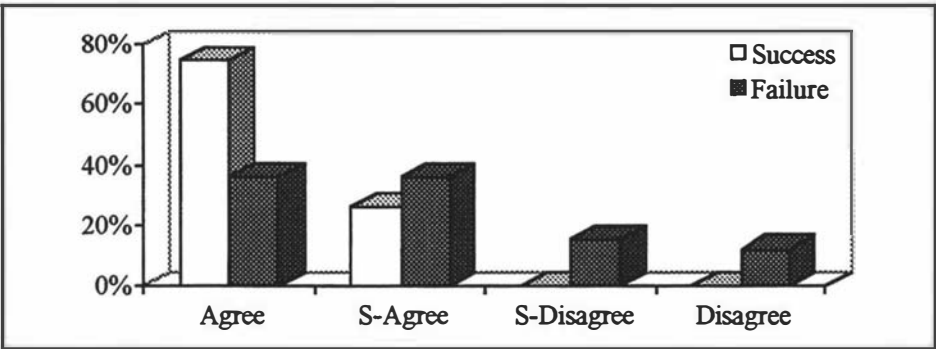
Figure 5.6 Distribution of Scores on ‘Allowed Greater Pricing Flexibility’



7. Attractive in Appearance

Appearance of products appeared as a common factor to new product success. 74% of successful products were claimed attractive in appearance, while the rest of them were less sure but still confident about their appearances. On the other hand, 73% of unsuccessful product were more or less attractive in appearance(with 36% ‘Agree’), and 27.3% failed to do so. The difference between product success and failure on this factor is obvious.

Figure 5.7 Distribution of Scores on ‘Attractive in Appearance’

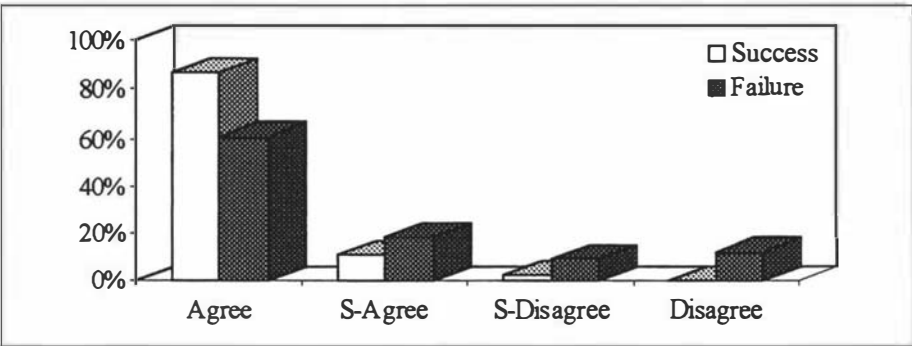


5.6.2 Factors with Moderate Difference between New Product Success and Failure

1. Project Supported by Senior Executives

Successful products were supported by senior executives a great deal: 87% ‘Agree’ and 11% ‘Somewhat Agree’. For failed products, there was also a significant number of them supported by senior executives(61% ‘Agree’ and 18% “Somewhat Agree”). But there were about one in every five failed products received inadequate, or not at all, support from senior executives.

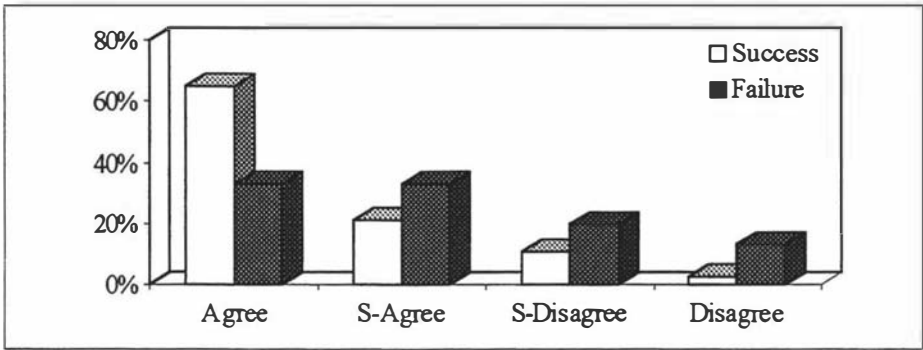
Figure 5.8 Distribution of Scores on ‘Project Supported by Senior Executives’



2. Adequate Distribution Resources

65% of successful products were claimed having definitely adequate distribution resources, with 22% of them having somewhat adequate resources of distribution. Only one third of failed products had adequate distribution resources, and the same number of them had less but still satisfactory distribution resources. The other one third of failed products were thought more or less to have inadequate distribution resources. Comparatively, 11% of successful products had less satisfactory distribution resources, and only one of total(3%) was admitted having inadequate distribution resources. This factor seemed driving new product success and failure apart.

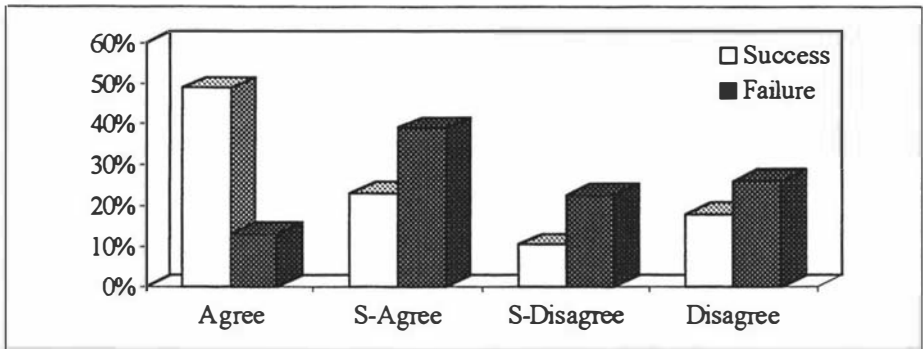
Figure 5.9 Distribution of Scores on ‘Adequate Distribution Resources’



3. Strong Sales Force/Launch Effort

49% of successful products were supported by strong sales forces and launch efforts, while only 13% of failed products had that fortune. Meanwhile, nearly half of failed products (23% for ‘Somewhat Disagree’ and 26% for ‘Disagree’) were thought more or less having weaknesses on sales force/launch effort. The differences on each scores of this factors for successful and failed products are quite clear.

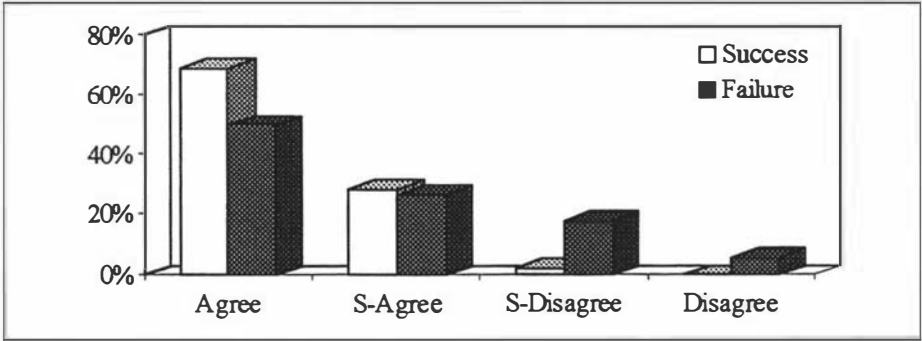
Figure 5.10 Distribution of Scores on ‘Strong Sales Force/Launch Effort’



4. Superior in Quality

For successful products, there were almost no quality problems. Only one successful product(3%) was slightly not superior in quality. The major proportion of them(69%) were claimed as having super quality. Half of unsuccessful products also had super quality, which was the biggest figure in the distribution. But there were quite a few of the unsuccessful products failed or nearly failed to deliver superior product quality(6% and 18% respectively). The percentages of successful and failed products that were thought to have somewhat superior quality were similar(28% and 27%)

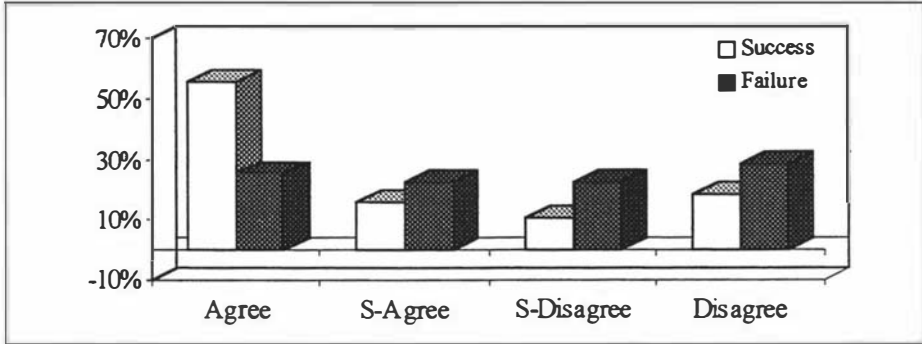
Figure 5.11 Distribution of Scores on ‘Superior in Quality’



5. First on the Market

The distributions of this factor for successful and failed products were distinctly different. More than half of successful products were definitely first on the market, and other 16% of them with less definite but positive answer for the factor. Only 49% of unsuccessful products were first on the market(with 26% ‘Agree’), and more than half of them were introduced later than competitors’ products. The percentage of products that were not first on the market but still successful was 29%.

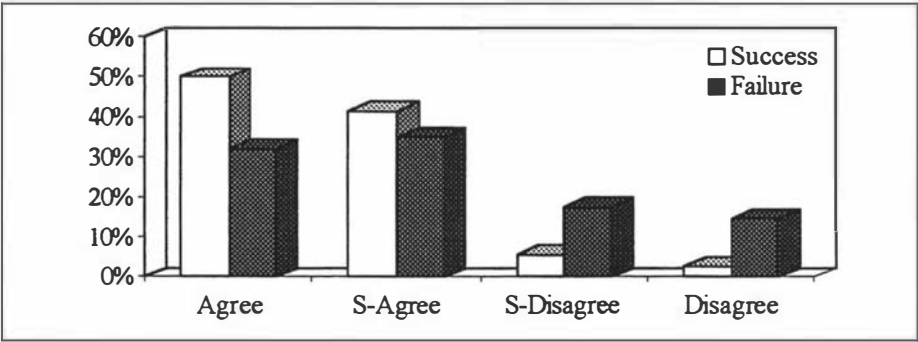
Figure 5.12 Distribution of Scores on ‘First on the Market’



6. Better Suited Our Firm’s Technology

The factor of technology suitability was agreed in most of successful products, while it was also quite common in failed products. More than 90% of successful products applied technology that more or less suited the companies’ technology(50% of total scaled as ‘Agree’), and only three(8%) found the technology was not so suited to the company. For the failed products, the figures of products with suited technology with the company was less than 70%(32% scaled ‘Agree’), and there were more than 30% of them found the technology not suited to their company’s technology.

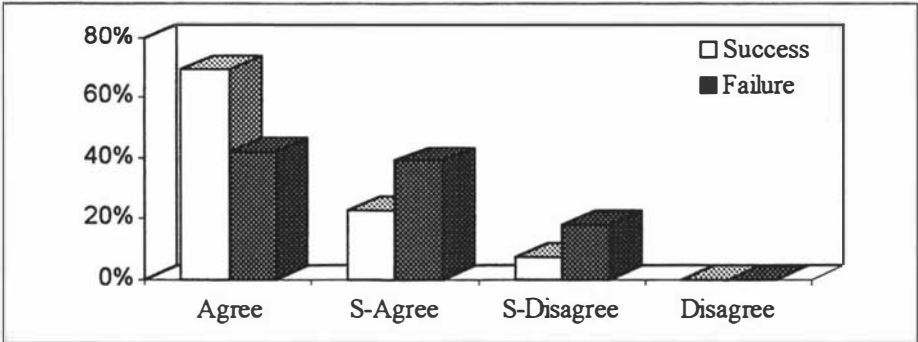
Figure 5.13 Distribution of Scores on ‘Better Suited Our Firm’s Technology’



7. Technically Superior to Competitors

The distribution of scores of successful products for this factor was similar to the factor ‘Better Suited Our Firm’s Technology’. 92% of successful products were technically superior to competitors, in which 69% had definitely superior technology. For the failed products, technical advantage seemed not a big problem, but the distribution of scores was not as sharp as successful ones: 82% of failed products led in technology, in which 42% were clearly technically advanced, and 18% of them were thought not so advanced in technology. None of the successful products nor failed ones were admitted to be really technically disadvantaged.

Figure 5.14 Distribution of Scores on ‘Technically Superior to Competitors’

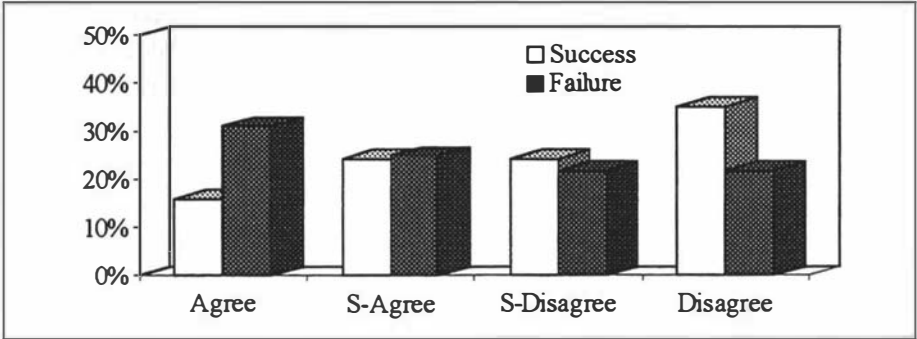


5.6.3 Factors that were Identical or Slightly Different between New Product Success and Failure

1. Frequent New Product Introductions in Market

It seemed that the less frequent new products were introduced in the market, the more likely new products succeed. The percentage of ‘Agree’ of this factor for successful products(16%) was about half of the one for failed products(31%). The percentage of ‘Disagree’ of the factor for successful products(35%) was also higher than the one for unsuccessful products(22%). But the percentages of the middle scores were similar. The trends of scores for successful and failed products were opposite, but quite flat.

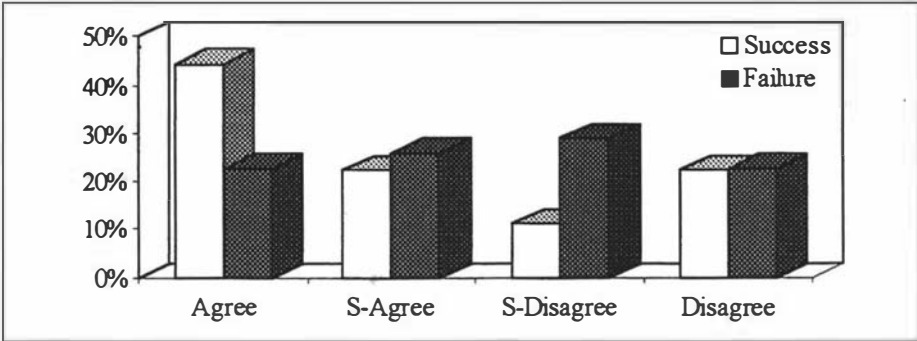
Figure 5.15 Distribution of Scores on ‘Frequent New Product Introductions in Market’



2. Adequate Advertising Skills

The distributions of scores for successful and failed products were quite different. 45% of successful products were marketed by adequate advertising skills, which is almost double the figure of failed products. More than half unsuccessful products had insufficient advertising skills in a greater or lesser extent, while the figure for successful products was about a third.

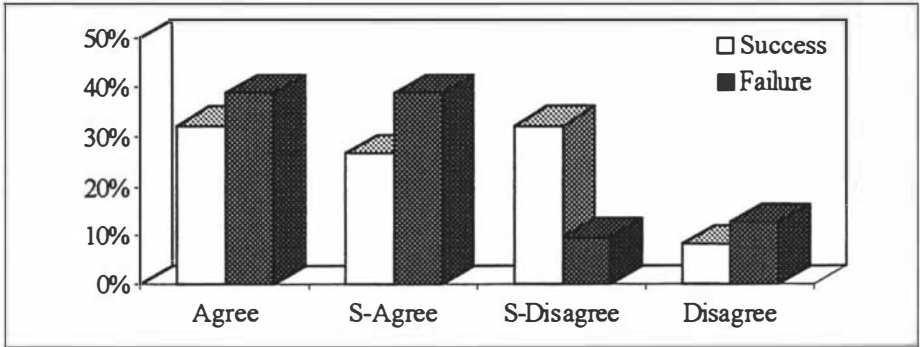
Figure 5.16 Distribution of Scores on ‘Adequate Advertising Skills’



3. Customer Satisfied with Existing Products

The degree of customer satisfaction seemed to play a minor role on the rate of new product success and failure. 32% of successful products entered markets that customers were satisfied with existing products, and 27% of them dealt with customers who were somewhat satisfied. These two figures were less than those of failed products, which were both 39%. But 32% of successful products were somewhat disagreed that customer was satisfied, this figure was much bigger than that of failed products(10%). Only three successful products(8%) and 4 unsuccessful products(13%) were introduced into markets that customers were unsatisfied.

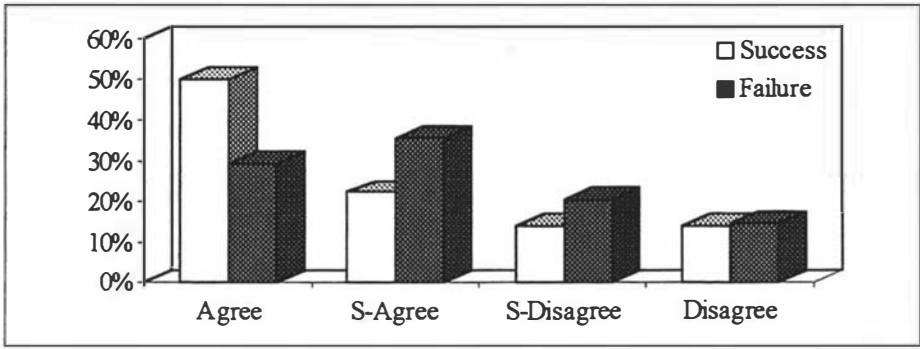
Figure 5.17 Distribution of Scores on ‘Customer Satisfied with Existing Products’



4. Market Growth Was High

50% of successful products entered highly growing markets, compared with 29% of failed products. The percentages of ‘Disagree’ on this factor for both successful and failed products were similar(14% and 15%). More than a third of failed products were introduced into markets where the growth was low, the portion of the successful products which entered the market with similar growth was 28%.

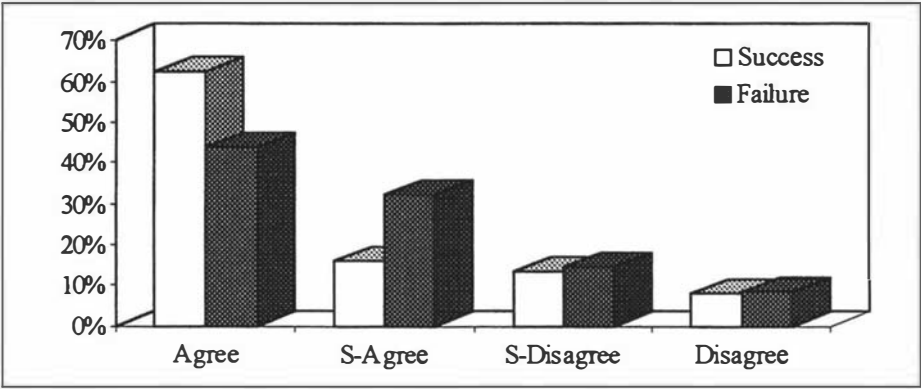
Figure 5.18 Distribution of Scores on ‘Market Growth Was High’



5. Adequate Financial Resources

The portion of successful products that had adequate or reasonable financial resources was about the same to that of failed products, although the percentage of ‘Agree’ for successful products(62%) was considerably higher than that for failed products(44%).

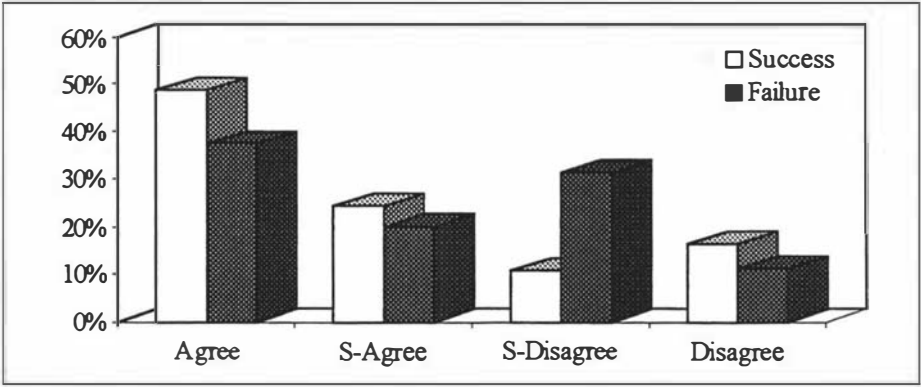
Figure 5.19 Distribution of Scores on ‘Adequate Financial Resources’



6. Market Size Was Large

Market sizes seemed not to differ very much between new product success and failure, although successful products had higher percentage on ‘Agree’(49%) and ‘Somewhat Agree’(24%) than failed ones(37% and 20% respectively). The large portions of middle scales(‘Somewhat Agree’ and ‘Somewhat Disagree’)for both type of products gave less trends on distributions of the factor.

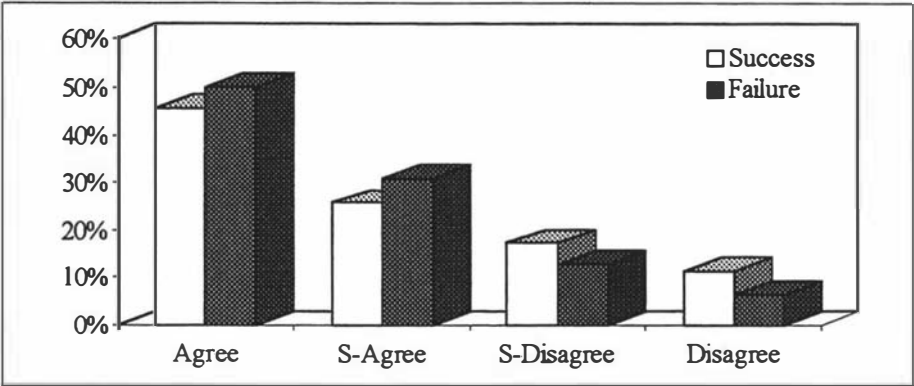
Figure 5.20 Distribution of Scores on ‘Market Size Was Large’



7. Multi-functional Development Group

This factor showed similar distribution of scores for successful and failed products. The percentages of ‘Agree’ and ‘Somewhat Agree’ for successful products were respectively less than the ones for failed products. And the percentages of ‘Disagree’ and ‘Somewhat Disagree’ for successful products were respectively higher than the ones for unsuccessful products.

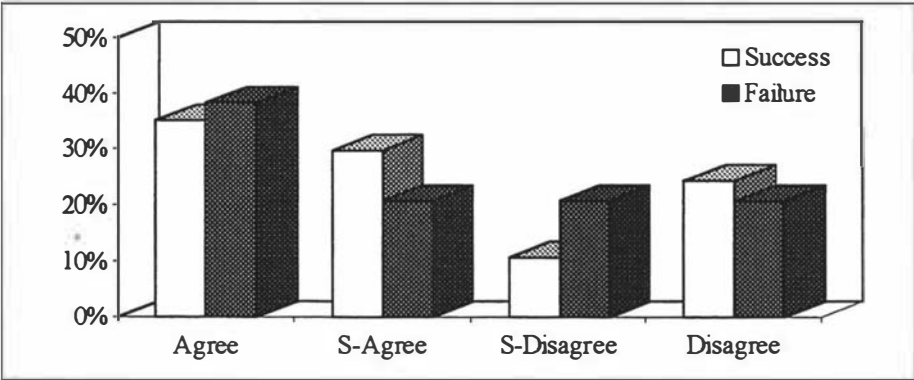
Figure 5.21 Distribution of Scores on ‘Multi-functional Development Group’



8. Many Competitors in Market

For successful products, 35% were admitted having many competitors, and 24% did not have competitors in market. Comparatively, figures for failed products on these two scales were: 38% for ‘Agree’ which was higher, and 21% for ‘Disagree’ which was lower, than those for successful products. But not much difference showed between successful and failed products.

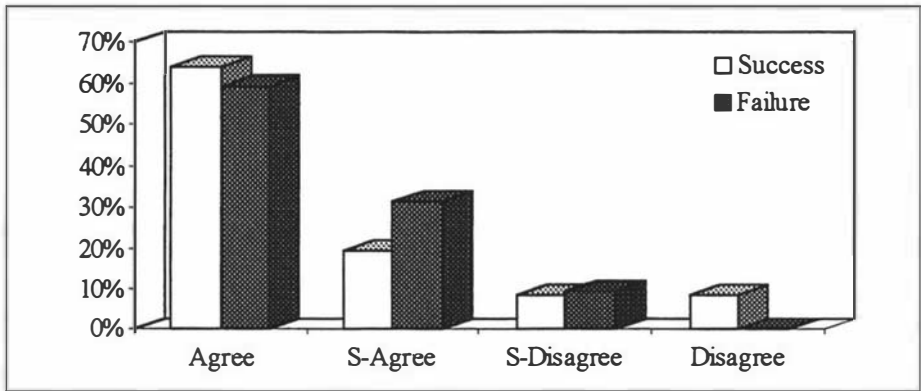
Figure 5.22 Distribution of Scores on ‘Many Competitors in Market’



9. Very Experienced Project Team

Most products, success or failure, were thought to have been developed by more or less experienced project teams(83% and 91% respectably). Interesting that three successful products(8%) were developed by inexperienced teams, while none of the failed products were claimed so. Three successful products(8%) and three failed ones(9%) were carried out by project teams that were not so experienced.

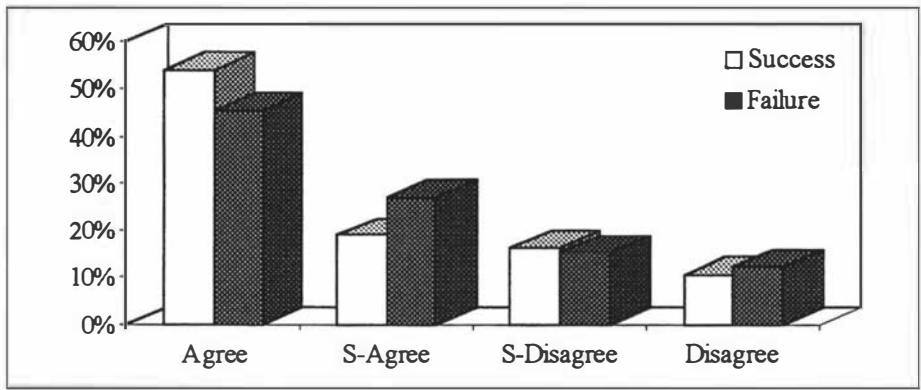
Figure 5.23 Distribution of Scores on ‘Very Experienced Project Team’



10. Intense Price Competition in Market

The percentages for each scores for this factor showed identical between successful and failed products. 54% of successful products and 46% of failed ones agreed that there was intense prices competition in the market; 10% of successful and 12% of failed ones disagreed it.

Figure 5.24 Distribution of Scores on ‘Intense Price Competition in Market’



5.7 Factor Analysis: the Underlying Factors for New Product Success and Failure

The factors tested in the survey were not independent. Factor analysis was utilized to group related factors so that the underlying dimensions that influenced new product success and failure could be determined. Data for successful and unsuccessful products were analyzed separately. The analysis used a varimax rotation with communality values greater than 0.5. The independent factors that had eigenvalues in excess of 1.0 are discussed in the following sections(See Appendix X for detailed results).

5.7.1 The Underlying Factors for New Product Success

There were eight factors identified as independent dimensions that had eigenvalues greater than 1.0, and together explained 80.5% of the variance in the original twenty-four factors. So they appeared to describe new product success fairly well. The eight factors are labeled in Table 5.4 based on each group of original factors, which summarized the most important factor loading and provided an indication of the strength and clarity of the evolved factors.

The first factor, Factor 1, had loadings for ‘Strong sales force launch effort’, ‘Adequate advertising skills’ and ‘Adequate distribution resources’, which suggested that this factor described the company’s marketing proficiency, and can be labeled as ‘**Marketing strength**’. A well-planned, properly executed market launch was central to new product success. Strong strength of marketing was fundamental to the launch.

Factor 2 was made up of four original factors which divided into two groups. The factors ‘Very experienced project team’ and ‘Multi-functional development group’ mentioned project team’s experience and functional structure. The other two ‘Frequent new product introductions in market’ and ‘Customers satisfied with existing products’ described the market environment. But there were relationships between the two groups. To gain the information about marketplace, it was necessary to have a effective new product development structure . And a so-called ‘multi-functional’ team was to integrate different functional areas into one

team and make internal communication efficient. So this factor was labeled as ‘**Product development team and market environment**’.

Table 5.4 Underlying Factors for New Product Success

Underlying Factor Name (% Variance Explained)	Variables(Original Factors) Loading on Factor	Variable Loadings
1 Marketing Strength (20.3%)	Strong sales force launch effort	0.84
	Adequate advertising skills	0.86
	Adequate distribution resources	0.73
2 Product Development Team & Market Environment (13.6%)	Very experienced project team	0.81
	Frequent new product introductions in market	0.72
	Customers satisfied with existing products	0.64
	Multi-functional development group	0.63
3 Product Superiority (10.6%)	Superior in quality	0.88
	Technically superior to competitors	0.72
4 Product Benefit (9.7%)	Good value for money	0.86
	Attractive in appearance	0.72
5 Market Competitiveness(8.3%)	Intense price competition in market	0.90
	Many competitors in market	0.84
6 Consumer Knowledge (6.8%)	Good understanding of buyer behaviour	0.94
	The consumer had great need for product type	0.70
7 Company Resources (5.9%)	Adequate financial resources	0.87
	Better suited to our firm's technology	0.61
8 Top Management Support (5.4%)	Project supported by Senior Executives	0.84

Note: From SPSS varimax rotation

Factor 3 contained two outstanding factors describing the new product’s characteristics. ‘Superior in quality’ and ‘Technically superior to competitors’ described product superiority. A superior product was typically highly innovative and new to market; incorporated unique features for customer; met customers’ needs better than competing products; and was of higher quality[Cooper, 1979a]. ‘**Product superiority**’ is such an important ingredient in new product success and so obvious and truistic that sometimes it tends to be overlooked. The product was the core or central strategy in most industrial new product ventures.

Factor 4, '**Product benefits**' was distinguishable from the two factors, 'Good value for money', 'Attractive in appearance'. The real benefits a new product can offer was from the customer's perspective, and it was based on an in-depth understanding of customer likes, wants and preferences.

Factor 5 was made up of two factors 'Intense price competition in market' and 'Many competitors in market', and can be explained as '**Market competitiveness**'. The intensity of market competitiveness would affect new product performance in the marketplace.

Factor 6, '**Consumer knowledge**' contained two factors, 'Good understanding of buyer behavior' and 'The consumer had great need for product type'. It was rather obvious that good knowledge of consumers' behavior and needs was helpful in exploring the market potential for a proposed product.

Factor 7, had two original factors with significant loadings, 'Adequate financial resources' and 'Better suited to our firm's technology', and could probably be labeled as '**Company resources**'. It related to a company's financial and technological resources that back up new product development execution.

The last factor, Factor 8 contained only one outstanding factor 'Project supported by Senior Executives', and was easily named as '**Top management support**'.

5.7.2 The Underlying Factors for New Product Failure

Seven independent dimensions were identified with eigenvalues greater than 1.0, and together explained 85.4% of the variance in the original twenty-four factors. Based on each group of original factors, which summarized the most important factor loading and provided an indication of the strength and clarity of the evolved factors, the seven factors were labeled in Table 5.5.

Factor 1, made up of four original factors which all described the characteristics of marketplace ‘Frequent new product introductions in market’, ‘Intense price competition in market’, ‘Many competitors in market’ and ‘Market growth was high’ described the competition and dynamism in market. So it might be labeled as ‘**Market competitiveness and dynamism**’.

Factor 2, which was named as ‘**Product superiority**’, contained three factors, ‘Superior in quality’, ‘Technically superior to competitors’, and ‘Made to meet users' needs’.

Table 5.5 Underlying Factors for New Product Failure

Underlying Factor Name (% Variance Explained)	Variables(Original Factors) Loading on Factor	Variable Loadings
1 Market Competitiveness and Dynamism (21.4%)	Many competitors in market	0.93
	Intense price competition in market	0.89
	Frequent new product introductions in market	0.80
	Market growth was high	0.73
2 Product Superiority (19.4%)	Technically superior to competitors	0.90
	Made to meet users' needs	0.87
	Superior in quality	0.84
3 Marketing Strength (15.0%)	Strong sales force launch effort	0.90
	Adequate advertising skills	0.89
	Allowed greater pricing flexibility	0.76
4 Product Development Team (9.3%)	Very experienced project team	0.94
	Multi-functional development group	0.82
5 Product Benefit (7.8%)	Less after-sale problems	0.79
	Attractive in appearance	-0.61
	Project supported by Senior Executives	-0.62
6 Company Resources (7.0%)	Adequate financial resources	0.84
	Project supported by Senior Executives	0.66
7 Existence of Competitor Products (5.5%)	Customers satisfied with existing products	0.97

Note: From SPSS varimax rotation

Factor 3 was identified as '**Marketing strength**', because the three factors that constructed the factor were, 'Allowed greater pricing flexibility', 'Strong sales force launch effort', 'Adequate advertising skills'.

Factor 4 was made up of 'Very experienced project team' and 'Multi-functional development group'. This factor could possibly be labeled as '**Human resources of product development**'. The experience and structure of a development team would help avoid pitfalls in new product outcomes.

Factor 5 was made up of three original factors 'Less after-sale problems', 'Attractive in appearance' and 'project supported by senior executives'. It is mixed and difficult to name. But the top management support was beneficial to make new products successful. So this factor can be explained as '**Product benefits**'.

Factor 6, had two original factors with significant loadings, 'Adequate financial resources' and 'project supported by senior executives', and could probably be labeled as '**Company resources**'. It was not unusual that 'project supported by senior executives' had high loading for both Factor 5 and 6, as it could combine with other original factors and resulted in different underlying factors.

Factor 7, '**Existence of competing products**' contained one outstanding factor 'Customers satisfied with existing products'.

5.7.3 Comparison of Underlying Factors in New Product Success and Failure

In summary, factor analysis revealed that the underlying factors for both successful and failed products appeared to explain over 80% of the variance in the original 24 factors. Thus they might describe the original factors considerably well.

In fact, most of the grouping of original factors in the underlying dimensions were rather similar to those of original groups chosen at the beginning of the research. It can be said as that the original grouping of the factors in the survey was reasonable on the whole. The underlying

factors can be used as the simplified list to examine new product success and failure in future research.

When putting the underlying factors for new product success and failure side by side (see Table 5.6), one can find that some underlying factors had similar, but not exactly the same, variables (original factors) of outstanding loadings, so they were labeled with the same names. It likely meant that these factors were important factors describing both new product success and failure. For example, Factor 1 for successful products and Factor 3 for failed products, also Factor 3 for successful products and Factor 2 for failed products, were similar or identical. Factor 4 for successful products and Factor 5 for failed products had different original factors, but they both described product benefits to customers, so they were named the same.

The underlying factors which showed outstanding difference between the two groups of products were Factor 6 and 8 for successful products and Factor 7 for failed products. The difference of these underlying factors showed their influence on separating new product success and failure.

Factor 6 in new product success included two original factors which did not appear in any underlying factors in new product failure, 'good understanding of buyer behavior' and 'the consumer had great need for product type'. The only variable with significant loadings in Factor 8 for new product success, 'project supported by senior executives', appeared in two underlying factors in new product failure but with lower loadings. It seemed that successful products had good knowledge of consumers and were supported by top management.

Factor 7 in new product failure had one outstanding original factor, 'customers satisfied with existing products', that had lower loading in Factor 2 for new product success. This factor had negative impact on new product introduction, and could result with deadly outcomes for the new product launched into the market.

Table 5.6 Comparison of Underlying Factors for New Product Success and Failure

Underlying Factors for Successful Products Variables(Original Factors)	Underlying Factors for Failed Products Variables(Original Factors)
1 Marketing Strength Strong sales force launch effort Adequate advertising skills Adequate distribution resources	1 Market Competitiveness and Dynamism Many competitors in market Intense price competition in market Frequent new product introductions in market Market growth was high
2 Product Development Team and Market Environment Very experienced project team Frequent new product introductions in market Customers satisfied with existing products Multi-functional development group	2 Product Superiority Technically superior to competitors Made to meet users' needs Superior in quality
3 Product Superiority Superior in quality Technically superior to competitors	3 Marketing Strength Strong sales force launch effort Adequate advertising skills Allowed greater pricing flexibility
4 Product Benefit Good value for money Attractive in appearance	4 Product Development Team Very experienced project team Multi-functional development group
5 Market Competitiveness Intense price competition in market Many competitors in market	5 Product Benefit Less after-sale problems Attractive in appearance Project supported by Senior Executives
6 Consumer Knowledge Good understanding of buyer behaviour The consumer had great need for product type	6 Company Resources Adequate financial resources Project supported by Senior Executives
7 Company Resources Adequate financial resources Better suited to our firm's technology	7 Existence of Competitor Products Customers satisfied with existing products
8 Top Management Support Project supported by Senior Executives	

5.8 Discussion and Conclusion

A number of factors were picked by the majority of the respondents to describe their successful new products. Among these popular factors, most were new product characteristics that described the superiority and uniqueness of new products. To be superior in quality and

technology, meeting users needs, attractive in appearance, and delivering good value of money and sound after-sales services were the most common factors in successful new products. They can be viewed as the determinants that led to new product success for the New Zealand electronics companies.

There were also some factors that were missing in the failed new products. For those commonly missed factors, they can be seen as the causes of new product failure. Such factors included: less pricing flexibility, later-comers on the market, weak sales forces and launch effort, after-sales problems, and inadequate advertising skills. These factors were mostly market-relevant.

Factor analysis reduced the original 24 factors in the survey to eight underlying factors for successful new products, seven underlying factors for failed new products. These underlying factors explained over 80% of the variance of original factors, therefore they described those original factors considerably well. The underlying factors for new product success were labeled as marketing strength, product development team and market environment, product superiority, product benefit, market competitiveness, consumer knowledge, company resources, and top management support. The underlying factors for new product failure were market competitiveness and dynamism, product superiority, marketing strength, product development team, product benefit, company resources, and existence of competitor products. While many of these underlying factors for new product success and failure remained similar in terms of the groups of original factors, three of them appeared significantly different between the two groups. Consumer knowledge and top management support were outstanding dimensions for new product success, whereas existence of competitor products was a major barrier for new product failure.

When comparing new product success and failure side by side for these factors, the difference between successful and failed products can be observed. As mentioned in the literature review, only those factors with significant differences between successful and failed new products are the real key factors that drive new product success apart from failure. The next chapter is going to look at these differences of the factors between new product success and failure to identify the importance of each factors in new product success and failure.

Chapter 6 Factors' Contribution to Separating New Product Success and Failure

6.1 Introduction

The 24 factors, which were analyzed in the last chapter, were divided into three groups in this chapter in terms of their contributions to separating new product success and failure. The three groups were very important factors, less important but influential factors, and non-important factors. The grouping was based on the significance levels of difference(SL) between successful and failed products means of the factor.

The group of important factors had SL 0.001 or less, the group of influential factors had SL between 0.001 and 0.05, and the groups of non-important factors had SL 0.05 and over. This grouping was empirical, and the factors with close SL values at the dividing point but in different groups may have similar impact on new product success and failure. The grouping was also combined with frequencies of scores of factors which directly reflected respondents' perceptions about the importance of factors to new product success and failure.

When comparing new product success and failure side-by-side, one can observe the difference between them on each of these factors. The number in the column SL in the following tables is the significance level of the difference of the factor means of successful and failed products and represents the probability of whether the two sets of products are likely to have the same means on the factor. The smaller the SL, the more likely it is that the factor is important in distinguishing between new product success and failure.

The group of very important factors appeared crucial to new product success and failure in this research, and they can be viewed as key factors that separate new product success and failure. The second group of factors played a moderate role in new product outcomes. The last group did not appear to be significantly different between successful products and failed ones, therefore they did not have impact on separating new product success and failure.

The impact of company size on new product success and failure was analyzed by dividing the companies into three groups according to their annual sales(see Section 4.3). The large companies had over (NZ)\$10 million annual sales, the medium ones had annual turnovers between (NZ)\$3 million to (NZ)\$10 million, and small companies had less than (NZ)\$3 million annual sales. The data analysis in the three groups of companies revealed that they had different key factors in new product success and failure.

Finally the result of this research is compared to those to previous studies. Looking at the similarities and differences between them, explanations are sought.

6.2 The Very Important Factors in Distinguishing New Product Success and Failure

Factors with very high significance levels of differences(SL < 0.001) between successful and failed products can be viewed as very important keys related to new product success/failure. These factors also had high percentages of ‘Agree’ for successful products and relatively low percentages of ‘Agree’ for failed products. Seven such factors are listed in Table 6.1, ranking by the significance of difference between new product success and failure.

Table 6.1 The Very Important Factors in Separating New Product Success and Failure

Factors	Percentage				Mean-Score		SL
	Agree		Disagree		Success	Failure	
	Success	Failure	Success	Failure			
1 Good understanding of buyer behaviour	62%	14%	0%	20%	2.28	3.60	1.15E-7
2 Good value for money	83%	26%	0%	14%	1.88	3.17	2.12E-7
3 Made to meet users' needs	85%	49%	0%	11%	1.65	2.71	5.05E-5
4 Less after-sale problems	82%	30%	3%	23%	2.03	3.27	3.32E-4
5 The consumer had great need for product type	68%	35%	0%	12%	2.18	3.03	3.51E-4
6 Allowed greater pricing flexibility	42%	15%	13%	36%	2.79	3.91	3.65E-4
7 Attractive in appearance	74%	36%	0%	12%	2.11	2.97	7.21E-4

SL: Significance Level of Difference between mean scores of successful and failed new products.

Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;

The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’.

Good understanding of buyer behavior was significantly different between successful and failed products. It is a kind of capability of the development team that is mainly relevant to the staff's experience and knowledge level of consumers. It is also based on good communication between development staff and customer. The dynamic nature of buyer behavior makes it impossible for the same marketing strategy to work all the time, or cross all products, markets, and industries. To understand buyer behavior, who, what, when, where, why, and how of the purchase processes are set out. For developing successful marketing strategies it is important to understand what buyers think, feel and do in a certain environment. Understanding buyer behavior plays a crucial role in the new product process. In the early stages of idea generation, when buyer behavior is well understood and the customer's requirement for products is well translated, it likely means that product concepts would be generated meeting customer's needs. Good understanding of buyer behavior is also helpful to avoid waste of resources at early stages of the new product process[Cooper, 1993]. In the final stage of the process, which is new product launch, it helps to define the target market, set the right price, and plan an effective promotion and advertising campaign.

Good value for money can be understood as providing significant cost saving or other benefits to users which is an obvious attraction to customers. A new product with good value for money can mean that it:

- reduced the customer's total costs; or
- met customer needs better than competitive product at the same costs.

In this study, only a quarter of failed products were claimed to offer good value for money to customers, compared with 83% of successful products. It is very clear how important a product's value is to new product outcome. Note that the value of a product is in the eyes of the customer. People can look at the same product and judge it to have a different value. So one needs to assess the value of a product to the customer by setting the target market and looking at their options. A real benefit a new product offers to the customer can add to the value of the product. To translate the desired benefits into features, attributes, and product requirements is how a new product should be designed for customers[Cooper, 1993].

Made to meet users' needs was one of the initial objectives when the company decided to develop a new product; 85% of successful products had achieved this objective. In fact, there

were some companies who developed ‘tailored’ products to meet individual clients’ specific requirements(See open-ended comments in Appendix VII). Although about half of failed products were claimed as ‘Made to meet users’ needs’, it probably was because that at their initiation those products were believed to be made to meet users’ needs. Further analysis showed that, among these products, more than half more or less failed to understand buyer’s behavior, had weak launch efforts and promotion skills, or had less pricing flexibility. These were some of the main causes of those failures as shown in Table 6.2.

Table 6.2 Main Causes of Failure of the Products Which Were ‘Made to Meet Users’ Needs’

Factors		Percentage	
		Disagree	S-Disagree
1	Strong sales force launch effort	33.3%	36.4%
2	Adequate advertising skills	33.3%	21.4%
3	Allowed greater pricing flexibility	37.5%	17.6%
4	Good understanding of buyer behaviour	17.6%	40.0%

Note: Sample size for this table is 17, which is the number of failed products that were ticked as ‘Agree’ for the factor ‘Made to Meet Users’ Needs’.

The total Percentages are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’

It is clear that the users’ needs are from the users’ perspective; they must be based on an in-depth understanding of customer needs, wants, problems, likes, and dislikes. Good communication between development team and customer is of great help to achieve this point.

Less after-sales problems were listed as an important factor driving successful products apart from failed ones. After-sale problems can be caused by one or several of the following:

- poor product quality and/or reliability;
- poor communication with customers;
- insufficient customer education;
- inefficient delivery service;
- inadequate repair service.

The factor 'Superior in quality' did not show a significant difference between successful and unsuccessful products (See Section 5.6.2), only 5.7% of the failed products had problems in quality. This seems to mean that a large part of the after-sale problems were not caused by product quality, but by customer service and education. Because this research focused on the electronics industry, a field with more high-technology involved and more rapidly changing than many other industries, after-sales communication and education could be important. When new features or skills are needed in using the new product, user's education becomes very important to the acceptance of the new product. In fact, a few respondents admitted in open-end comments, that their failed products were hard to use, in spite of having new or advanced features. This could be caused by poor design, but also can be viewed as the result of insufficient customer education

The consumer had great need for product type showed the market demand for the product. It seems that when market demand is high, it is likely to give more opportunities for new products. The customer demand is defined as market attractiveness which needs to be well addressed in market analysis by the time the new product development project is ready to enter the development stage[Cooper and Kleinschmidt, 1990a].

Allowed greater pricing flexibility showed significant difference between successful and failed products. It was likely a very important factor overall in spite of the relatively low percentage of 'Agree' for successful products(Refer to Section 5.6.1). Since the price competitiveness in the marketplace did not show significant difference between successful and unsuccessful products in this study(see Section 5.6.3), the flexibility of pricing seemed not to gain competitive strength, but to offer good value to users and to set good profit margin. Although less than half of the successful products were claimed as having great pricing flexibility, which was quite low comparing to other factors, there were more than a third of unsuccessful products not having such flexibility, which was the highest figure of 'Disagree' among all factors.

It was interesting that **Attractive in appearance** differentiated new product success from failure. Product's appearance is an important product feature, and is based on packaging and product design. When there is not a big difference in the products' technical features and

quality, the product with an attractive appearance will likely give customer a very good first impression.

6.3 The Moderate Factors in Separating New Product Success and Failure

Factors listed in Table 6.3 were those which showed less importance, but still had influential impacts in separating new product success and failure. These seven factors had significance levels of difference between successful and failed products from 0.001 to 0.05. Four of them related to the new product's nature, two were company resources, and another one related to company's mangement style.

Table 6.3 The Moderately Important Factors in Separating New Product Success and Failure

Factors	Percentage				Mean-Score		SL
	Agree		Disagree		Success	Failure	
	Success	Failure	Success	Failure			
	1 Project supported by Senior Executives	86%	61%	0%	12%	1.84	
2 Adequate Distribution Resources	65%	33%	3%	13%	2.32	3.20	2.14E-3
3 Strong sales force launch effort	49%	13%	18%	26%	2.82	3.74	7.81E-3
4 Superior in quality	69%	50%	0%	6%	2.03	2.65	1.06E-2
5 First on the market	55%	26%	18%	29%	2.66	3.57	1.35E-2
6 Better suited to our firm's technology	50%	32%	3%	15%	2.47	3.12	1.42E-2
7 Technically superior to competitors	69%	42%	0%	0%	2.03	2.58	2.08E-2

SL: Significance Level of Difference between mean scores of successful and failed new products.

Note: in the table, Agree = 'Strongly Agree' + 'Agree'; Disagree = 'Strongly Disagree' + 'Disagree';

The percentages of a factor for success(failure) are 100% by adding percentages of 'Somewhat Agree' and 'Somewhat Disagree'

Senior executive support for project was a factor commonly picked for both successful and failed products, although the successful products had higher percentage of 'Agree'. One possible reason is that most respondents were in senior positions of companies. They would have thought they were very supportive to all projects in the companies. But there were 12% of failed products which did not receive support from senior executives. The differences between successful and failed products were notable.

Adequate distribution resources showed a rather striking difference between new product success and failure. The best products in the world will not sell themselves. Distribution channel is a bridge between customer and products. The distribution decisions for new products should be based on the company's market segments and marketing objectives. The role of distribution resources was obviously important in new product outcomes.

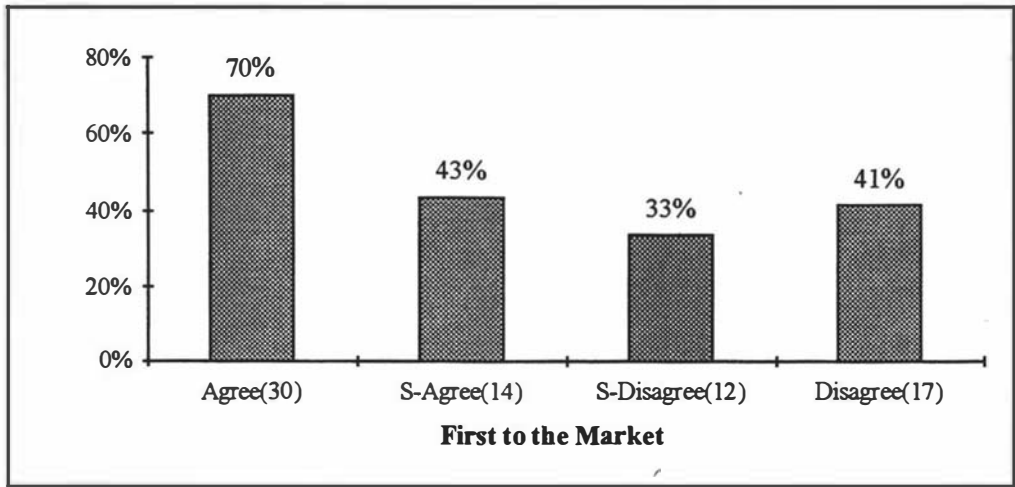
Strong sales force/launch effort impacted on new product success and failure. A well-conceived and well-designed new product does not ensure success. A strong marketing effort, and a well-targeted selling approach are central to the successful launch of the new product[Cooper, 1993]. But a well-integrated and properly targeted launch has to come from a fine-tuned marketing plan. It means that one of the preconditions for strong launch efforts is a well-developed marketing plan. In the analysis of new product development activities(See Chapter 8), a clear market strategy had significant influence on new product success and failure.

Superior in quality was a very important factor in previous research[Cooper, 1979a; SPRU, 1972], but did not show such determination on new product success and failure in this study. Half of the failed products were superior in quality, only 6% of them had quality problems. The significant level of difference was greater than 0.01. It might be because quality was seen as one of the basic essentials to new product outcome. It can be seen that successful products almost had no quality problems.

First on the market was true for over half of the successful products. It seemed that a new product that was innovative or novel with unique features was more likely to be successful. But in this study, product's uniqueness and superiority did not play as much of an essential role to separate new product success and failure as previous research showed[Cooper, 1979a and 1993]. This might have two reasons to explain it. First, a 'first-to-market' product involved more technological and marketing uncertainty, it sequentially required more technological assessment and marketing research, therefore had more risk of failure. Second, as a 'me-too' or 'second-to-market' product, if marketing research showed potential opportunity, a well executed development process would more or less secure a success.

All products in this survey, either successful or failed, were divided into four groups according to the respondents’ answers to the factor ‘First on the market’: ‘Agree’, ‘Somewhat Agree’, ‘Somewhat Disagree’ and ‘Disagree’. Then looking at the success rates for each group, thirty products that were claimed ‘first-to-market’ had 70% success rate, and 41% of the seventeen ‘me-too’ products also succeeded(See Figure 6.1). These two groups had reasonable difference in success rate. It shows that the factor ‘first on the market’ had considerable influence in separating new product success and failure.

Figure 6.1 Success Rate of New Products Classified by ‘First to the Market’



Note: Data based on total number of products that ticked the factor ‘First on the market’.
Numbers in the brackets indicated the number of products(both successful and failed products) ticked the scores.

Better suited to our firm’s technology This factor related to the new product’s technology was found to have moderate influence on separating new product success and failure. Technological fitness between the company and the products was found very important in previous research[Cooper and Kleinschmidt, 1990a; Maidique and Zirger, 1984]. Cooper described the new product project’s ability to build on in-house-development technology, utilize inside engineering skills, and use existing manufacturing resources and skills as ‘technological synergy’. And his message was that the technological synergy was vital to new product success. The current study on this factor revealed that half of the successful products had good technological fit between company and products, compared with 32% of failed

products. This finding may somehow reflect the rapid change of technology in the electronics industry. There were many cases that new technology which was not familiar to company had to be involved in new product development.

Technically superior products appeared considerably different between new product success and failure. But none of the successful and failed products in this study were admitted to be technically falling behind competitors. This factor had very a similar result to ‘superior in quality’. It is believable that one of the initial aims to develop a new product is to make it technically superior to competitors’ products.

6.4 The Non-Important Factors in Separating New Product Success and Failure

Ten of the factors tested in this research did not appear much different between successful and failed products. The significance levels of difference of these factors were nearly 0.1 or greater. They had either minor or no influence on separating new product success and failure. So they were viewed as non-important factors. They are listed in Table 6.4.

Table 6.4 The Non-Important Factors in Separating New Product Success and Failure

Factors		Percentage				Mean-Score		SL
		Agree		Disagree		Success	Failure	
		Success	Failure	Success	Failure			
1	Frequent new product introductions in market	16%	31%	35%	22%	3.76	3.19	9.97E-2
2	Adequate adervtising skills	44%	23%	22%	23%	3.08	3.61	1.00E-1
3	Customer satisfied with existing products	32%	39%	8%	13%	3.19	2.74	1.30E-1
4	Market growth was high	50%	29%	14%	15%	2.78	3.18	1.80E-1
5	Adequate financial resources	62%	44%	8%	9%	2.49	2.79	2.44E-1
6	Market size was large	49%	37%	16%	11%	2.78	3.09	3.27E-1
7	Multi-functional development group	46%	50%	11%	6%	2.80	2.63	5.36E-1
8	Many competitors in market	35%	38%	24%	21%	3.08	3.21	7.26E-1
9	Very experienced project team	64%	59%	8%	0%	2.36	2.28	7.58E-1
10	Intense price competition in market	54%	45%	11%	12%	2.70	2.79	7.87E-1

SL: Significance Level of Difference between mean scores of successful and failed new products.
Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’

Frequent new product introductions in market indicated the level of market dynamics. It seemed that a new product was more likely to be successful when it entered a marketplace with less new product introductions, but its influence was not significant. Dynamic markets, characterized by many new product introductions, were likely receptive to new ideas, and facilitated new products. But they could also become a quagmire of problems and hidden obstacles, and show high competitiveness. To avoid high market competition was proved to be helpful but less essential to new product success[Cooper, 1979a, 1993]. In fact, the marketplace studied in this survey, for either successful or unsuccessful products, was not very dynamic at all(only 16% of successful products and 31% of failed ones were ticked 'Agree' for this factor). That probably somehow reflected the niche market, which was claimed by several respondents as the most important factor for their new product successes.

Adequate advertising skills, as a part of marketing strength, played a rather minor role in the new product game. Less than half of successful products were assisted by adequate advertising skills, and 22% without such assistance. Advertising as a part of marketing activities, is an effective communication tool to promote new products to the target markets[Cooper, 1993]. The result of the current study on this factor might somewhat indicate that small companies did not have specific people doing advertising. They rather subcontract it to the advertising agency. It may be also because that the majority of the companies in this study were selling industrial products, their customer bases were rather different from those selling consumer products. They probably had relatively narrow customer groups who know the business areas well, therefore they might not need as heavy advertising as consumer product companies do.

Customer satisfied with existing products was a somewhat strange factor. It was assumed that being in a competitive market, where customers were already well satisfied, was a major barrier to new product success[Cooper, 1979a]. In this study, the level of customer satisfaction for successful and failed products were not significantly different, and the percentages of satisfied customers for both group of products were all higher than those of unsatisfied customers. It might somewhat show the market competitiveness, that wherever a market is, there are competing products existing. It is hard to find a marketplace without competing products.

The market size and market growth factors did not differentiate new product success and failure. In fact, successful products that entered large-sized and high-growth markets were about half of the total, in comparison with about a third of failed products. This probably is one of the results of the New Zealand electronics industry looking for niche markets in the international competition. It was mentioned in open-end comments by a few respondents. Following a niche strategy means staying away from what might be termed the 'heart of the market.' [Linneman and Stanton, 1995] The heart of the market is where the volume sales are, and this market segment is usually dominated by large companies. Conversely, market niches are small market segments that dominant companies are likely to ignore or overlook, as they deem those unprofitable or unimportant.

It may be also because New Zealand is a small country with limited financial and human resources which restrict its capability of sharing the mass international markets. Only a quarter of the surveyed companies had annual sales over (NZ)\$10 million, and they were still small-sized companies by American standard [Yap and Souder, 1994]. In fact, small size of a company can be an advantage in capturing market niches. The limited potential growth of a mature market can also protect the small companies from emergent competition.

It seems the factor **Adequate financial resources** was another minor player in differentiating new product success and failure. Very few new products in this survey, either successful or failed ones, suffered pitfalls caused by inadequate financial resources (8% of successful products and 9% of failed ones were ticked 'Disagree'). There are a number of previous studies which found adequate financial resources crucial to new product success [Song and Parry, 1994; Mishra, Kim and Lee, 1996]. One possible reason for the current finding is that as small companies, the New Zealand electronics companies did not need huge financial resources to operate their businesses.

It was a surprising finding that **multi-functional development group** did not differentiate between new product success and failure. It seems that the same number of failed products were developed by multi-functional teams as successful products (refer to both mean scores and percentages). In a large empirical success/failure study, Larson and Gobeli (1988) assessed the relative effectiveness of different project management structures for new product

development. Multi-functional team approaches were found to have higher success rates. Cooper also emphasized the importance of multi-functional teams on new product success[Cooper, 1993].

Does the current finding indicate that New Zealand new product developers in the electronics industry were not aware of the importance of multi-functional teams? The possible explanation is that the surveyed companies were mostly small-sized and compact. It was not so obvious whether a development team was multi-functional, as a single person might play several roles during the product development process. In fact, according to the in-depth interview, quite a few large companies have already adopted multi-functional approach of new product development(See Chapter 9).

The lack of difference on market competitiveness, characterized by the factors **Many competitors in market** and **Intense price competition in market**, somewhat reflected the same implications of market niche. Market niche is described as a small, narrow and specific market segment[OECD, 1995]. A company can reduce the intensity of competition by targeting and securing a defensible segment in the market. In doing so, it can virtually exclude substitute products of new entrants. On the other hand, by producing differentiated products which may appeal to specific segments of the market a company can strengthen its competitiveness.

A very experienced project team did not separate new product success from failure. There was no obvious difference between successful and failed new products that were developed by experienced project teams(64% 'Agree' for successful products and 59% 'Agree' for failed products respectively). Only a few successful new products were developed by an inexperienced project teams(8%). It might indicate that the majority of surveyed companies had adequate experience of new product development. It may also imply that an experienced team cannot guarantee new product success in the electronics industry, because it is an area where technology is changing rapidly. Development teams have to update their knowledge of new technology regularly rather than solely depend on old experience.

6.5 The Impact of Company Size on New Product Success and Failure

As described earlier, the companies who participated in this survey were mostly small sized. They can still be grouped as small, medium and large companies according to the annual sales of these companies. A total of 39 companies were divided into the three groups(refer to Table 4.3). The data analysis was conducted repetitively within these three groups of companies. The aim was to identify whether companies in different sizes have different key factors in new product success and failure.

Table 6.5, 6.6 and 6.7 list important factors in new product success and failure for small, medium and large companies, ranking by the significance levels of differences between successful and failed products means. The difference between large and small companies is rather clear, while they both had similarities with the medium companies.

For the group of small companies, the most important factors in new product success and failure was to understand buyer behavior well, make new products offering good value and meeting users' needs, with great pricing flexibility, finding marketplaces where customer needs is great, and supported by strong distribution resources. Large companies emphasized the importance of financial resources and distribution resources to new product success, along with quality superiority, attractiveness in appearance and considerate after-sales services. Good understanding of buyer behavior and good value of money were also important but not as crucial as they were for the small companies. The group of medium companies had important factors that were at a mixture of the other two groups. Good understanding of buyer behavior, good value for money and met users' needs were the most important factors for medium companies, as they were for the small companies. Other two important factors, less after-sales problems and attractive in appearance, were in the large companies' list of important factors.

The small companies had a very compact structure which allowed them to develop 'tailored' new products for their clients at very low quantity. That largely explained why the value of new products, good understanding of buyer behavior, and meeting users' needs were so important to new product success. As small companies had relatively lower profit targets, and because of the specificity of 'customer-made' products, they could afford more pricing flexibility. Adequate distribution resources was also important in small companies, but even for

successful products only 50% were ticked ‘Agree’ for this factors. That was probably because many small companies did not have their own distribution channels, especially those who mainly produced ‘customer-made’ products, and directly contacted their clients, and did not need a distribution system.

Table 6.5 Important Factors in New Product Success and Failure for Small Companies (Annual Sales \$3 million or less)

Factors	Percentage				Mean-Score		SL
	Agree		Disagree		Success	Failure	
	Success	Failure	Success	Failure			
1 Good value for money	94%	17%	0%	17%	1.56	3.33	5.14E-5
2 Good understanding of buyer behaviour	53%	0%	0%	25%	2.40	3.92	6.21E-5
3 Allowed greater pricing flexibility	50%	0%	14%	64%	2.64	4.55	6.38E-4
4 The consumer had great need for product type	75%	40%	0%	20%	2.13	3.33	6.15E-3
5 Made to meet users' needs	94%	58%	0%	8%	1.44	2.58	1.80E-2
6 Adequate distribution resources	50%	10%	7%	20%	2.79	3.90	2.54E-2

SL: Significance Level of Difference between Successful and failed new products mean scores.
Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’.

Table 6.6 Important Factors in New Product Success and Failure for Medium Companies(Annual Sales \$3 million - \$10 million)

Factors		Percentage				Mean-Score		SL
		Agree		Disagree		Success		Failure
		Success	Failure	Success	Failure			
1	Good understanding of buyer behaviour	64%	9%	0%	0%	2.09	3.36	8.71E-4
2	Good value for money	82%	36%	0%	18%	1.91	3.27	1.57E-2
3	Less after-sale problems	100%	45%	0%	9%	1.55	2.64	2.89E-2
4	Made to meet users' needs	91%	55%	0%	9%	1.55	2.55	3.11E-2
5	Attractive in appearance	67%	45%	0%	9%	2.00	2.91	4.83E-2

SL: Significance Level of Difference between Successful and failed new products mean scores.
Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’.

It is a bit strange that great customer need for product type was listed as a very important factor in new product success and failure in the small companies(at SL <0.01), while it did not appear of much importance in the large companies(at SL < 0.15). The possible explanation is

that the small and large companies have a different gauge of 'great customer needs'. An order which was rather big for a small company could be a tiny one for a big company.

Table 6.7 Important Factors in New Product Success and Failure for Large Companies(Annual Sales over \$10 million)

Factors		Percentage				Mean-Score		SL
		Agree		Disagree				
		Success	Failure	Success	Failure	Success	Failure	
1	Adequate financial resources	100%	60%	0%	0%	1.64	2.40	3.04E-3
2	Adequate distribution resources	100%	56%	0%	11%	1.64	2.67	1.69E-2
3	Superior in quality	67%	27%	0%	9%	2.00	3.09	1.86E-2
4	Attractive in appearance	73%	27%	0%	27%	2.27	3.45	1.89E-2
5	Good understanding of buyer behaviour	67%	27%	0%	27%	2.33	3.64	2.19E-2
6	Less after-sale problems	75%	13%	0%	25%	2.17	3.75	2.30E-2
7	Good value for money	75%	27%	0%	9%	2.17	2.91	2.46E-2

SL: Significance Level of Difference between Successful and failed new products mean scores.
Note: in the table, Agree = 'Strongly Agree' + 'Agree'; Disagree = 'Strongly Disagree' + 'Disagree';
The percentages of a factor for success(failure) are 100% by adding percentages of 'Somewhat Agree' and 'Somewhat Disagree'.

The large companies viewed adequate financial resource as the number one factor separating new product success from failure. This is because comparatively more financial backup may be required to support the new product development process within large companies than small companies, even though the percentage level of financial resources is equally crucial to both groups of the companies. Previous research showed that successful new products spent more money on marketing activities in the new product development process, especially at the up-front stages[Cooper, 1993].

Adequate distribution resources was another very important factor to new product success. Large companies normally had wider product range which may require different distribution channel patterns, such as agents, wholesalers and retailers[Hisrich and Peters, 1991]. Having adequate distribution resources means the company can make the right choice on distribution channels and then to sell new products more effectively therefore more successfully.

When looking at new product superiority, large companies were more concerned about product quality, appearance, and after-sales service rather than value of money. One reason might be that large companies had more customers to serve with their new products. They

needed to assure the new product having attractive appearance to appeal customer, superior quality and good service to satisfy most customers.

The medium companies had key factors to new product success that were similar to small companies in one part, to large companies in other part. As like small companies, they emphasized the importance of good understanding of buyer behavior, good value of money, and meeting users' needs. Because they had a compact structure similar to small companies, they were allowed the flexibility in developing the new product to suit customer requirements. On the other hand, they needed to serve more customers than small companies so that made after-sales service more important to keep customer satisfied.

In summary, the company size had an impact on new product success and failure. Most key factors for separating new product success and failure in each group were the same as in the overall analysis, but were ranked in different orders. The only factor that did not appear in the overall list of key factors for new product success emerged from large companies, adequate financial resources playing a crucial role in new product success and failure in large companies.

6.6 Comparison to Other Research Projects

Some of findings in this study confirmed the results of previous studies, while others were different. Here the results were put side by side to see what were identical and what were different, and explanations were sought.

6.6.1 Comparison to Cooper's Research

In Cooper's research project NewProd[Cooper, 1979a and 1993; Cooper and Kleinschmidt, 1987], the most important dimension leading to new product success was named '**Product Uniqueness and Superiority**', which included having unique and superior features, high quality, meeting customer needs better than competitor's products, and reducing customers' cost.

The findings of current research on product superiority supported Cooper's results. Good value for money, meeting users' needs, having great pricing flexibility, and attractive in appearance were among the group of the most important factors in new product success and

failure. But some factors did not show the impact in new product success as strong as his. For example, superior in quality and technology appeared to have moderate influence on new product success and failure in the current study, but it was found as the most important factor in Cooper's study.

Cooper's study found that the external environment had little impact on new product success. Although having a large and growing market with strong customer needs existing helped pave the way for a success, negative market characteristics, such as intense competition, only made new products marginally less successful. Current research supported Cooper's findings in the main, but found market size and growth influenced little new product success and failure. It may be explained that the current research tested mainly small companies who were looking for market niches where market size and growth were less than that studied in previous research.

6.6.2 Comparison to the Studies in the Electronics Industry

Stanford Innovation Project[Maidique and Zinger, 1984 and 1990] studied high-tech electronics companies and their new products. Its findings were partly supported by the current study. In-depth understanding of customers and the marketplace was found very important in both studies. Stanford Project revealed that new products with high contribution margin were more successful, which was similar to the result of current study that new product with great pricing flexibility were more successful. Top management support for the project was found essential to new product success in Stanford Project, but had moderate influence in new product success and failure in the current study.

There were several different findings in the two studies. Stanford Project emphasized the importance of multi-functional new product development approaches in new product success, but current research did not found the relationship between multi-functional project team and new product success and failure. Being first in the market was found as one of the important feature of successful new products in Stanford project, but it had moderate impact on new product success in the recent research.

Yap and Souder(1994) investigated new product success and failure in small entrepreneurial high-tech electronics companies, and found that new products, with high synergy, entering the markets where there were had little competition and high customer need, having high quality resources support, and conducting effective interdepartmental communication, were more successful. These results were mostly proven by the current study. Yap and Souder's study identified selecting niche markets as a key factor to turn small high-tech companies' advantage, and it was mentioned in the current research by several respondents that niche markets were a key factor to their new product success. The current study also emphasized the importance of high customer needs to new product success. But in the current study, the technical synergy and internal communication did not show a significant impact on new product success and failure.

One of the reasons that so many different findings occurred between the current study and previous research is the sizes of the companies. Although Yap and Souder's project looked at 'small' companies, this 'small' company was defined as 'annual sales less than US\$75 million and less than 500 employees'. Stanford Innovation Project's sample had median business unit with sales of US\$20 million and 200-300 employees. By contrast, the current study had a sample that contained companies mainly having less than 100 employees and annual sales less than NZ\$10 million. Such compact business units might not have as much internal communication problems as large companies did. They did not actually realize the importance of multi-functional new product approaches or interdepartmental communications.

6.6.3 Comparison to Other Studies in the Asia-Pacific Region

Link's project in Australia[1987] revealed six determinants for industrial new product success and failure which included management of launch execution, synergy of new product and existing business, market intelligence, market attractiveness, and product novelty and quality. Among these findings, the current study confirmed the importance of technological synergy of new product and company, and product uniqueness; but disagreed in launch execution, and partly disagreed in market attractiveness, market intelligence, and product quality.

Link stated that Australian industry was less innovative, 85% of the new products in his study were 'me-too' and line extension products. So they might be more dependent for their success on launch execution than other factors in his list. Comparatively, the new products in the current study of the New Zealand electronics industry were probably more innovative (about 60% of all the products in this study were 'first to the market'), and their success were more dependent on the new product value and uniqueness.

Song and Parry's study [1994] in Chinese state enterprises concluded six significant correlates of industrial new product success and failure: marketing potential and proficiency, competition intensity and relative lack of product advantage, production start-up proficiency, perceived risk, market determinateness, and technical synergy and proficiency. These findings had great differences with the results of the current study, although some similarities existed. The current study did not find market potential and competition intensity playing big roles in new product success and failure. However both studies emphasized the importance of product superiority and offering good value to customer on new product success. Nevertheless the current study found good understanding of buyer behavior as a critical factor to new product success and failure, while the Chinese research revealed little relationship between this factor and new product success.

The differences can be explained largely because the countries of the two studies are in different stages of economic development, and they have rather different cultures. China is a giant country with huge market size. It used to be the state-determined central plan economy and is currently under economic reform. It has had rapid economic expansion in recent years. The massive market potential certainly draws enormous interest from international investment, therefore the competition intensified. Also the Chinese study investigated companies in mixed industries. New Zealand is a much smaller country in considerably stable economic situation, where the market size is small. Even for the companies exporting their product to overseas market, as most the companies in this study did, they tended to look for niche markets.

As Mishra, Kim and Lee [1996] stated, after compared Korean companies with Chinese and Canadian companies in new product success and failure, that there is no one global formula for the success of new products. Factors that are important in one study are either not important or less important or have an inverse relationship in another study. Temporal differences in data

collection or the industries representing in the sampling frame are also possible reasons for the differences.

6.6.4 Comparison to the Studies that Applied Factor Analysis

Several previous studies in new product success and failure conducted factor analysis. Cooper(1979a) identified 18 underlying factors from 77 variables that were tested in his NewProd project. The 18 factors explained 71.3% of the variance in the original 77 variables. Song and Parry(1994) repeated the test with the same 77 variables in China and yielded 16 underlying factors which explained 78% of the variance in the original variables. A few of the factors were grouped identical to Cooper, and most were distinct but related to Cooper's factors. The top eight factors are listed in Table 6.11. It seems that even using the same variables to conduct factor analysis, different research may yield different results because of the difference in data collection, involved industries and countries.

Table 6.8 Comparison of Underlying Factors in Canadian and Chinese Studies

Factor Name (Canada, 1979)	% Variance Explained	Factor Name (China, 1994)	% Variance Explained
1 Technical and production synergy and proficiency	28.8%	1 Market potential and marketing proficiency	34.4%
2 Marketing knowledge and proficiency	11.7%	2 Competitive intensity and relative lack of product advantage	6.5%
3 Newness to the firm	10.1%	3 Technical synergy and proficiency	6.4%
4 Product uniqueness/superiority	9.0%	4 Strength of marketing communi- cation effort and launch effort	4.7%
5 Market competitiveness and customer satisfaction	6.7%	5 Production synergy and proficiency	3.8%
6 Marketing and managerial synergy	5.1%	6 Product technical complexity and magnitude	3.0%
7 Product technical complexity and magnitude	4.4%	7 Production start-up proficiency	2.7%
8 Market need, growth and size	3.5%	8 Newness of skills and competitors	2.4%

Source: Cooper, 1979a; Song and Parry, 1994.

Link's research(1987) investigated the contributions of 19 variables to success and failure of new products in Australia, and extracted six significant underlying factors determining new product success and failure: management of launch execution, synergy of new product with

existing business, completeness of market intelligence, product/market attractiveness, novelty of product, and quality of product. These six factors appeared to explain 62% of the variance in the original 19 variables. Link gave the possible reasons for the wide set of factors to explain new product success and failure as the wider sample size and variety of industries, the innovativeness of new products, and the research techniques.

The current study had a relatively narrow set of original factors which explained new product success and failure compared to those previous studies. It might be because that this study was focused on one industry rather than the mixed industry in the other two studies.

6.7 Conclusion

There were a number of key factors that separated new product success from failure. In this study such factors delivered a clear message that new product success was based on good understanding of buyer behavior, offering good value and benefits to customer to meet their needs, backed by good after-sales service and adequate distribution resources, and entering markets with great customer needs. Senior executives' support, effective marketing activities, superior quality and technology were helpful to achieve new product success. However, market competition, market size and growth, and the experience of development team appeared either a very weak influence or did not influence new product success and failure.

The further analysis in groups of companies by their sizes revealed that company size had an influence on the important factors of new product success and failure. Small companies emphasized their flexibility of providing 'customer-made' service to make new products suit users' needs. Large companies were concerned about strong financial support and distribution resources.

It is of interest how the companies with different core business, i.e. manufacturing and distribution, viewed their new product success and failure. The groups of manufacturing and distribution companies were comparable in sample size. The detailed analysis of these two groups of companies is presented in next chapter.

Chapter 7 Manufacturers and Distributors: The Differences of the Factors on New Product Success and Failure

7.1 Introduction

In this chapter the survey data were divided into two groups, manufacturers and distributors. The objective was to find whether there were any differences between these two groups on the factors affecting new product success and failure. There are obvious differences between these two kind of companies regarding organizational structures, core businesses, and staff professions. One key difference is surely that a manufacturer relies on manufacturing for profit, while a distributor resells products. Whether these or other hidden differences would impact on their efforts for new product outcomes is the main interest of this chapter.

This part of the research used the data collected from the mail survey, to determine if different factors in manufacturing and distribution companies impacted new product success and failure. Next, looking at the same factor, an effort was made to find out whether it had different levels of importance to separating new product success and failure in manufacturing and distribution companies. This can be identified from the distinct ranks of the factors by significance level of difference between successful and failed new products. Explanation for these differences is suggested.

7.2 The Two Groups of Companies: Manufacturers and Distributors

There were seventeen manufacturing companies and eleven distribution companies. Most of the manufacturing companies conducted product development activities, so the products they chose for this study were presumably developed and marketed by themselves. By contrast, the distribution companies did not have a product development facility, the products they selected for this study were merely launched by them into the market, and guided by the original manufacturers.

There were another thirteen companies doing both manufacturing and distribution. Because it was not known if the products were developed within the company or just commercialized by the company, they were not chosen for this comparison.

The data were the same as in the previous chapter but analyzed in two groups: manufacturing and distribution companies. The analysis was conducted in two ways. Firstly, the two groups were analyzed separately, to find out each factor's impact on new product success and failure for both groups. Then a comparison on percentages of each factor for both group was probed, on successful and failed products between the two groups. Any obvious differences were picked up and explanation was sought.

Mean scores of each of the factors for these two groups were calculated and the significance levels of differences of each factor between manufacturing and distribution companies were obtained from two-tailed t-test. Note that poor significance levels of difference between manufacturing and distribution companies appeared because of small sample sizes. It was also because the parallel comparison was between the successful(or failed) products from the two groups of companies, the significance levels of difference of the factors were certainly lower than those from opposite comparison between successful and failed products. The results would give some idea about differences between the two groups on the reasons of new product success and the causes of new product failure. Factors showing significant difference between manufacturing and distribution companies were discussed, and those not showing much difference were omitted. For full results see Appendix VIII.

7.3 Factors' Impact on New Product Success in Manufacturing and Distribution Companies

Looking at successful products when comparing manufacturing and distribution companies, there were some factors showing relatively significant differences between these two groups. Table 7.1 shows the mean scores and the percentages of 'Agree' and 'Disagree' of the top ten factors for manufacturing and distribution companies, ranked by significant levels of difference between the two groups. It likely means that these factors had different impacts on successful products of manufacturing and distribution companies. It implies that manufacturing and distribution companies had different advantages and disadvantages for their new product success.

**Table 7.1 Different Impacts of the Factors on Successful Products Between
Manufacturers and Distributors**

Factor	Percentage				Mean Score		SL
	Agree		Disagree		Mnfr	Dstr	
	Mnfr	Dstr	Mnfr	Dstr			
1 Made to meet users' needs	88%	73%	0%	0%	1.53	2.09	5.24E-2
2 Allowed greater pricing flexibility	50%	10%	13%	20%	2.63	3.50	6.86E-2
3 Better suited to our firm's technology	27%	78%	0%	0%	2.67	2.11	6.99E-2
4 Adequate distribution resources	53%	80%	7%	0%	2.67	1.90	7.92E-2
5 Adequate financial resources	50%	89%	13%	0%	2.75	2.00	1.04E-1
6 Project supported by Senior Executives	94%	80%	0%	0%	1.56	2.00	1.13E-1
7 Adequate advertising skills	29%	55%	29%	9%	3.43	2.64	1.22E-1
8 Attractive in appearance	69%	100%	0%	0%	2.13	1.75	1.38E-1
9 Strong sales force launch effort	38%	64%	19%	18%	3.13	2.36	1.94E-1
10 First on the market	69%	50%	19%	30%	2.25	3.10	2.45E-1

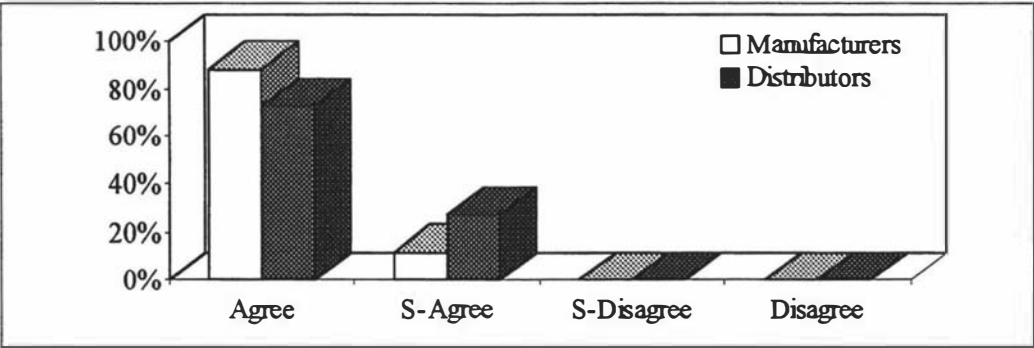
Mnfr: Manufacturing group.
Dstr: Distribution group.
SL: Significance Level of Difference between manufacturers and distributors mean scores.

Some of these ten factors showed significant difference between the means of the two groups of manufacturers and distributors, but the distributions of scores for the two groups appeared not distinctly different. And some other factors had different distributions of scores for manufacturing and distribution companies, although they did not show significant difference between the mean scores of the two groups. The details of distributions of scores for all these factors are illustrated from Figure 7.1 to Figure 7.12.

7.3.1 Made to Meet Users’ Needs

Manufacturing companies’ successful new products were more likely meeting users’ needs than distribution companies’ ones. But there was no distinct difference appeared in the distribution of score, although the level of difference these two groups’ means was high comparing to other factors. There was not a single product from both groups not ‘meet users’ need’. It was one of their virtues that the manufacturing companies designed ‘tailored’ products for their clients. This was very common in small manufacturing companies who were willing to make a small quantity or even only one product to suit the client.

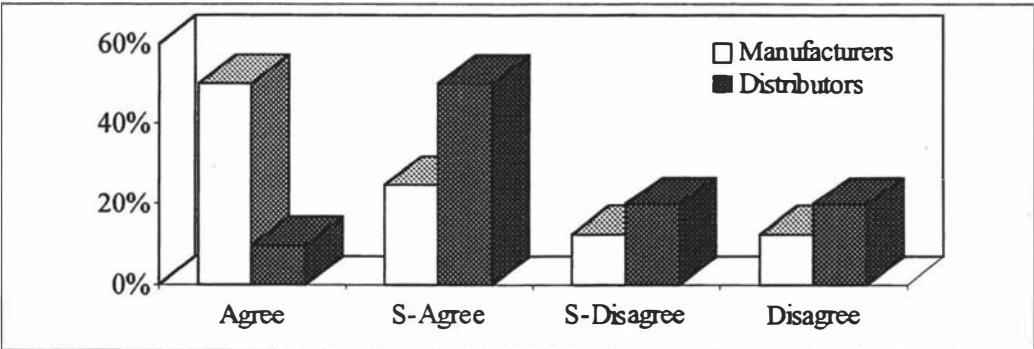
Figure 7.1 Distributions of Scores on ‘Made to Meet Users’ Needs’



7.3.2 Allowed Greater Pricing Flexibility

Manufacturing companies had more authority on product prices than distributors. Pricing flexibility gave companies an advantage to attract customer for cost-saving. Manufacturing companies normally developed products within their enterprises from idea to launch. They understood the costs of every stage of the process. To attract customers, they were able to set the target price more depending on customer’s preference, rather than on profit margin. Distribution companies were mostly dealing with products that were not developed by themselves; that made their pricing dependent on the suppliers’ price, and less under their control.

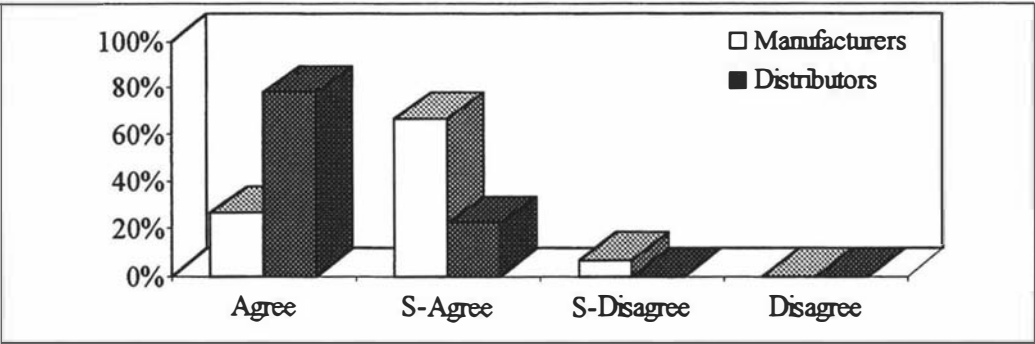
Figure 7.2 Distribution of Scores on ‘Allowed Greater Pricing Flexibility’



7.3.3 Better Suited to Our Firm’s Technology

It is rather surprising that distribution companies had more technological fitness between products and company. Although both groups of successful products did not have technological unfitness except one, distributors had higher level of confidence on this factor. It might be because distribution companies normally engaged in a certain range of products that were within their expertise fields. They likely had a portfolio of like-minded technology products to offer a niche market. Manufacturing companies, on the other hand, might have developed products involved in some new or unfamiliar technology as customers required, that led to a bit of unfitness between technology and the company.

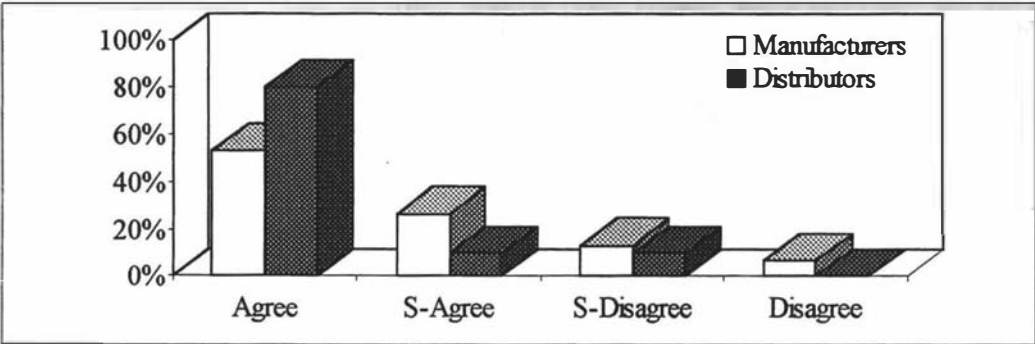
Figure 7.3 Distribution of Scores on ‘Better Suited to Our Firm’s Technology’



7.3.4 Adequate Distribution Resources

Distribution companies were more satisfied about their distribution resources than manufacturers. It is not surprising that distribution companies had this advantage because of their business nature. About a fifth of the manufacturing companies had more or less inadequate distribution resources. In fact, some manufacturing companies did not have a distribution chain at all, as they directly dealt with customers. That often happened to small-sized companies who were producing customer-made products.

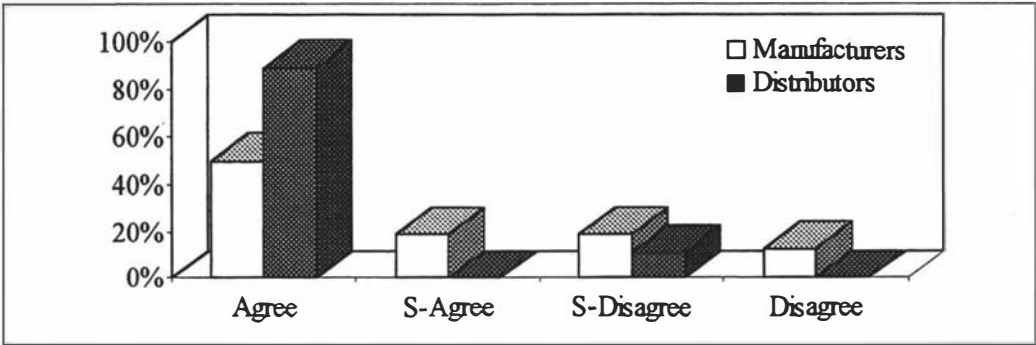
Figure 7.4 Distributions of Scores on ‘Adequate Distribution Resources’



7.3.5 Adequate Financial Resources

Distribution companies had very strong financial supports on their new product success. By contrast, only half of the manufacturing companies had adequate financial resources for their successful products. And about a third of the manufacturers did not, more or less, have significant financial resources. It is imaginable that manufacturing companies spend more on new product development than distributors, as they have to do prototype design and production development, also distribution. They need more financial resources to start-up their new product development process. Rather distribution companies might have enough financial support to cover marketing and distribution costs because they do not have development costs.

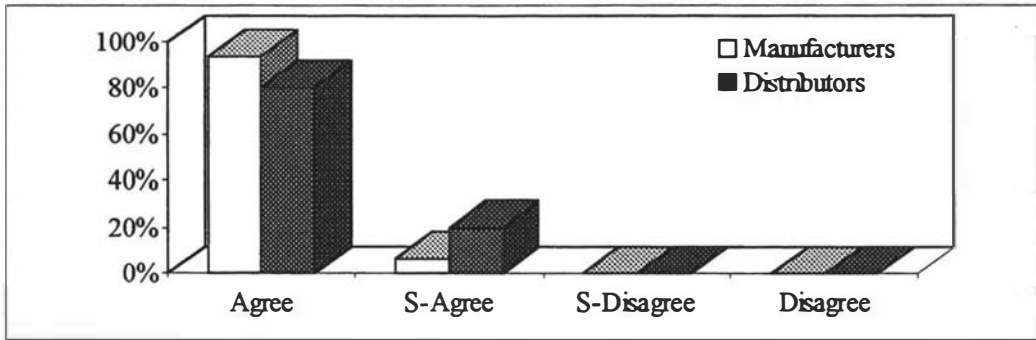
Figure 7.5 Distributions of Scores on ‘Adequate Financial Resources’



7.3.6 Project Supported by Senior Executives

Although the difference between the two groups of companies was quite significant , there was not really a big difference on distribution of scores between the two groups of companies on this factor, as no product was claimed not ‘supported by senior executives’. But the manufacturing companies had a slightly higher level of senior management support than distribution companies.

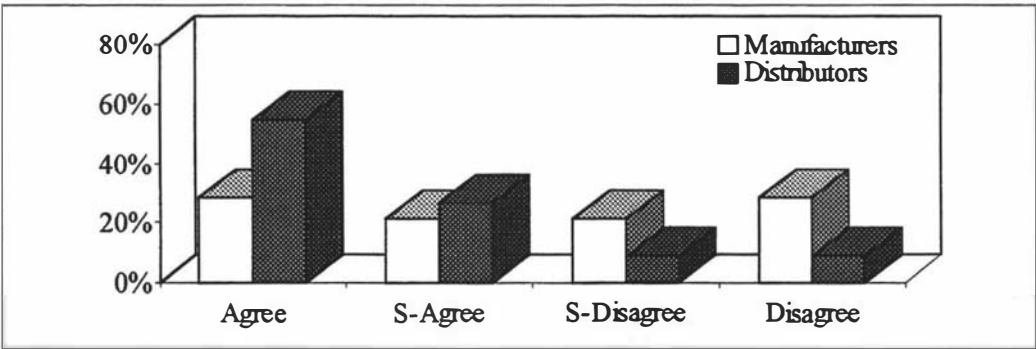
Figure 7.6 Distribution of Scores on ‘Project Supported by Senior Executives’



7.3.7 Adequate Advertising Skills

The obvious difference in the distribution of scores for the two groups of companies shows that distribution companies were more skilful in advertising new products. It is understandable, as many distribution companies had expertise in advertising for their new products, while some manufacturing companies did not even do advertising by themselves at all. Half of the manufacturing companies claimed they did not have adequate advertising skills for their successful new products(30% of ‘Disagree’). By contrast, only 20% of the distribution companies admitted, more or less, having inadequate skills in advertising their successful new products.

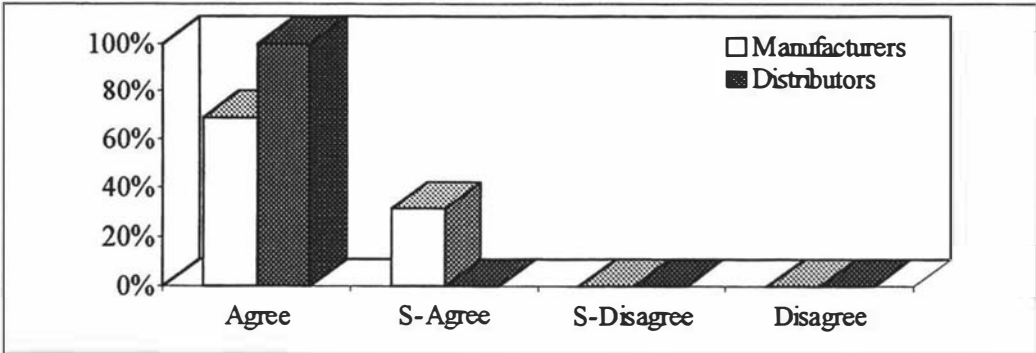
Figure 7.7 Distribution of Scores on ‘Adequate Advertising Skills’



7.3.8 Attractive in Appearance

All successful products that distribution companies chose for the survey were attractive in appearance, whereas manufacturing companies were less confident about their products' appearances, although no one admitted faults of product appearance. It might be explained that a large part of distribution companies imported products from overseas, that package design had to be better to attract market attention. Manufacturing companies might concentrate more on product's technical features. In fact, some industrial products, for example some electronic components, had nothing to do with appearance.

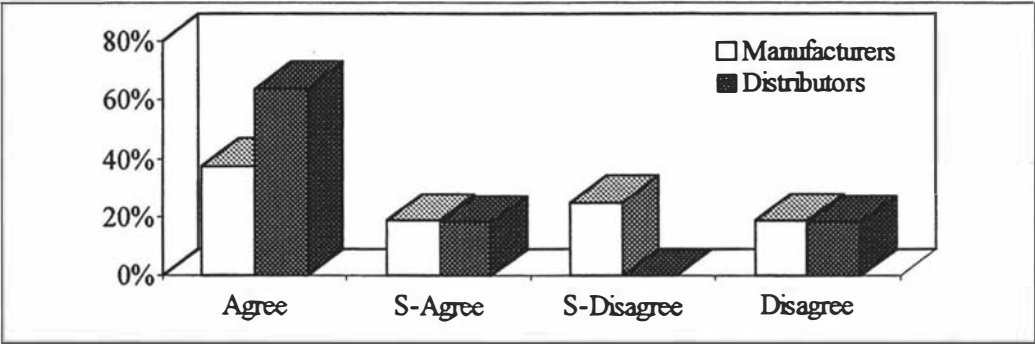
Figure 7.8 Distribution of Scores on ‘Attractive in Appearance’



7.3.9 Strong Sales Force/Launch Effort

The distribution companies had an obvious advantage on sales force to manufacturing companies. Although the percentages of ‘Disagree’ for both groups were nearly the same(19% for manufacturers and 18% for distributors), those of ‘Agree’ were very distinct. As selling products was the core business of distribution companies, they had sufficient reasons for doing it better when they succeeded on new products.

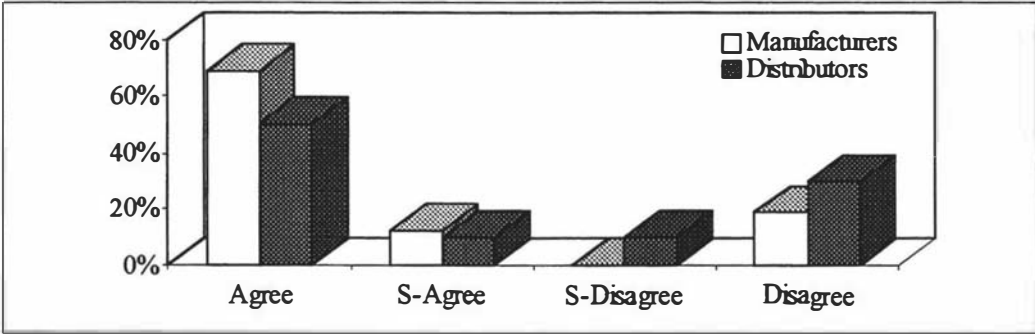
Figure 7.9 Distribution of Scores on ‘Strong Sales Force/Launch Effort’



7.3.10 First on the Market

More successful new products from manufacturing companies than from distribution companies were first on market. It seems that manufacturing companies’ products were more innovative than distributors’ products. As manufacturing companies had ability to expand product range by adding features to existing products to meet customers needs, they could claim their products ‘first to market’ although they might not be innovations.

Figure 7.10 Distribution of Scores on ‘First on the Market’



7.3.11 ‘Intense Price Competition in Market’, ‘Many Competitors in Market’

It seems that distributors faced higher market competition than manufacturers. 70% of the distributors’ products were marketed where price competition was intense, 50% claimed they had many competitors in markets. It might be because manufacturing companies tended more to look for niche markets to avoid intensive competition. But both groups had a major part of their products succeed in highly competitive markets. It likely means that market competition had positive impacts on new product success.

Figure 7.11 Distribution of Scores on ‘Intense Price Competition in Market’

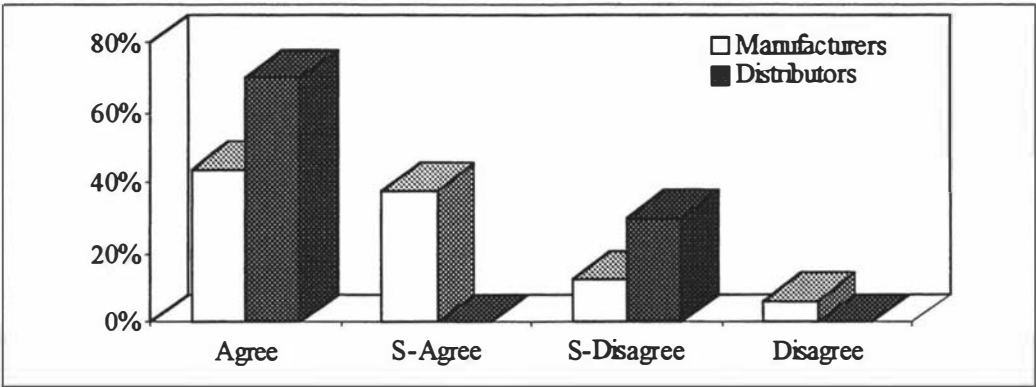
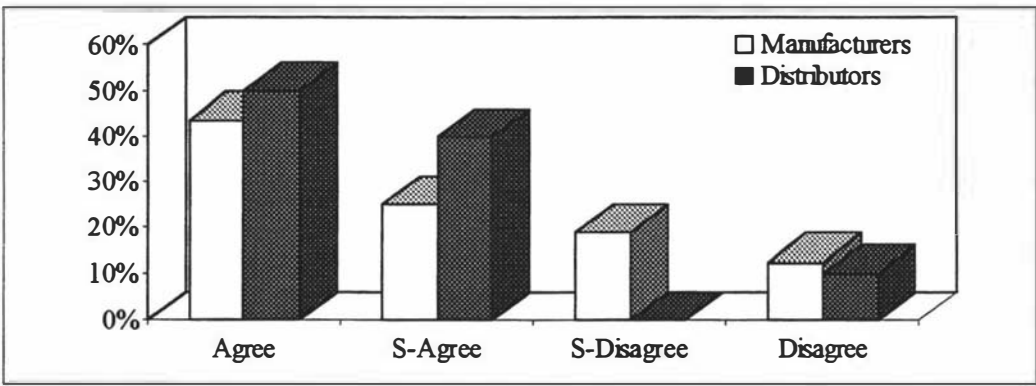


Figure 7.12 Distribution of Scores on ‘Many Competitors in Market’



7.3.12 Summary

In summary, the manufacturing and distribution companies shared some common factors in their new product successes. Their successful new products were supported by senior executives, delivered good value for money, had superior quality, based on good understanding of buyer’s behavior, and entered marketplaces where customers were unsatisfied with existing products, with insufficient new product introductions. Table 7.2 lists the common factors for manufacturing and distribution companies in successful products(For details see Appendix VIII). These factors had high percentages of ‘Agree’ in both groups of companies and were in the similar ranking positions within the group. For example, factor ‘Project supported by senior executives’ was ranked first in manufacturing companies with 94% of successful products ticked ‘Agree’, and was ranked in fourth place in distribution companies with 80% of successful products ticked ‘Agree’. Two factors with negative impact on new product success had low percentages of ‘Agree’ in both groups, and they were also listed in the table. The two environmental factors had high percentages of ‘Disagree’.

Table 7.2 Common Factors for Manufacturing and Distribution Companies in New Product Success

Factor	Group	Percentages				Rank
		Agree	S-Agree	S-Disagree	Disagree	
Project supported by Senior Executives	Manufacturers	94%	6%	0%	0%	1
	Distributors	80%	20%	0%	0%	4
Good value for money	Manufacturers	88%	12%	0%	0%	3
	Distributors	82%	18%	0%	0%	3
Superior in quality	Manufacturers	69%	25%	6%	0%	5
	Distributors	73%	27%	0%	0%	7
Good understanding of buyer behaviour	Manufacturers	63%	25%	13%	0%	10
	Distributors	73%	27%	0%	0%	11
Customers satisfied with existing products	Manufacturers	25%	25%	38%	13%	23
	Distributors	30%	20%	40%	10%	22
Frequent new product introductions in market	Manufacturers	19%	19%	31%	31%	24
	Distributors	20%	10%	30%	40%	23

Note: The numbers in **Rank** column are factors’ ranking by percentages of “Agree’ in the groups.

Differences appeared in many factors on new product success for the two groups of companies. Manufacturing companies attributed their new product success more to the

product’s benefit to users (made to meet users’ needs and good after-sales services), first on market, great pricing flexibility, and entering less competitive marketplaces. Comparatively, distribution companies gave more credit to strong financial support, technological fitness between company and product, and adequate marketing efforts and skills.

7.4 Factors’ Impact on New Product Failure in Manufacturing and Distribution Companies

For failed products, factors showing obvious differences between these two groups of manufacturing and distribution companies are listed in Table 7.3. They are ranked by significant levels of difference between the mean scores of the two groups. It seems that the two groups viewed their product failures differently.

Table 7.3 Different Impacts of the Factors on Failed Products between Manufacturers and Distributors

Factors	Percentage				Mean		SL
	Agree		Disagree		Mnfr	Dstr	
	Mnfr	Dstr	Mnfr	Dstr			
1 Superior in quality	64%	44%	0%	11%	2.21	3.11	6.96E-2
2 Intense price competition in market	57%	78%	7%	0%	2.64	1.89	8.46E-2
3 Better suited to our firm's technology	36%	20%	7%	40%	2.86	3.80	9.93E-2
4 Market size was large	36%	50%	21%	0%	3.29	2.50	1.08E-1
5 Customers satisfied with existing products	29%	78%	7%	11%	2.79	2.00	1.55E-1
6 Market growth was high	21%	30%	29%	0%	3.57	2.90	1.83E-1
7 Multi-functional development group	57%	38%	7%	0%	2.36	3.00	2.31E-1
8 Technically superior to competitors	50%	33%	0%	0%	2.43	2.89	2.35E-1
9 Strong sales force launch effort	0%	10%	31%	30%	4.31	3.60	2.60E-1
10 Very experienced project team	64%	63%	0%	0%	2.00	2.50	2.82E-1

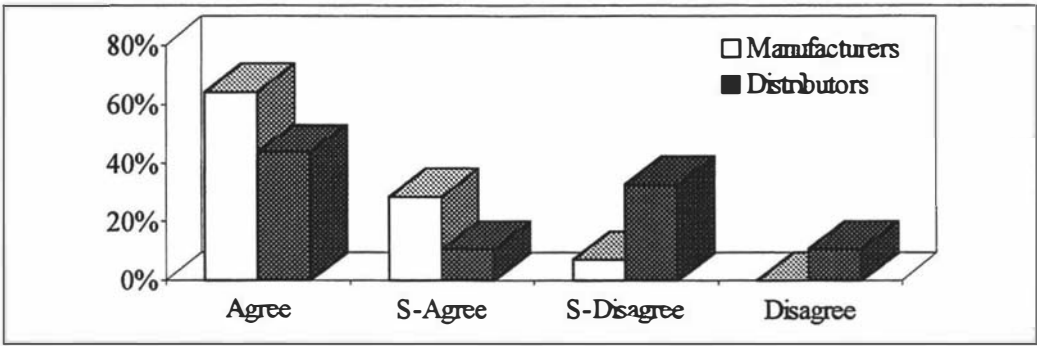
Mnfr: Manufacturing group.
Dstr: Distribution group.
SL: Significance Level of Difference between manufacturers and distributors mean scores.

Looking at the percentages of ‘Agree’ and ‘Disagree’ for the factors, one can find that there were quite different distributions between these two groups of companies. A couple of factors did not show significant difference between the mean scores of the two groups, but had distinct difference in distribution of scores. These factors are shown in detail in the following figures.

7.4.1 Superior in Quality

It is clear that the manufacturing companies did not have as many quality problems to blame for new product failure as the distributors did. Only one failed product(7%) from manufacturers was admitted not very ‘superior in quality’, while more than 40% of failed products from distribution companies had more or less quality problems. It is presumable that manufacturing companies were more familiar to their own products which were developed and launched by themselves. They had more capability to assure product quality. They were therefore more confident about their products’ quality. Distribution companies, by contrast, might have less confidence on the product quality, although one would assume they would test the product before becoming a distributor.

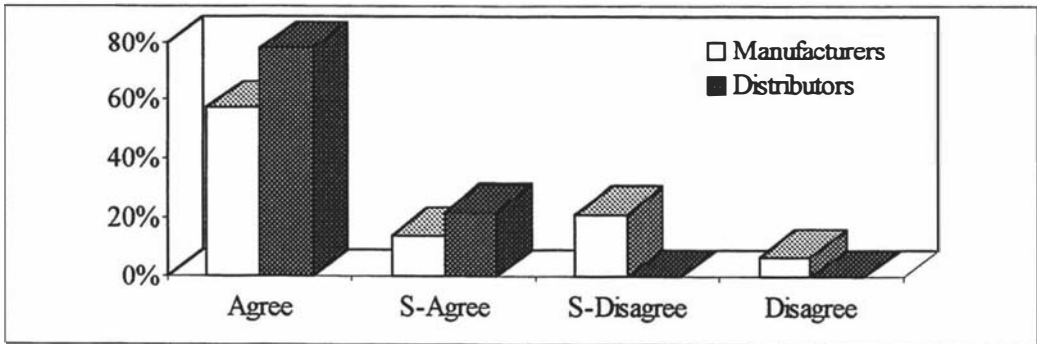
Figure 7.13 Distribution of Scores on ‘Superior in Quality’



7.4.2 Intense Price Competition in Market

The price competition in market was more intense for distributors than for manufacturers. 78% of distributors’ failed products entered markets in which price competition was intense, compared with 57% of manufacturing companies’ failed products. It is probably because manufacturing companies have more capability of providing unique products, or unique features to the product, to customers, therefore price competitiveness seems less crucial. Distributors’ product ranges rely more on suppliers, and price competitiveness would be more important if there are similar products in the market.

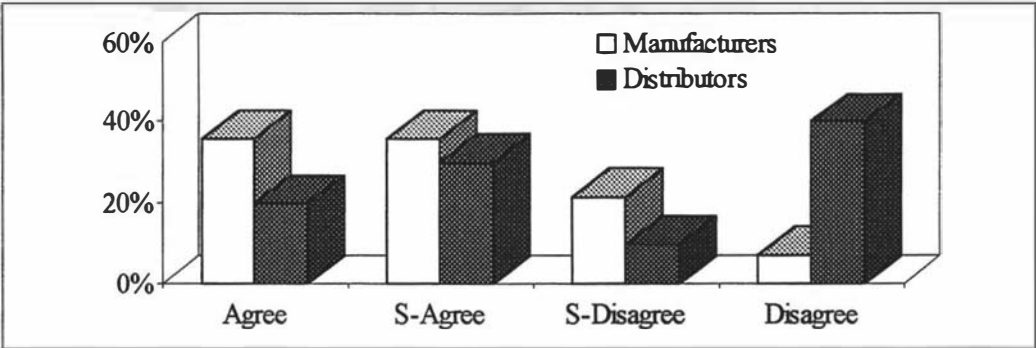
Figure 7.14 Distribution of Scores on ‘Intense Price Competition in Market’



7.4.3 Better Suited to Our Firm’s Technology

It is not surprising that distributors’ new product failures were more related to the fitness of technology with the company than manufacturers’. 40% of the failed products from distribution companies were admitted having poor fitness between technology and companies, compared with only 7% of manufacturers’ products. Distribution companies normally had a certain product range, their employees normally had a major background of marketing, and relatively limited technology background. When a new product had new or unfamiliar technology, it was likely to cause problems in serving customers.

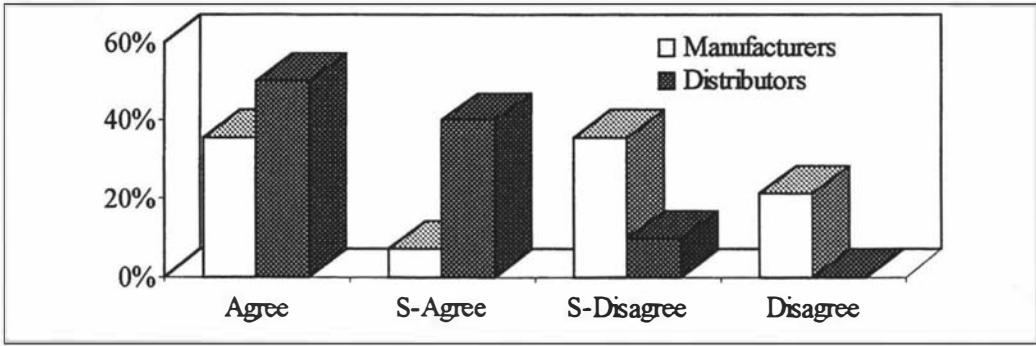
Figure 7.15 Distribution of Scores on ‘Better Suited to Our Firm’s Technology’



7.4.4 Market Size was Large

More than half of the failed products from manufacturers entered markets which were, more or less, small-sized. By contrast, only 10% of distributors’ failed products were introduced into somewhat small-sized markets. It likely indicated that new product failures in manufacturing companies were related to market size. As some manufacturing companies looked for niche markets, this might cause pitfalls in new product introductions because of small market size.

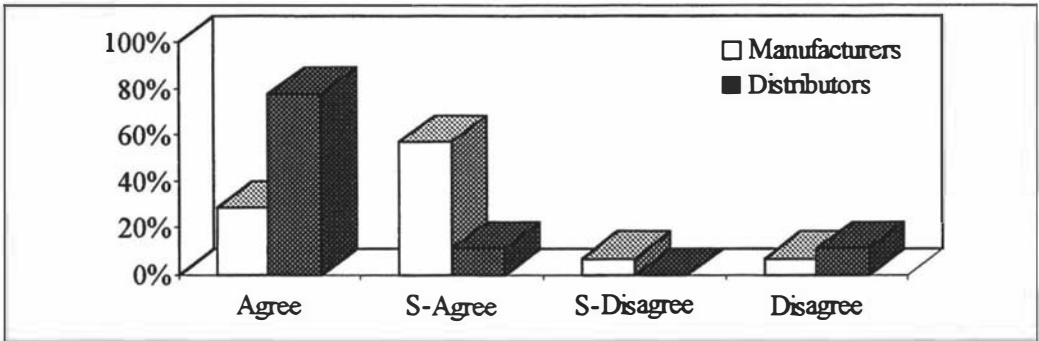
Figure 7.16 Distribution of Scores on ‘Market Size was Large’



7.4.5 Customer Satisfied with Existing Products

It seems that distributors' products would more likely fail when customers were satisfied with competing products. 80% of the failed products from the distribution companies were launched into the markets where customers were satisfied with existing products. 30% of manufacturers' failed products were the same, and another 60% of them entered the markets when customers were somewhat satisfied with existing products.

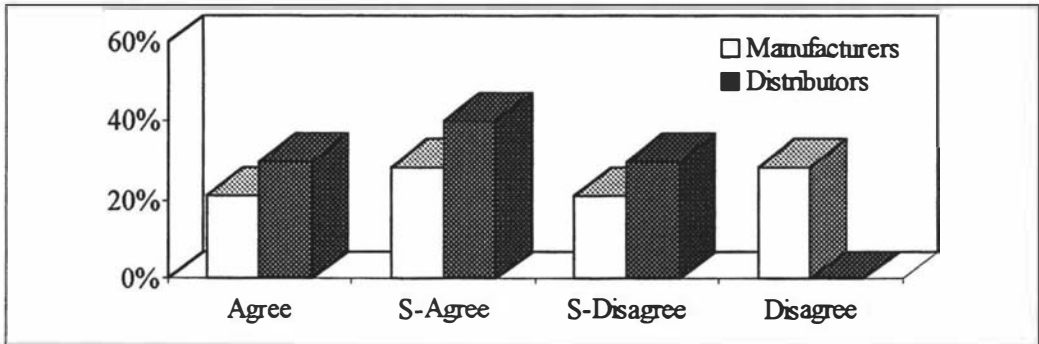
Figure 7.17 Distribution of Scores on 'Customer Satisfied with Existing Products'



7.4.6 Market Growth was High

The market growth seemed to impact more on manufacturers' new product failures than distributors'. Half of the manufacturers' failed products admitted entering marketplaces with low or somewhat low growth. It is assumed that distribution companies paid more attention to marketing research before launching new products. So they selected products aiming more at the market potential and demands.

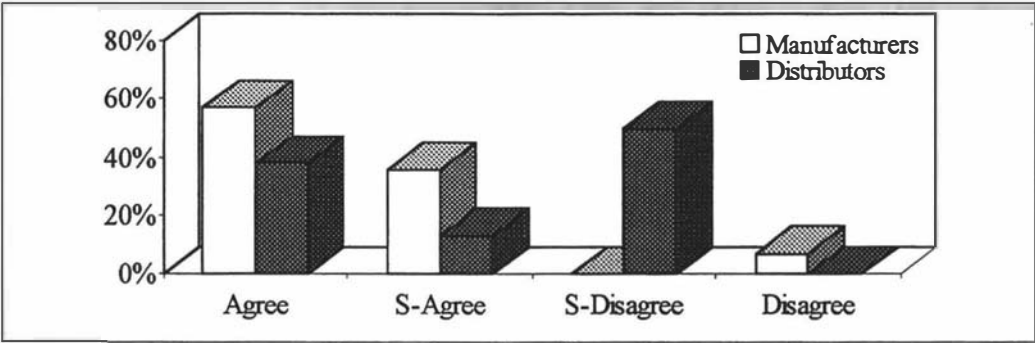
Figure 7.18 Distribution of Scores on 'Market Growth was High'



7.4.7 Multi-functional Development Group

Manufacturing companies used more multi-functional development approaches than distribution companies. Only one manufacturer did not have a multi-functional development project team. Multi-functional approach of new product development integrates different functional areas into one project team. There is a joint approval and direction. It is understandable that distribution companies had rather narrow functional areas, compared with manufacturers, as they concentrated on marketing new products. Therefore they might not need to have a multi-functional development team. Surprisingly half of the distributors did have such a project team., most likely because of their need to have technical support got their products.

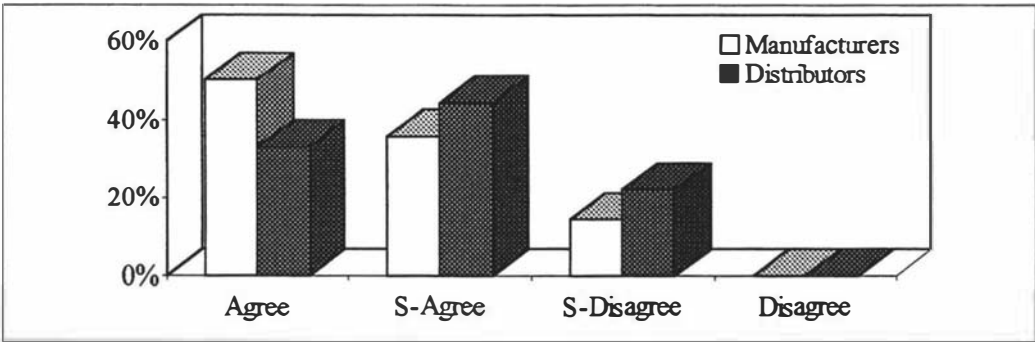
Figure 7.19 Distribution of Scores on ‘Multi-functional Development Group’



7.4.8 Technically Superior to Competitors

Manufacturing companies had slightly more technological superiority than distributors in their failed new products, although this factor did not appear important to new product failure for both groups of companies. It is presumed that manufacturing companies were able to assess a new product’s technical aspect before it took off for development, and distribution companies likely selected product range with technical superiority. So there were seemly not many new product failures caused by technology disadvantage.

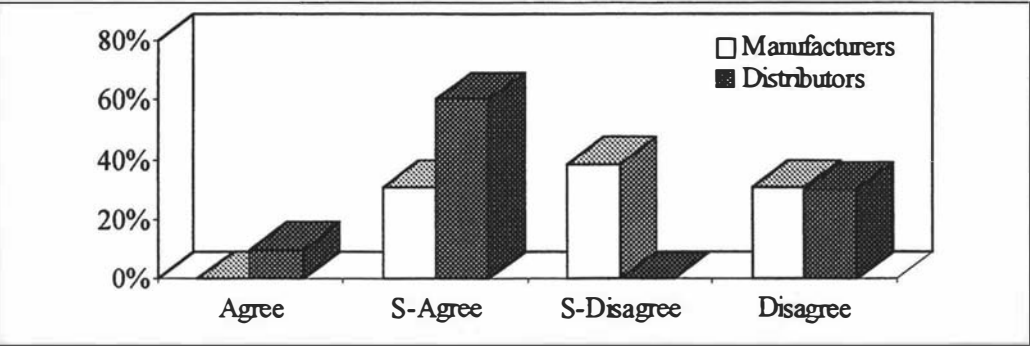
Figure 7.20 Distribution of Scores on ‘Technically Superior to Competitors’



7.4.9 Strong Sales Force Launch Effort

More manufacturers had failed products due to lack of sales force/launch efforts than distributors. The percentages of ‘Disagree’ for both group were nearly the same, but the distributions of scores between ‘Agree’ and ‘Disagree’ were different. 60% of distributors’ and 30% of manufacturers’ products were launched by somewhat strong sales forces, and 40% of manufacturers’ products were slightly lacking in sales/launch efforts while none of the distributors ticked this score. It is not surprising that distribution companies had more confidence for their sales force/launch effort as that is their core business. A manufacturing company may not have an adequate sales force for its new products especially if it is small-sized.

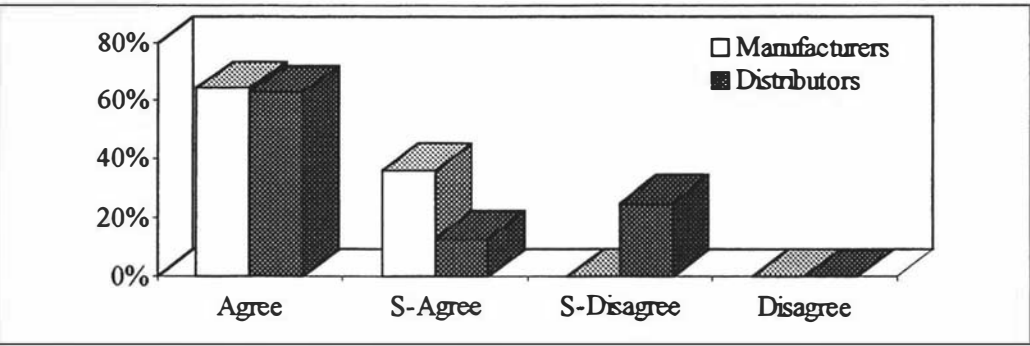
Figure 7.21 Distribution of Scores on ‘Strong Sales Force Launch Effort’



7.4.10 Very Experienced Project Team

It seems that project teams in manufacturing companies were a bit more experienced than those in distribution companies. But they both had not much to do with their new product failures. Only about a quarter of distributors’ failed products were admitted they were developed by slightly inexperienced project teams.

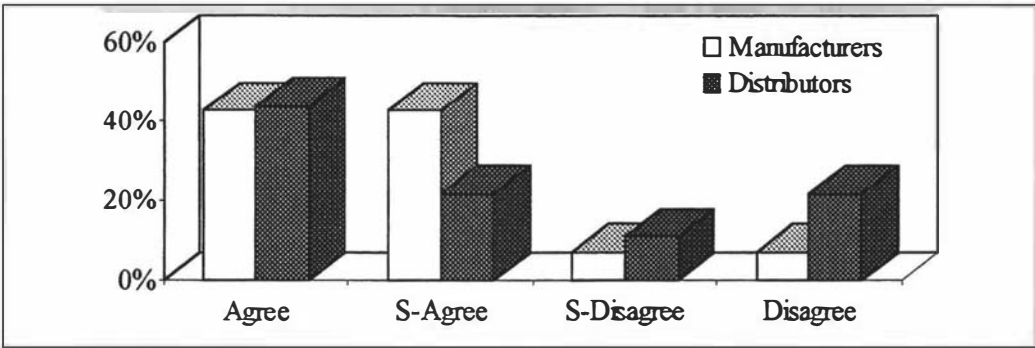
Figure 7.22 Distribution of Scores on ‘Very Experienced Project Team’



7.4.11 Adequate Financial Resources

Financial resources seemed not to impact much on new product failures of manufacturing companies, while it played a minor role in distributors' new product failures. About a third of distributors' failed products had inadequate or somewhat inadequate financial resources, and the number of failed products from manufacturing companies at the same financial situations was less than 15%. It can possibly be explained by that distribution companies relied more on financial resources for marketing their new products. When financial resources were inadequate, the quality of their new product promotion, usually using advertising and trial marketing, would be affected. Manufacturing companies were more flexible on financial resources, they can rely on their technological and design facilities to create new product advances.

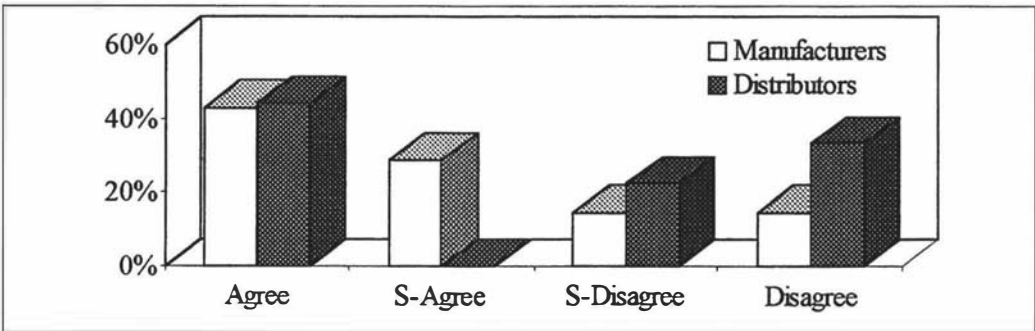
Figure 7.23 Distribution of Scores on 'Adequate Financial Resources'



7.4.12 Frequent New Product Introductions in Market

The frequency of new product introductions seemed to impact more on manufacturers' new product failures than on distributors'. The market dynamism, partly reflected by the frequency of new product introductions, did not show much impact on new product failure of distribution companies, as there were about the same number of the failed products in the dynamic markets and more or less stable markets. The failed products of manufacturers that entered markets where the frequencies of new product introductions were high and somewhat high, were 70%. It seem that distributors' failed products were less affected by market dynamism.

Figure 7.24 Distribution of Scores on 'Frequent New Product Introductions in Market'



7.4.13 Summary

In conclusion, both manufacturers and distributors viewed inadequate pricing flexibility, later-comer to market, weak advertising skills, and poor understanding of buyer behavior as common causes of their new product failures. Table 7.4 lists the factors with high percentages of ‘Disagree’ and having similar rankings in the two groups of companies. These factors were commonly missing in the failed products from both groups, therefore they were assumed as the common causes of the new product failure for the two groups of companies. For instance, factor ‘Allowed greater pricing flexibility’ had the highest percentages of ‘Disagree’ in both manufacturing and distribution companies(36% and 44% respectively).

Table 7.4 Commonly Missed Factors for Manufacturing and Distribution Companies in New Product Failure

Factor	Group	Percentages				Rank
		Disagree	S-Disagree	S-Agree	Agree	
Allowed greater pricing flexibility	Manufacturers	36%	29%	29%	7%	1
	Distributors	44%	22%	11%	22%	1
First on the market	Manufacturers	29%	21%	36%	14%	3
	Distributors	40%	20%	0%	40%	3
Adequate advertising skills	Manufacturers	25%	33%	33%	8%	5
	Distributors	33%	11%	33%	22%	6
Good understanding of buyer behaviour	Manufacturers	21%	36%	36%	7%	7
	Distributors	20%	30%	30%	20%	12
Good value for money	Manufacturers	15%	15%	38%	38%	9
	Distributors	20%	0%	60%	20%	11

Note: The numbers in **Rank** column are factors’ ranking by percentages of “Disagree’ in the groups.

There was a wide range of factors which received different views from the two groups of companies regarding their failed new products. Distribution companies imputed their failure in new products more to the nature of new product, such as technological unfitness within company and poor after-sales services, and market competition which included price competition and customer satisfaction with existing products. Manufacturing companies, on the other hand, blamed failure more on limited market size and growth, market dynamism (frequency of new product introductions), and weak sales efforts.

It was noted that examining successful and failed products separately would lead to misunderstanding for some factors might be popular in successful products, but also very common in failed products. Next step is to compare new product success and failure with the

two groups of companies to find out if there are any different factors that drive new product success within manufacturing and distribution companies.

7.5 Factors that Separated New Product Success and Failure for Manufacturing and Distribution Companies

As mentioned in Chapter 2, a factor simply showed popular in successful products, or commonly missed in failed products, does not mean it could lead to success, or cause failure. Only those factors having significant differences between success and failure can separate winners from losers. First looking at the two groups, manufacturing and distribution companies separately, to find out their own key factors separating new product success and failure, and then comparison between them will give the idea how different they are in the issue of new product outcome.

7.5.1 Important Factors in Separating New Product Success and Failure for Manufacturing Companies

Table 7.5 lists eight important factors for manufacturing companies on separating new product success and failure which were ranked by the significance levels of difference between successful and failed products mean scores(<0.05).

Table 7.5 Important Factors in Separating New Product Success and Failure for Manufacturing Companies

Factors	Percentage				Mean-Score		SL	
	Agree		Disagree		Success	Failure		
	Success	Failure	Success	Failure				
	1	Good understanding of buyer behaviour	63%	7%	0%	21%		2.31
2	Good value for money	88%	36%	0%	7%	1.71	3.00	1.64E-3
3	Allowed greater pricing flexibility	50%	7%	13%	36%	2.63	3.93	5.51E-3
4	First on the market	69%	14%	19%	29%	2.25	3.79	9.28E-3
5	Project supported by Senior Executives	94%	64%	0%	7%	1.56	2.43	1.65E-2
6	Strong sales force launch effort	38%	0%	19%	31%	3.13	4.31	2.18E-2
7	Made to meet users' needs	88%	64%	0%	0%	1.53	2.36	2.91E-2
8	The consumer had great need for product type	65%	39%	0%	8%	2.12	2.85	3.94E-2

SL: Significance Level of Difference between successful and failed new products' mean-scores.

Note: in the table, Agree = 'Strongly Agree' + 'Agree'; Disagree = 'Strongly Disagree' + 'Disagree';
The percentages of a factor for success(failure) are 100% by adding percentages of 'Somewhat Agree' and 'Somewhat Disagree'.

Good understanding of buyer behavior was listed as number one important factor in new product success and failure. It was one of the bases to develop a new product that buyers would buy it. Good value for money, and made to meet users' needs were two advantages which are a superior new product's feature[Cooper, 1993]. Manufacturing companies viewed pricing flexibility as a key factor driving new product success apart from failure. When a new product had higher profit margin, it had more flexibility in price. It is a unique advantage in electronic new product success[Maidique and Zinger, 1984].

A product that is first on the market can be understood as two aspects: innovative and novel. A total innovation with technological breakthrough is brand new to the world market. But new product with unique features not available on competitive products are also first, or maybe the only one in the market. It means that extensive marketing research and good communication with customers can be the resource of product ideas which lead to 'first-to-market' products.

Senior executives' support of the project is an important factor to new product success. Manufacturing companies usually developed and marketed their new products. It is important to get senior executives' support to have all functional areas performing effectively together. Strong sales force/launch effort was another important factor in new product success and failure. As a majority of the surveyed companies are very small, it was possibly a common fact in small manufacturing companies that they did not have their own strong and experienced sales forces. It was a pitfall if a new product failed because of weak sale forces even it was a very good product. The customer needs for the product type is a basic presupposition to start a new product project. A market-driven and customer-focused new product development process is critical to success.

Other five factors having moderate influences on separating new product success and failure($SL < 0.15$). They were: adequate distribution resources, attractive in appearance, less after-sale problems, frequent new product introductions in market, and market growth was high. The following five factors appeared not to impact on differentiating new product success from failure: better suited to our firm's technology, superior in quality, intense price competition in market, many competitors in market, and adequate financial resources(See Appendix IX for full details).

In summary, manufacturing companies tended to relate their new product success based on good communication with customer to recognize their needs and wants, and by making unique features that fill the market needs. Senior executive support makes new product development process more effective. Market competition did not impact on new product success and failure. Technological synergy and financial resources were also non-impact factors.

7.5.2 Important Factors in Separating New Product Success and Failure for Distribution Companies

Nine important factors for distribution companies on differentiating new product success from failure(SL<0.05) are listed in Table 7.6 by ranking of the significance levels of difference between successful and failed products means.

Distribution companies regarded good fitness between technology and company as the number one important factor in new product success and failure. As most of the distributors were suppliers of special industrial goods, it was essential to have expert sales people who have good knowledge of the product range they are selling. To be at the winning edge of the highly competitive environment of the electronic product market, a distribution company needs to deliver new products with super quality and advanced technology, because it cannot make a new product special by itself to appeal to the customer.

Table 7.6 Important Factors in Separating New Product Success and Failure for Distribution Companies

Factors	Percentage				Mean-Score		SL
	Agree		Disagree		Success	Failure	
	Success	Failure	Success	Failure			
1 Better suited to our firm's technology	78%	20%	0%	40%	2.11	3.80	4.31E-3
2 Technically superior to competitors	73%	33%	0%	0%	1.73	2.89	6.49E-3
3 Good understanding of buyer behaviour	73%	20%	0%	20%	2.18	3.60	6.84E-3
4 Good value for money	82%	20%	0%	20%	1.91	3.30	7.92E-3
5 Attractive in appearance	100%	33%	0%	22%	1.75	3.11	8.35E-3
6 Adequate distribution resources	80%	22%	0%	33%	1.90	3.56	1.14E-2
7 Superior in quality	73%	44%	0%	11%	1.91	3.11	2.10E-2
8 Less after-sale problems	73%	30%	0%	40%	2.00	3.70	2.42E-2
9 Customers satisfied with existing products	30%	78%	10%	11%	3.30	2.00	3.27E-2

SL: Significance Level of Difference between successful and failed new products mean-scores.
Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’.

Good understanding of buyer behavior may lead a distribution company to launch a new product that suits customers' preferences, wants and needs, and provide good value of money to users. As distribution companies are willing to sell new products that give customers 'first sight impression', the appearance of new products would certainly help customers make purchase decisions when there are competing products existing.

It is definitely an important factor for distribution companies to have adequate distribution resources to sell new products successfully. Many new product may have new features or functional concepts added that may require different distribution systems. Having the sound distribution resources in place is helpful to the companies to select suitable strategy to marketing new products[Hisrich and Peters, 1991].

Distribution companies with sound after-sales service had higher success rates in marketing new products. After-sales problems may be related to new products' quality and user training. New products often involve some new technology or have new features that are unfamiliar to users. By providing good service and education program, distribution companies will appeal to customers. When customers are satisfied with existing products, it is very hard to launch a new product successfully. So it is necessary to pay more attention in marketing research to identify market need satisfaction before making a 'go' decision to a new product project.

Five factors with moderate impact on separating new product success and failure($SL < 0.15$) are: strong sales force launch effort, made to meet users' needs, adequate financial resources, adequate advertising skills, and project supported by Senior Executives. The five factors that had no difference between new product success and failure were: multi-functional development group, many competitors in market, very experienced project team, market growth was high, and market size was large(See Appendix IX for full details).

In summary, distribution companies had higher success rate of new products when they chose new products with superior technology and quality that well suited their technological expertise, and providing good value of money to customers. It is also very important to have sound marketing research to avoid the market where customers were satisfied with existing products. The experience of the project team did not show any influence on new product

success. The characteristics of marketplace, such as size, growth and competition did not make any difference in new product success and failure.

7.5.3 Comparisons of the Important Factors in Separating New Product Success and Failure for Manufacturing and Distribution Companies

As expected, manufacturing and distribution companies had a wide spread of difference among the factors that separated new product success and failure, along with some similarities between them. Big differences between the manufacturing and distribution companies appeared in five factors(see Table 7.7).

Table 7.7 Factors’ Different Impact on Separating New Product Success and Failure in Manufacturing and Distribution Companies

Factor	Mean Score				SL		Rank	
	Success		Failure		Mnfr	Dstr	Mnfr	Dstr
	Mnfr	Dstr	Mnfr	Dstr				
Allowed greater pricing flexibility	2.63	3.50	3.93	4.00	5.51E-03	0.3893	3	17
First on the market	2.25	3.10	3.79	3.70	9.28E-03	0.4682	4	18
Better suited to our firm's technology	2.67	2.11	2.86	3.80	0.6178	4.31E-3	20	1
Technically superior to competitors	2.13	1.73	2.43	2.89	0.4091	6.49E-3	17	2
Superior in quality	2.13	1.91	2.21	3.11	0.7859	0.0210	21	7

SL: Significance Level of Difference Between successful and failed new products mean-scores.
Rank: The number in this column is ranking by SL within the groups of companies.
Mnfr: Manufacturers
Dstr: Distributors

Pricing flexibility and first on the market seemed to separate more manufacturers’ new product success and failure than distributors’. On the other hand, distributors viewed the superiority in product quality and technology, and the technological fitness between product and company as the key factors driving new product success apart from failure.

The differences might be explained as the nature of the core businesses of the two groups of companies. Small manufacturing companies, as described earlier, looked for market niches to avoid competition with large companies in mass markets. They tended to develop ‘customer-made’ products with unique features to suit special requirements, which were likely the ‘first to the market’ type of products. And they had more authority to decide prices of new products, because they conducted the whole product development process by themselves.

The distribution companies, by contrast, did not develop new products, they were selling somebody else's products. Some of them may be the agents of manufacturers. Therefore choosing the right products that will be successful in the markets is the key task. The current study found that the new products with superiority in technology and quality, attractive appearance, and within the company's technological expertise were more likely to be successful in the markets. Within the company's technological expertise means that the company can provide customers with good usage education and service about the products.

There were some factors having similar impacts for the two kinds of companies. Both groups of companies regarded good understanding of buyer behavior and providing good value of money to customer as important factors to separate new product success and failure. The study also found that market competitiveness had no impact on separating new product success and failure for both manufacturing and distribution companies.

7.6 Discussion and Conclusions

By comparing the factors' influence on new product success and failure in the manufacturing and distribution companies, the study investigated the different impacts of the factors affected by the nature of the businesses on new product performance in the markets.

In manufacturing companies, the majority of successful new products were meeting users' needs well, first in the market, and having greater pricing flexibility. In distribution companies, successful new products mostly were attractive in appearance, well suited to the company's technology, launched by strong marketing forces, and supported by adequate financial resources. Both groups of successful products provided good value for money to customer, were supported by senior executives, and had superior quality.

The manufacturing companies' new product failures were related to weak sales force, low market growth and small market size, and 'me-too' type of products. The distribution companies found their new product failures were: not fit with the company's technological expertise, poor quality, and entered market where customers were satisfied with existing

products. Both groups of companies had their failed products with insufficient pricing flexibility and poor understanding of buyer behavior.

When looking at the key factors driving new product success apart from failure, the current study identified different sets of factors for the two groups of company, while two factors appeared similar in importance to differentiate successful products and unsuccessful products. They were good understanding of buyer behavior, and good value for money. The manufacturing companies stressed more about new products to be first on the market; have great pricing flexibility, senior executives' support, and strong sales force/launch effort; also new products were made to meet users' needs, and the market demand was great. The distribution companies were likely to be successful when their new products suited the company's technology, were superior in quality and technology, had less after-sales problems and attractive appearance. They also had adequate distribution resources, and identified the market where customer were not satisfied with existing products.

Senior executive support helped the new product development process run smoothly, and the cooperation between different functional areas. The sales force was another important factor in separating new product success and failure for the manufacturers. As some of them did not have sales department because of their compact structures, it might be necessary to hire agents to do marketing launch activities.

This study revealed that manufacturing companies needed to establish close relationships with customers in order to understand users' needs well and develop new products that provide customers with specified features to meet their requirement better than competitors. And it was suggested that distribution companies should do adequate marketing research before launching a new product to identify target market, and have substantial knowledge about products.

It is of interest how the manufacturing companies conducted new product development activities in achieving new product success. The following chapters are to analyze the impact of product development activities on new product success and failure, and investigate in detail about new product development practice in manufacturing companies.

Chapter 8 New Product Development Activities and Their Effect on New Product Success and Failure

8.1 Introduction

The factors relating to **Nature of Product, Market Characteristics and Skills and Resources**, have been analyzed and discussed in Chapter 5, 6 and 7. This chapter concentrates on the analysis of factors relating to **Project Activities**. In the mail survey only those companies who conducted product development were required to answer the questions which concerned new product development activities.

Twenty-eight companies answered the questions, but two of them did not provide failed products. So a total of twenty-eight successful products and twenty-six failed products were analyzed. The respondents were asked to describe how well these activities were conducted in the new product development process.

The eight factors are regarded as major new product development activities, and were tested in previous research. Some of them were found very important to new product success and failure [Cooper, 1993; Griffin, 1997]. Their influence on separating new product success and failure were analyzed in the current study. The differences between successful and unsuccessful products were determined, and the distributions of the scores of the factors for both successful and failed products were examined. The respondents' comments were extracted to discover any additional factors that had significant impact on new product success and failure.

8.2 New Product Development Activities: their Importance to New Product Success and Failure

When looking at the significance levels of difference between new product success and failure, it was found that half of these factors did not show significant difference between successful and failed new products (Table 8.1). The low levels of significant difference between new product success and failure have been caused partly by the small sample size, however, it might indicate that some of these activities in new product development process did not have strong impact on separating new product success from failure. The details of distributions of factor

agreement score are illustrated from Figure 8.1 to Figure 8.8, ranked by the significance levels of difference between new product success and failure.

Only two of these factors, developed with a clear market strategy and undertook preliminary market assessment, had high levels of significant difference between new product success and failure($SL < 0.05$). They were viewed as the key factors in the new product development process to differentiate new product success and failure.

Table 8.1 The Importance of Factors in Separating New Product Success and Failure

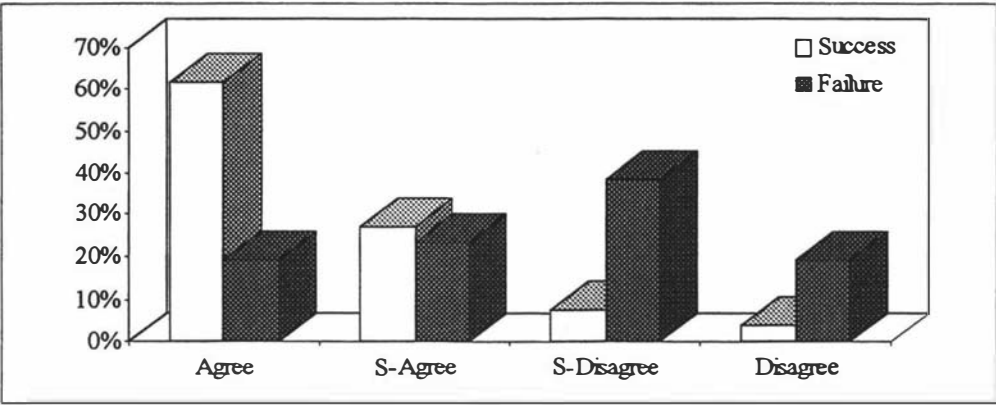
Factors	Percentage				Mean-Score		SL
	Agree		Disagree				
	Success	Failure	Success	Failure			
	Success	Failure	Success	Failure	Success	Failure	
1 Developed with a clear market strategy	62%	19%	4%	19%	2.23	3.58	9.30E-5
2 Undertook preliminary market assessment well	50%	13%	14%	23%	2.82	3.62	2.72E-2
3 Undertook in-depth consumer evaluation	40%	4%	20%	33%	3.20	3.85	5.89E-2
4 Undertook financial analysis well	50%	15%	11%	12%	2.79	3.35	7.24E-2
5 Undertook prototype development well	64%	42%	11%	4%	2.46	2.92	1.57E-1
6 Undertook prototype test well	57%	46%	11%	8%	2.50	2.96	1.96E-1
7 Undertook sound technical assessment	64%	36%	4%	8%	2.36	2.76	2.03E-1
8 Developed using idea-generation techniques	31%	36%	15%	9%	3.08	2.73	3.12E-1

SL: Significance Level of Difference between successful and failed new products mean-scores.
Note: in the table, Agree = ‘Strongly Agree’ + ‘Agree’; Disagree = ‘Strongly Disagree’ + ‘Disagree’;
The percentages of a factor for success(failure) are 100% by adding percentages of ‘Somewhat Agree’ and ‘Somewhat Disagree’.

8.2.1 Developed with a Clear Market Strategy

Many more successful new products were developed with a clear market strategy than failed new products(62% of successful products and 19% of failed products). More than half of the failed new products(38% ‘Somewhat Disagree’ and 19% ‘Disagree’) were developed, more or less, without a clear market strategy, compared to only 12% of successful products. It seems that a clear market strategy is very important to drive new product success from failure. This emerged as the only factor in this section of the survey with a high level of significant difference($SL < 0.001$) between successful products and failed products, which was far less than those of the remaining factors.

Figure 8.1 Distribution of Scores on ‘Developed with a Clear Market Strategy’



Market strategy can be understood as a formal marketing plan for the product. It is basically the answer of the question: how to provide superior customer value to the target market. The answer to the question requires the formulation of a consistent marketing mix. The marketing mix is the product, price, communications, distribution, and services provided to the target market[Hawkins, Best and Coney, 1995]. It is the combination of these elements that meets customer needs and provides customer value.

One of the key tasks in development of marketing strategy is an assessment of the company’s strengths and weaknesses and a matching of those strengths with unsatisfied customer needs in the marketplace. Effective market strategy, therefore, depends upon both an honest assessment of strengths and weaknesses and good information about customer needs and wants and the extent to which they are being served by current suppliers.

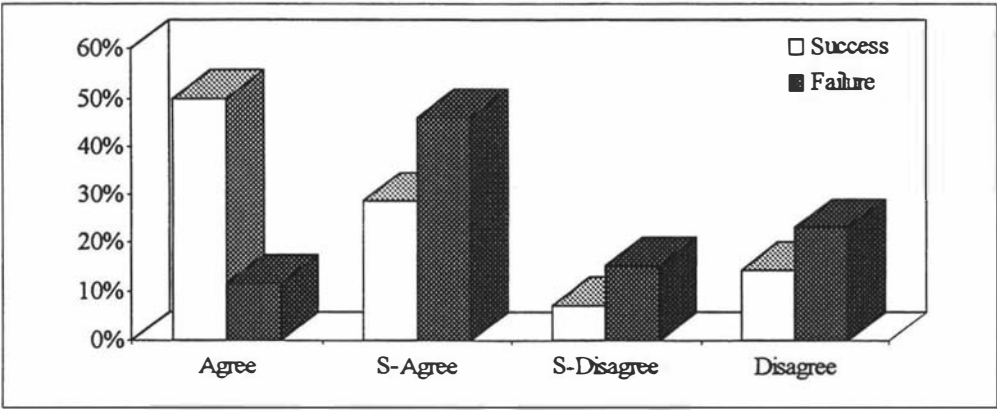
8.2.2 Undertook Preliminary Market Assessment Well

Preliminary market assessment showed strong influence on separating new product success and failure. 79% of successful products undertook sound preliminary market assessment, percentage of ‘Agree’ was 50%. 58% of failed products did preliminary market assessment well, but in which the percentage stating ‘Agree’ was only 12%. More than a third of them did not conduct preliminary market assessment very well.

Preliminary market assessment is recommended as a part of the preliminary investigation stage in the new product development process, which includes preliminary market, technical and financial assessments. It aims to determine market size, market potential, market competition

situation, and likely market acceptance. It is a relatively small and quick step and involves a variety of relatively inexpensive activities: a library search, contacts with key users, and focus groups.

Figure 8.2 Distribution of Scores on ‘Undertook Preliminary Market Assessment Well’



The survey results are basically consistent with what the other similar research has found[Cooper, 1993]. As a part of pre-development activities, preliminary market assessment qualifies and defines the new product project. It aids to make a right ‘go/no-go’ decision on a new product to avoid the risk of pitfalls and the waste of money and time for a full fledged development effort. The quality of execution of the pre-development steps in the new product development process is closely tied to the new product’s financial performance[Khurana and Rosenthal, 1997].

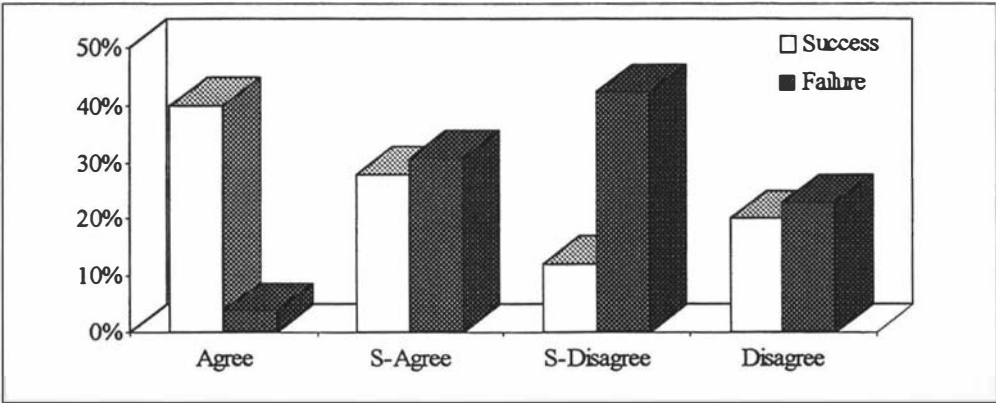
8.2.3 Undertook In-Depth Consumer Evaluation

There was a significant difference between successful and failed new products for the factor ‘undertook in-depth consumer evaluation’. 68% of successful new products had in-depth consumer evaluation, while about the same percentage(65%) of failed new products more or less did not have in-depth consumer evaluation. The biggest difference between the two groups of new products showed at the score of ‘Agree’, 40% for the successful and 4% for the failed ones.

The survey results showed that consumer evaluation, described by Cooper(1993) as a continuing activity throughout the new product development, played an important role in most

of the New Zealand electronics companies. Using rapid prototypes, models and partially completed products to gauge customer reaction and seek feedback during the development is helpful to find out and solve problems at an early stage. User or field trials are to verify that the new product functions under actual use conditions, and also to gauge potential customers' reactions to the product to confirm intent to purchase and market acceptance.

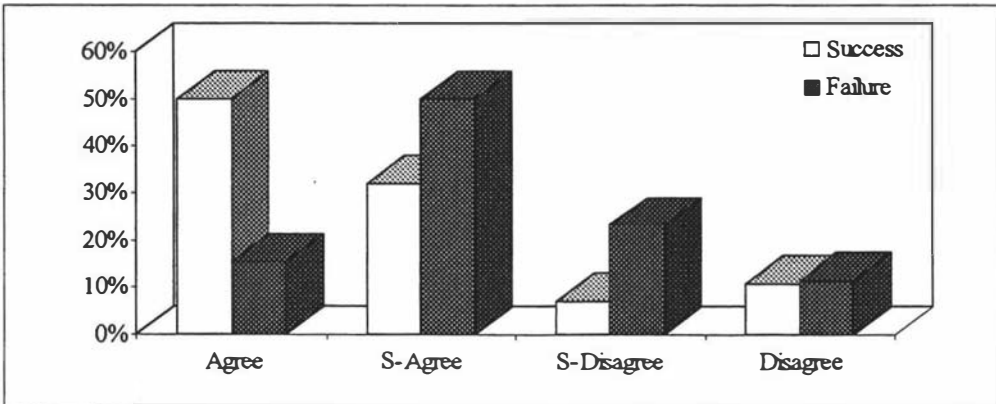
Figure 8.3 Distribution of Scores on ‘Undertook In-Depth Consumer Evaluation’



8.2.4 Undertook Financial Analysis Well

Successful new products undertook better financial analysis than failed new products. Half of the respondents were very confident about the quality of financial analysis for their successful products, compared with only 15% of them for their failed products. While the percentages of ‘Disagree’ for successful and failed product were similar(11% and 12% respectively), those of ‘Somewhat Disagree’ were obviously different, 23% for failed products and 7% for successful products. It appeared to have moderate impact in separating new product success and failure.

Figure 8.4 Distribution of Scores on ‘Undertook Financial Analysis Well’

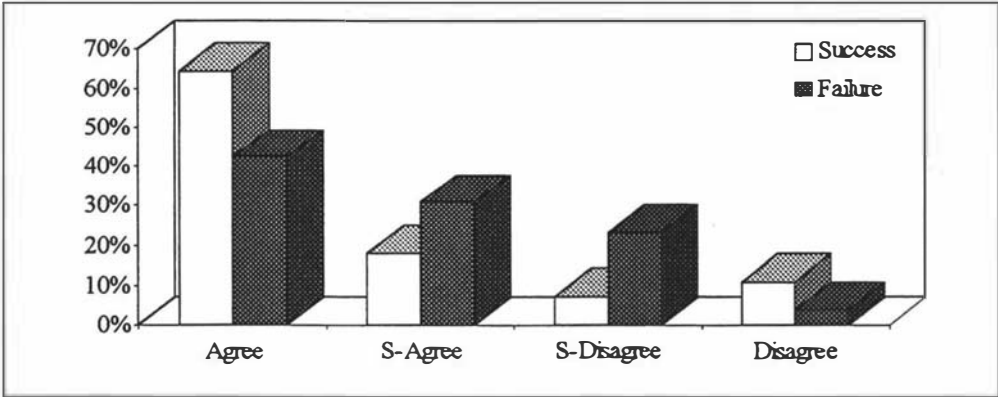


Financial analysis is an essential up-front activity to probe the expected financial consequences and risks of the new product project. It is conducted after the detailed marketing and technical analysis, competitive analysis, and concept test have defined the target market, product features, performance and benefits. And it is conducted as part of the justification to estimate the expected revenues, development cost, launch cost, capital equipment requirement, and profit margins. There are several types of financial analysis: pay back period analysis, discounted cash flow analysis, and sensitivity analysis. The justification is the final phase before serious product development work begins, and also before product launching.

8.2.5 Undertook Prototype Development and Test Well

The two factors, undertook prototype development well and undertook prototype test well, did not show big differences between new product success and failure, although successful products had higher percentage of 'Agree' than the failed ones(See Figure 8.5 and 8.6). They had similar distribution of the scores for the successful and the failed products.

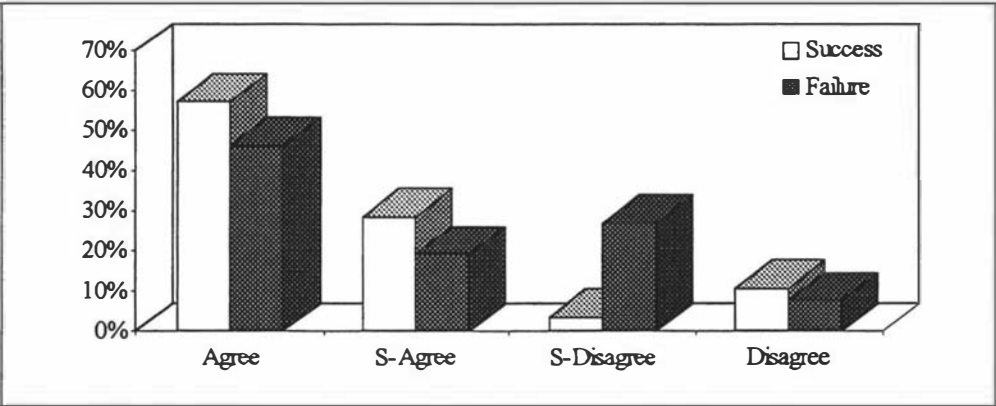
Figure 8.5 Distribution of Scores on 'Undertook Prototype Development Well'



Prototype development is the important part of the product design of new product development. It is based on product definition: target market, product concept and positioning, benefits, and product requirements. Prototype tests are used throughout this phase of development, and it aims to ensure the product is right and also to speed development towards a correctly defined target. It is important to keep the communications between customers and development people open. Because the world is changing all the time, and sometimes the

product concept is wrongly translated because of technical problems, it is necessary to seek customer input and feedback at every step of the way throughout the entire design phase as the product takes shape.

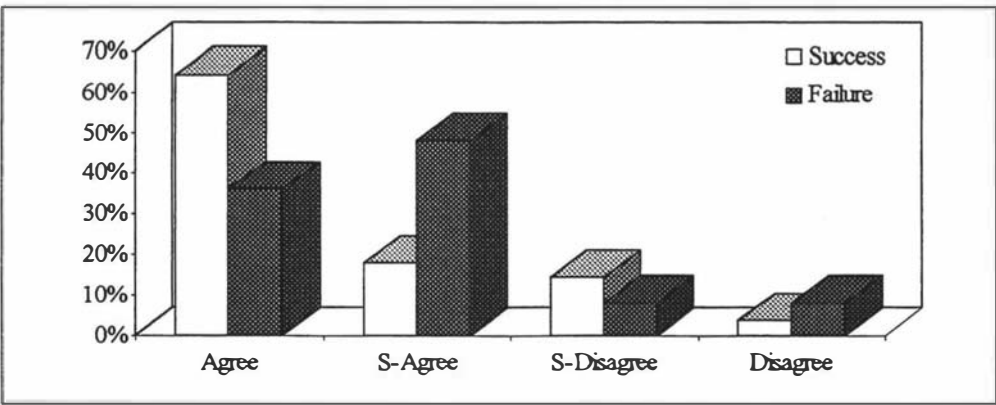
Figure 8.6 Distribution of Scores on ‘Undertook Prototype Test Well’



8.2.6 Undertook Sound Technical Assessment

Technical assessment did not appear a major problem for both successful and unsuccessful products. 82% of the successful products more or less had satisfied technical assessment, comparing with 84% of the failed products. But the percentage of ‘Agree’ for successful products was much higher than that of failed ones. Very few products, either success or failure, were admitted to have a poor technical assessment(4% and 8% respectively).

Figure 8.7 Distribution of Scores on ‘Undertook Sound Technical Assessment’



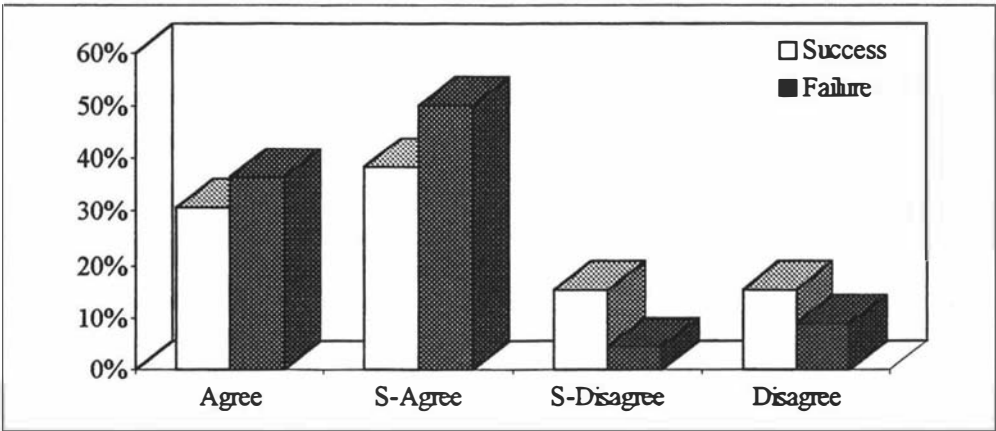
Technical assessment is an up-front activity that subjects the proposed product to the company’s technical staff for appraisal. Its purpose is to establish technical and product

performance objectives, undertake technical feasibility study, and pinpoint possible technical risks. It gives a clear view of what the product will be from a technical standpoint, what the probable technical solution and technical route are, and a reasonably high confidence that the solution and route are technically feasible.

8.2.7 Product Concept was Developed Using Idea-Generation Techniques

It was somehow surprising to find out that more failed products used idea-generation techniques to create new product concepts than successful products. 69% of the successful products used idea-generation techniques(31% of ‘Agree’), compared with 86% of the failed products(36% of ‘Agree’). 15% of the successful products did not use idea-generation techniques at all, compared with 9% of the failed ones.

Figure 8.8 Distribution of Scores on ‘Product Concept was Developed Using Idea-Generation Techniques’



Idea-generation is the first phase in new product development process. There are various idea generation techniques in terms of whether the general approach is to identify possible needs and problems, develop solutions to these problems, known as the problem find-solve approach; or to modify or improve existing products to create new products, called the fortuitous scan approach[Rochford, 1991].

One possible reason to explain the finding is that some of the surveyed companies were small-sized, and only made customer-tailored products. The only source of a new product idea was their customer. They did not conduct self-motivated new product development. Several

respondents ticked 'Not Applicable' for this factor (2 for successful products, and 4 for failed products), probably because of that reason. In the in-depth interviews, two companies who used to have their own new product development facilities, but one turned to be subcontract manufacturers and only produced other companies' products. The other one became tailored-product producer. They said it was too risky and costly to develop new products.

8.3 Respondents' Comments

More than twenty of the respondents gave comments about what they thought the most important factors for their successful/failed new products. Many of these comments were repetitions of the listed factors, while a few emerged as new factors to new product success and failure relevant to new product development activities. See Appendix VII for the full record of these comments.

For the successful products, at least six respondent's comments were related to sound technical assessment, which led to the new product that solved technical problems with specified concepts. Market assessment was cited by several respondents, as it specified the market demands. Customer evaluation was also mentioned by two respondents. It seemed that the respondent attached great importance to the pre-development activities. By contrast, only two respondents thought prototype development and test the most important factor to new product success.

The most important factors for failed new products cited by the respondents were rather concentrated on a few factors. Inaccurate or flawed market assessment, and lack of in-depth customer evaluation were thought to be the main causes of about ten failed products. Another common cause was in the physical development stage of the process, such as it took too long or too expensive to develop the product prototype, but it could be also caused by poor technical assessment.

Two respondents mentioned that constant contact or co-operation with customers was a main attribution to their new product success. Another two emphasized the importance of delivery time to their successful products. One respondent brought up the problem with key components as the main cause of their new product failure. These three factors were not

included in the survey, but their importance to new product outcomes appeared to be understandable. Constant contact with customer helps good understanding of customer needs and wants, and quickly discovers any changes in the market or customer requirement. In the industrial electronics markets where technology changes rapidly and competition is very intense, the ability of delivering new products quicker than competitors is an obvious advantage. As there is a world-wide shortage of electronic components in recent years, companies need to pay more attention to ensuring the component supply.

8.4 Summary and Discussions

In summary, it was found that new product success and failure were strongly influenced by market and consumer related activities during the new product development process. Technical activities had little or no impact on separating new product success and failure. Clear market strategy was singled out as the most important factor to separate new product success and failure. Using idea-generation techniques to develop new product concept was rated as the weakest factor differentiating between new product success and failure. A strong market orientation in the new product development process was believed critical to new product success[Cooper, 1993]. The results of the current study supported this point. Having a clear market strategy, conducting sound market assessment and consumer evaluation showed significant influence in achieving new product success.

A study of the practices in new product development process[Cooper and Kleinschmidt, 1986] revealed that there were thirteen key activities in new product development process. The initial screening was the most frequently undertaken activity, but was rated lowest on the proficiency scale and cited as an activity greatly in need of improvement. The current study supported this point, as it found that idea generation techniques was not used as much as expected by these companies.

These tested factors did not include all the factors that play important roles in the new product development process to separate new product success and failure. A few factors were identified by the respondents as the most important factors to their successful/failed products such as constant contact with customer during the development, delivering the product quicker, and the supply of key components.

To gain further information about how a company really conducts new product development activities, the best way is to listen to the people who are doing new product development in the company. To collect the opinions of practitioners about new product development was one of the main objectives of the in-depth interview. The next chapter will explore further investigation and findings in this area.

Chapter 9 New Product Development Processes for Specific Companies in the New Zealand Electronics Industry

9.1 Introduction

The in-depth interviews with professionals in the New Zealand electronics companies are analyzed in this chapter. The aim was to obtain specific insight into these companies regarding new product development performance, and assess the importance of their new product development activities in leading new product success, discover problems that they had, and then provide suggestions to improve their new product development performance.

Seventeen manufacturing companies participated in the interviews. The interviewees were the persons in the company who were in charge of new product development, such as R&D manager, development manager, technical manager, design manager and engineering manager. For the general information of these companies, please refer to Table 4.4.

The topics of the interview covered the new product development process the company applied, successful and failed new products the company developed and marketed, the company's strengths and weaknesses, and the future of the companies. This information was analyzed qualitatively to develop a plan to improve their performance in new product development. Those companies who were tailored-products producers and contract manufacturers are discussed in a separate section.

9.2 The Companies in the Interviews

The majority of the interviewed companies(12, 71%) had formal or semi-formal processes for new product development. They usually had organized structures to conduct new product development activities. Many of them had been growing quickly in recent years, and were very successful in the international markets, providing products that were technically advanced and suitable for the market niches. They were small companies by international standards, but they had strong R&D forces, and their emphasis was new product innovation and continuous improvement of existing products. There were five companies in the telecommunication field, who had their own product ranges mainly for export and were not competing with each other.

These companies were likely the main force driving the New Zealand electronics industry internationally. Therefore they became the focus of analysis in this chapter. The activities related to new product development in the first group of companies are described in detail. The interviewees' opinions of their companies' current situations, strength and weakness, futures are also discussed.

There were three companies who did not have a formal development process to develop new products in this study. These companies were usually very small in size, and customer orientated. They developed new products by requests from clients rather than on their own initiatives. The volumes of their production were normally very small, sometimes only one or two of a certain range of products, depending on the customer demands. The other two companies did not conduct new product development at all. They may have done product development in the past, but they found it was more risky to develop own new products than just to stick to manufacturing. So they turned their business to contract manufacturing of other companies' products. They emerged in recent years, and can be viewed as an outcome of the fast growth of the major companies in the industry, thus it is worth to investigate this business sector. The information of these companies are briefly presented afterwards.

9.3 Formal New Product Development Process

In terms of new product development, these companies had particular programs to follow, although some interviewees were not willing to give details of their product development processes. These processes appeared to be practical and flexible, and were claimed to work well within the companies.

‘We have a formal process for product development which starts with the potential product which has been identified. The product manager, who is in charge of developing the product for market, works on the engineering specification and sets up a budget and a timetable. Then the marketing people will make a go/stop decision based on their knowledge of the market demand.’ – Company A

‘Our product development process is generally quite formal. Looking at different customer requirements, we evaluate our own capability of developing a product

which will satisfy most of the customer requirements. We write a specification report and get approval from senior management board. Then we start up the development process.’ – Company B

‘We use cross-functional approach in new product development, because there are different techniques involved in the new product project, such as mechanical, electronic, and mathematical calculation. We have a project manager to look after the new product development. He directly reports to the senior management board.’ – Company C

‘We have a formal process for new product development. We have two documents, one is market requirement specification prepared by marketing department to identify the market demands, another is product development plan set up by R&D department to specify everyone’s duty in process. When the project is set up, a time schedule is generated, and the project management team is to manage the schedule.’ – Company E

‘We have an internal process for new product development based on ISO9000 system which is quite formal. But it would be less formal than what the textbook said. It needs to be flexible to respond to different situations, and we think we are doing very well. We keep changing the structure of the organization to have the best approach to new product development.’ – Company F

‘We have our own design methodology for new product development. This system is based on ISO9001 and it works well for us. ... We write a design brief once we get into the field of the project, and then we design the product towards the brief.’ – Company H

‘We have a formal new product development process which is from a management textbook, and we are always trying to improve it. As the company is growing we modify the process to enhance our performance of new product development. We developed a formal quality menu based on ISO9001 to control the implementation of the process.’ – Company I

‘We have two types of approaches for new product development. One is for products with special requirements. It has been proven a successful strategy. We establish clients before starting development, and we can meet the needs very quickly. Another is for long-term products, we have a semi-formal process to design a new product. By keeping an eye on the newly released products from overseas, and the available materials, we choose the one that may be successful in the local market for the next two years that we are able to produce.’ – Company K

‘We have a quality system for new product development. It starts from project convention which includes project file and plan, then we have a schedule of the design process. ... This is a very fast process that enables us to deliver new products faster than competitors.’ – Company L

It was noted that these companies’ new product development process were somewhat different. It may be impossible to assess which one is better than another, because these companies had different product ranges, or they served different markets. But we can go through the major steps of these new product development processes and find some common points among them.

Company D and G did not have a well documented new product development process, but they did follow a certain procedure to develop new products. Company D was making key parts for capital equipment in the Integrated Circuit manufacturing industry. It had the new product idea as a physical concept from the client, and tried to get it into an engineering package. A prototype was built up for the client to do trials in the client’s laboratory. If it met the requirements, another two prototypes were made for the client to build into the machines in the workshops. This trial took about a year. The customer might feel the machine was good but needs some alteration. It was time for the final detailed design. Then the client would start to order, and the company would settle the final design.

Company G was a small company making technical equipment which helps people with visual disabilities. It was in the process of attempting to establish a well defined new product development process, as the business was expanding. Currently it ‘tend to do things(in new

product development) in the ways that are habitual.’ The new product development started from perceiving the needs of customers, and what the existing technology can do about them. Once the new product was introduced into the market, they would continuously improve or modify it according to the market feedback.

9.3.1 Up-front Activities in New Product Development Process

Many of the companies emphasized the importance of up-front activities, or predevelopment activities, before seriously investing in new product development. As reviewed in the literature, many key activities occurred before the physical development of new products [John and Snelson, 1990; Cooper, 1993]. It included idea generation and screening, preliminary technology and market assessment.

Idea generation

Most of these companies had new product ideas from a mixture of technology-push and market-pull, although market-pull might be more than technology-push, because of the technology driven and market focus nature in the electronics industry. For example, in the telecommunication market, there are different standards set by some authority committees for different countries. So the new products would be strongly influenced by this kind of standards. Company F had three idea resources, one of them was ‘Standard driven’ ideas. This company participated in some of the standard setting committees to get involved into setting new standards.

‘We are both technology- and market-driven company. We need to be technology-driven, because when a new standard comes in and the new product is set and developed, the market does not know about it. We can’t have market feedback, we have to convince the market.’ – Company F

Few companies had new product ideas purely from markets or customer. Company D’s new product development was basically in response to the customer requirements. When there is a need for making new integrated circuits, there is generally a need for a machine.

‘The new product ideas come from physical field, where our clients generate the idea for a new machine. What we need to is to transform the idea into engineering package. We need to understand the physical ideas and work out how to achieve a physical goal by engineering.’ – Company D

The R&D Manager in Company E thought that customer feedback was very useful for the improvement or modification of existing products, but not very good for new product ideas. Because of the price-sensitive nature of the products (agricultural products), customers always wanted products cheaper than reality. That was not a productive approach of new product ideas. Instead, their new product ideas came from R&D people in technical perspectives on what problems the existing products had, and how they can have detailed solutions of them. But the ideas must be specified by market demands.

Idea screening

Many of these companies used unique techniques in idea screening. The underlying principle guiding new product development combined external market needs with internal functional strengths. This combination allowed the companies to generate a new product portfolio that satisfied their strategic objectives.

Once a month Company A had a meeting including commercial people, development manager, technology team leaders, and some product managers, to discuss new product ideas. 75% of the new product ideas came from the sales people, 25% from the technology people.

‘We stimulate the ideas and do demand analysis, try to gain good business opportunities. When the ideas are collected, we look from the company’s point of view to find out what we can produce quickly and we can sell the most of them.’ –
Company A

Company I had a continuous idea-generation technique. Idea collection, idea generation and idea screening were going on all the time in the new product development process. A special team of people in each product division had a task to define new products. When a new product was introduced to the market, this team kept working and started idea generation and idea screening for the next new product.

‘What we try to do in this process is, to define where our product is in the product-life-cycle curve. We want to keep the cash flow in a straight line. So we need to introduce a new product before the sales of the old one drop off.’ – Company I

Company F had a special ‘Advanced technology group’ working consistently on what was likely to come in new technology, how it could be applied into new products which fitted into market opportunities. They kept aware of changes in the basic research and used them in new product development.

‘... And we work closely to our customers and have good feedback from the market, as part of the sales strategy. We gather all the information to create a good vision of match between what we generate and what the market needs. To do so we need to be strongly coupling with the market.’ – Company F

Company L is a small company with only 20 employees. But the small size did not restrict it to adopt a unique technique of idea-generation. It had a ‘Positive Action Form’ as part of its quality system. If anyone in the company had a good idea for new product, or other kind of things in running the company, they filled in this form. The company used this as a part of generating new product ideas, and also looking for the people who wanted products similar in concept to their existing products.

‘We have many ideas that we are working on for one time. But we have to specify the size of the market demand. If marketing research reveals there is no demand yet, we would file the idea into our library and give priority to the one with big orders.’ – Company L

Preliminary technology and market assessment

Company B evaluated its capability of developing a product that met customer requirement before setting up the new product specification, it was preliminary technical assessment. Company E had a document for market demand specification, which was mainly based on customer feedback. This document was a guideline for generating new product ideas and setting up the new product development plan. Company H run a R&D investigation before

starting new product design, in which they had better understanding for the product design: what the market need is, what the product should have. The design brief, was generated based on the investigation, to guide the new product project.

Company I had a new product development process in which they focused effort before the product specification stage. The proposal for a new product was based on the feasibility study which technically assessed the new product idea. Once the proposal has been approved by the senior management board, a marketing plan was prepared for the product which might include market analysis and market screening or market survey. Financial justification was then conducted to develop a financial model, which was used to see if this new product would be a worth-while project, in terms of profit. It might take several times of this procedure to reach the final specification, and then they would invest seriously into implementation, and start the physical development of the new product.

‘Half of the product development process is before starting to write specification of the new product. Before we invest our money, we should be very careful to make right decision. ... We don’t call a product a failure if it is stopped before we put in serious investment. Actually we encourage staff to do this, that is part of idea generation. We want them to be innovative and think about new products’ –
Company I

9.3.2 The Relationship of New Product Development Team with Customers and Markets

Many companies emphasized the relationship between the new product development team and other departments in the company, and the customers or the markets, during the new product development process.

Company B had a communication system between R&D department and marketing department. The marketing people brought in information of market and customer that R&D required for developing new products, and R&D team scheduled the development timetable for the market demands. The R&D team and manufacturing were going almost parallel because the procedure was very short ‘to be ahead of competitors’. The production process might be

proceeding even though the software of the new product was not finished. So there were a lot of information to share between R&D and production. For the external communications with customers, the R&D team had constant contact with customers. The customer feedback was gathered from product trial and marketplace, for generating new product ideas, modifying or upgrading existing products. The company provided training program and had strong technical support for the customers, because their products were technically complicated for them. It was believed that it was helpful to establish customer confidence in the products, so they would repeat orders which was an easy way for profit.

Company C had a unique information officer who was in charge of gathering all kind of information in the business field, which included information about relevant technology, markets and competitors. This position allowed the company to have efficient communication with external parties.

Company E had marketing people involved in the early stage of the new product development process for identifying the market demand. It was an integrated company, having R&D, marketing and manufacturing facilities. As a small company it was able to have R&D, manufacturing and marketing departments working together on new product development with consistent communications between each other. Once the products were on the market, they usually relied on distributors for feedback. Occasionally they sent engineering and marketing people to the farm gathering information directly from end users.

Company F worked closely with their customers and they had good feedback from customers. As the biggest company in this research, it was in a structure of groups based on product range, each group had their own product development and marketing department, which made it efficient to internal and external communications.

‘It is essential to have close relationship between R&D and marketing people, not only to get major new product ideas, but also to get the market feedback for small adjusting of the existing products.’ – Company F

Company G had some degree of contact between product development team and marketing people, which was less than its Technical Manager would like. But it was obviously beneficial

to the R&D performance. And the technical support manager interfaced with the end users who had problems with the present products. That information transferred to R&D for product improvement or development.

Company H manufactured small consumer appliances, so it appeared more essential to have close relationship between new product development people and customers. The Design Manager described their new product development as a 'customer-based design'.

'When we design a new product, we try to put our designers into the customer shoes. We would spend time talking with people using existing products, video-taping them. We would do a lot of research to find what customers really want, what are the problems the existing products have. As soon as we know what customers want, we implement it to features into the product.' – Company H

The Design Department had a very close relationship with other departments in the company, such as Marketing, Quality and Production. At the start and during a new product project, the Production Department was involved in the development process to aid on establishing a production process to suit the design. The Quality Department was in charge of testing new products. And Marketing Department did marketing research and gave feedback from customers on the existing products.

9.4 The Most Important Factor in New Product Success and Failure

The interviewees were asked to give examples of successful and failed products of their companies, and what made them a success or a failure. Various factors contributed to these new products' successes and failures, but appeared to be related to the product range, company's structure, as well as technical and marketing reasons.

Company A produced telecommunication equipment. As its Development Manager described, their new product success was based on providing state-of-art technology which suited the markets. The successful example of their products used technology which was bought from other company, but the product quickly responded to the market requirement. The cost effectiveness also significantly influenced customer's decision when thinking of investing in

new telecommunication systems. Good after-sales service would increase customer's confidence of the products. He defined a product as a failure, because although the company got the investment back, they did not make as much profit as they expected. The main reason was that another technology became available which could do the same job as the technology they used and was more cost effective.

The R&D Manager of Company B claimed they had a very high success rate in new product introductions, and he thought the flexibility of their products was a 'big selling feature'. He believed their typical knowledge made them able to do technically better than competitors. In fact, the company was a technical leader world-wide in some areas. Mentioning about failed products, he admitted that one or two military products for the local market failed in the international market. It was because of the special nature of military products, that they were mostly ordered by governments. As the cold war went off, the world-wide military expenditure cuts made many countries stay with old products rather than new and high-tech products.

Company C had a new product which was the first breakthrough in the South Pacific region. They used a unique technique to solve customer's problems. There were two important things that made this product so successful: initial design and complicated mathematical calculation, and skilful mechanical operation. The Development Engineering Manager did not think they had any product 'a real failure', despite some of their products were the 'follow-up' in the marketplace, where other companies had established the market therefore they did not have much market share.

Company D developed new products basically in response to customer requirements, so it was understandable when the Managing Director said that all their products were reasonably successful in the market. He attributed their success to high quality, right price and on-time delivery. They did have some products not selling as well as others, mainly because their clients misjudged their markets. The price of their products was closely related to its performance. So if the balance between the price and performance was poor, it would end up with a product which was 'over designed', poorly designed, too cheap or too expensive.

Company E developed a very successful product based on thorough marketing research and technical feasibility study. They addressed the product to the bottom line of the market, where

there was a big demand but the customers were very price concerned. And they used the new technology to make this product under the cost budget. The main points for this success were the low price combined with reasonably high quality of the product. Another product was given as the failed example, as it had many warranty returns. Because the company did not directly deal with the end-users of their products, it took a long time to have the feedback. They did not received the message from users quick enough to correct the problems that the product had.

The Engineering Manager of Company F gave two products as successful examples. One was perceived in the market as good value for money, because it was cost-effective to make, having good range of features, and user friendly. The R&D team did a lot of work at the early stage of concept specification, to identify the customer needs and to make sure the product can satisfy them. The cross-sectional teamwork which combined their experience in engineering and sales made this product very successful and have good market share. It was a high-end product, with wide range of features and high performance combined with the reasonably high price. Another product had the best ratio between performance, features and price. It was a more technically orientated product. They recognized a very price-conscious customer group who wanted high performance products, and they used the latest technology to make it achieve the same performance at much lower cost. The company had a good profit margin for the product and its price was still lower than others. He admitted they had failed products, but mainly minor products which he called 'secondary products'. The company had a very wide range of products, and they had a major product range into which they put a lot of effort during the product development process in checking market changes and making sure the product was in the right track. But for the minor products, they put less attention on marketplace. So this failed product had a bad matching to market need.

Company G had a product as an immediate success, because it solved a number of customer' problems. It actually was a re-work of a previous product. But what they had done was finding a market niche based on existing technology, and they had many orders for this product. The failed product example was caused by the technology they used which was not standardized at the time they developed the product. The company wanted to be technology leading, but the plug connection system had many problems of incompatibility with various computer systems.

It was viewed as a failure at first because it was too expensive to develop, although the plug problems had been solved and the next generation of it became a good product.

Company H's successful products were based on sound design and thorough consumer research, as they were making consumer appliances. The successful example had a unique design which made it easier to use, safer, and faster than competing products. The soft and organic shape of the product was also a selling feature to attract customers. 'We design a product by features, and sell it by features.' This product made the company enter a number of international markets. The example of the failed product occurred when the company was having a difficult time. It had a very heavy management structure which misled the new product development. The product itself was a good one but went out of the design track, and it did not do what it was supposed to do. It had many warranty returns, so the company had to withdraw it from market, and redesigned a part of the product to make it more reliable.

The Technical Manager of Company I was confident about their new product development process as they had only one product failed since they adopted the process ten years ago. This product was stopped at the stage of customer testing, before it went to production. They invested multi-million dollars in the development. They tried to develop a new product based on an emerging technology which did not work as they expected.

'The main reason for the failure is that we gave too much trust to an emerging technology which did not deliver the benefit that it should have.' – Company I

The successful product of Company I showed that their new product development process made it possible to be quicker than their competitors. The company also had the ability to do ergonomic study and industrial design which made products look good and user friendly.

Company J also had very high success rate in new product introduction, they had most of their products very successful in the market. The successful example showed that they developed the product faster than competitors. It took only three months from concept generation to product sample for sale. The only product that could be called a failure was that they could not develop the product to meet customer requirement by using technology available at the time.

When a new technology emerged, they designed another product which was very successful. So the first product was also called 'the predecessor of a successful product'.

The Project and Technical Manager of Company K reckoned their technical leadership and high product quality were the main reasons for the success of the product. One failed product was during the early stage of the company trying to enter a new market. The failure was due to the nature of public acceptance, that they did not believe the company had good quality products initially, and the sales skills. They tried to change the public perception of the company by restructuring the company, hiring higher educated people in the design team, improving sales people's skills. It was proved they did it right by the very fast growth in sales for the products.

Company L started preliminary developing and manufacturing products for specialized customer requirements, and then they made some of these products into standard products and sold in larger quantities. What the Managing Director described was that when they developed a product for a particular customer, they also looked for the possibility of selling it to other customers who had the same need as the first one. The very example of successful products was just like that. They developed it a few years ago, and continuously developed it to suit different requirements. This product made the company's annual sales triple in just one year. He also thought they had a bit of luck because they entered the market just at the right time when there was increasing demand. The failed example was more than ten years ago, they developed a product that did not perform as the client expected. The main reason was that they did not do sufficient research on what the customer expectation was, which led to a poor product specification.

In summary, these new product successes were based on superior work in new product development, either technical or marketing, which made clear new product specifications, provided unique benefits to customers. The speed of new product development was found very important from these examples, as well as the product price-sensitivity which was relevant to some product ranges. A bit of luck can be important, but mainly the new product success is predictable.

These failed new products could have been avoided if the new product development processes were well managed and executed. Many of the causes of these failures were controllable within the company, only a few new product failures in these companies were out of the control of the company, such as the market changes. There were two things seemingly very important: technical assessment, and market demand or customer requirement specification. These two sides had to be well matched before physical development of new products, and were checked regularly during the process to make sure it was on the right track.

9.5 The Company's Recent Situation and Future in New Products

9.5.1 The Strengths and Weaknesses of the Companies

Many interviewees in this study were confident about their company's current situation regarding new product development, although admitted they had weaknesses, while a couple of them seemed confused or unhappy with their company's current situations. When asked about the company's strength, the answers appeared to have two groups: the technical or marketing skills and knowledge, and the culture and the people in the company. The weaknesses in these companies seemed somewhat relevant to the management skills required to cope with their rapid growth in the international market.

The Development Manager of Company A claimed they provided 'state-of-art' technology which suits the markets, but the technology was unnecessarily developed by the company. Sometimes they would buy a technology rather than develop it.

'In some cases we just buy technology from others and integrate into our products, because they are more specialized and better than we do. It is not cheaper but effective. The aim is to speed up the process and make our customers satisfied. ...There are a lot of technologies available, we choose the most suitable one, and apply it into our products. ' – Company A

It was a 'me-too' company, and its strength was described as their quick response to the market demands, and good after-sales service. The weakness he cited was inaccurate market forecasting.

Company B marked the technical capability and flexibility as the strongest point of the company. As a small company they had shorter development-to-production time, which allowed them quickly respond to market without many changes during the process. They addressed the niche market area which required low product quantities and high degree of flexibility, where big companies were not interested, because big companies preferred standard product ranges with large volumes. The people in the company were another important treasure of the company, as they had the knowledge and skills of developing and marketing superior new products, and provided enormous support for customers by good customer service and training. Regarding the weakness, the R&D Manager thought they still needed to improve the time of developing a new product. Sometimes they took a longer time to develop a new product than they expected, because the R&D process was not predictable as a straight forward process. When some problems were uncovered during the process, it would take time to fix it, or sometimes re-do some part of the job.

The Development Manager of Company C reckoned it was the company's culture that made it so successful.

'It(the company) is a very good place to work in, with very open management structure. We try to encourage the environment to be an interesting working place. People have a chance to inter-relate a lot, and we encourage team work. We are very careful to choose staff to ensure they can work together well.' – Company C

He thought the company's nature of privately owned and small size could be a barrier to its growth. Because it was very difficult to them to have adequate financial resources to grow along with the market. But he also mentioned that private-ownership can be an advantage too, because they had less restrictions, they could do what they wanted.

Company D was also a small privately owned company, and its strength was that they filled the gap between engineering and physics. They had engineering background which helped them to achieve the physical goals of their clients by engineering methods. The weakness was they were overworked because of the increasingly growing demand of the market. They tried to expand as fast as they could, but they seemed not to want to be bigger in size, because that

would bring a lot of managerial work which was not their specialty. They also had shortage of skilled people. It was a special field, the new staff need at least one year's work training.

The strongest point for Company E was that it was a integrated company, with R&D, manufacturing and marketing departments working together on new product development. It was small enough to have efficient internal communication during the new product development process. The R&D Manager reckoned they were very good at cost-effective product development, as they served a special market where product price was a driving point in new product purchasing. He personally thought they stayed too long in the new product idea generation stage, that was a weakness in new product development. The R&D people needed the co-operation of marketing staff on marketing research, but the marketing people just were not as dedicated in new product development as R&D people because they had many other jobs to do with existing products. The consequence of the delay in new product idea generation was that they could lose the chance in the market.

‘When we have an (new product)idea, we probably don’t do marketing research early enough. By the time we start product development, it is obviously we should have done it, consequently it could lose sales. ... When you realize the idea can be a product, it is too late, you’ve just lost the chance.’ – Company E

The Engineering Manager in Company F strongly attributed their success to the responsiveness to customer and technology changes. It had advanced techniques in developing and marketing new products. As the company was growing very quickly, they kept changing the structure of the organization to have the best approach to new product development.

‘We are small by standing by most of our major competitors, but we would be recognized as being right up among those playing technology things. And we are in the leading group in development technology, product relevant technology, and manufacturing technology.’ – Company F

He thought the company not big enough compared to their competitors with the latest technology. So it had to grow. The company’s weakness emerged along with its fast growth, which required restructuring the company. Because the overall management structure had not

taken in place, there were barriers that limited their performance. He was also concerned about the availability of suitable skilled people, particularly those who had working experience.

Company G believed that having strong technical skills and extreme knowledge of the market, could be its strengths. Some of their products were the technical leader in the world. The Technical Manager seemed not happy with their current new product development process which was not well defined and documented. He pointed out that insufficient contact between R&D and marketing departments led to poor planning in the early stage of new product development, and inaccurate market demand specification. He was thinking about making their new product development process well defined and well documented.

As a consumer electronics company, Company H was very much 'design driven'. The most important point for their successful design was that they always tried to put the designers into customers' shoes. It was essential to understand customers' needs, so they made a lot of effort to have customer feedback on their products. It was also important to have an efficient sales team working on different marketplaces. The Design Manager did not think of any weakness directly to their design program, but he admitted that their market strategy sometimes was not as good as their competitors.

Looking at two products on the shelf, if you choose the other one not ours, you must have your reason for it. We are convinced our products are better, but all the oppositions have a particular features that we don't offer. That could be related to buyer behavior.' – Company H

The Technical Director of company I thought their staff was the most important thing to make the company so successful.

'We have the best staff we can find, and we continuously update them. We have all the latest tools for them, sending them to technology conferences, so they know the technology and how to benefit our customers.' – Company I

He did not think they had many problems in the technology or engineering side of the company, but reckoned their weakness as managing sales growth, capital credibility and staff growth.

Company J was a electronic components manufacturer. The secret of its fast growing was that it found a niche market between high-performance, high-price products and low-performance low-price products, so they could avoid high competition in the component industry. Its fast new product development process allowed them to respond to the market quicker than competitors.

‘Innovation, performance for size and price has been our hallmark. ... The main contribution to our fast growth is that we happened to be in this particular market very early. We have the right products at right prices with right specifications.’ –
Company J

The company suffered some component supply problems, because of the world-wide shortage. They were also concerned about potential problems in attracting skilled people and locating financial resources for expanding the business.

Flexibility was the strongest point of Company K, that meant they responded to customer requirements very quickly. It established long-term relationships with customers, the reputation and good service of the company created high loyalty from some of these customer. The weakness of the company was believed to be related to the corporation culture and interpersonal relationships. Some ‘unsound personality’ could be damaging, and it was the senior management members’ responsibility to influence the staff behavior.

The Managing Director of Company L attributed their success to the constant communication with customer, and the ability of quick response to their demands. The compact structure of the company, in which they combined responsibility of selling and marketing, and got everyone in the company involved into the business, was an advantage to have quick feedback from market. Their weakness was the lack of capital resources. They did not have enough money to spend in marketing to cope with the increasing demands.

In summary, these companies had strengths and skills in particular technology and marketing to provide niche products for the customer to meet their requirements. Quick responsiveness, just-in-time delivery, superior quality and good customer services were important for retaining and expanding business. Most of these companies were doing well in terms of new product development, which somewhat reflected to their rapid growth in the international markets.

Their weakness, on the other hand, mainly accompanied their attempting of fast growth. The effective managerial work on human resources, financial resources and component supply required relevant changes in the organizational structure. These companies seemed to need more management skills and knowledge to manage the changes. Other weaknesses related to the execution of new product development, which implicated a more effective and systematic new product development process was needed to improve their performance.

9.5.2 Other Important Issues for the Companies

- **The government policy of supporting local industries**

There were two sides of opinions about the government policy to the local business. One was that the government's free market policy was helpful for the local companies to be competitive in the international markets, while another was that the government did not provide financial aids for the local company that were unable to compete with overseas large companies.

Company A's Development Manager criticized the government's hands-off policy to local manufacturing industry, they could not get funding from the government to develop new products. They did not have favorable terms in investment on new product development, like many countries had, for example tax reduction for the investment in new product development. The interviewee of Company C had the same opinion about the government's inadequate support to local companies.

More companies believed that the government's policy towards local business was reasonable, and the New Zealand economy was in a healthy situation(in 1995). Company B's interviewee thought that there were a number of local companies not depending on the government. They were very strong, innovative and niche market companies, which were consistent with the local

manufacturing ability and the high level of technical expertise available in New Zealand. The Technical Director of Company I viewed the open economy as an advantage in competing in the world.

‘We have a very open economy which I think is very helpful. Because open economy makes NZ market very sophisticated. If we can sell products to NZ consumer, I am sure we can sell it to the world. The NZ market and consumers lead us to be globally competitive.’ – Company I

- **Information channel of technology**

Most of these companies gained technology information by reading trade and technological magazines, attending trade shows. Company C had a unique position as an ‘Information Officer’ was in charge of gathering all kinds of information in their business area. That was because they were in a very specific area, where the relevant information was hardly found from general information resources. Company D was a small company with special product range that was only for an overseas market. It hired consultants to work on the information on new technology it needed for new product development.

A few companies(Company F, I and J) sent their staff to local and overseas conferences to obtain the newest information about technology. But it seemed an unpopular event for other companies, because they felt they were using the cutting-edge of new technology, also it was expensive to travel overseas and there were very few in New Zealand.

- **Product promotion and distribution**

It appeared that most companies had agencies for distribution in international markets, as they believed the local people can do better than themselves because they know their culture, traditions and language(in non-English speaking countries); they can access more local resources. Some of them had overseas branches mainly for technical back-up, but Company D was directly dealing with the client.

Because many companies in this study focused on overseas markets, they paid less attention to the New Zealand market. Few companies(Company A, F, G and K) had branches in New Zealand for local distribution and customer services.

The promotional methods used by these companies included advertising in technical journals, sending out brochures, and joining international trade exhibitions. Trade shows were thought an effective promotional tool for small industrial business[Browning and Adams, 1988], as its cost was much less than field sales. It became an increasingly important component of the promotional mix for these companies.

Company L did very limited advertising because it did not make a big difference in profit margin. Many companies spent very little on advertisement, normally less than 1% of annual sales.

9.5.3 The Companies' Future

Many companies were believed to have a bright future in the next few years. They looked forward to the increasing market demands overseas, while the local market seemed too small and easy to saturate. Only one company showed uncertainty for the future.

When asked about the Company A's future, the Development Manager replied, 'I don't know.' That somewhat indicated that the company was having some problems, although he did not reveal much details about them. In fact, just one year after the interview, the company went into receivership. The serious problems in the company were emerging already at the time of interview.

Companies B, C, E, F and I were very ambitious to expand their international market, where the demands were growing.

'We have a very bright future. We have very good people working in the company, we are currently looking forward to expanding. It is based on the capability to accommodate new staff and the financial resources. ... It is the innovative Kiwi attitude and flexibility that is the vision of the electronics industry. We need to let the world know about New Zealander's innovative talent.' – Company B

‘The market we are serving is still growing, so we are extensible. We have a bright future. We are a bit slowing down after a few years of growth at a very high rate, because we want the growth to be manageable.’ – Company C

‘The future of our company is very good. There are new product possibility and new market possibility. Although it is not 100% certain, there are a lot of opportunities. The agriculture market is at a down-turn now but we still managed a remarkable growth in recent years. If the market is back in the near future, we should have new products ready for it. We can’t wait till then to develop new products for the up-turn market, it will be too late, competitors will take the market.’ – Company E

‘The future for the company is unlimited. As long as we keep doing things as well as we can, we have very much opportunities to compete in the world market with anyone else. We have no fundamental disadvantage. There are examples of similar companies in small countries who become very successful and dominant in the world market, like Ericsson, Nokia, and some Asian companies. We have been very successful in the history and we’ll keep growing.’ – Company F

‘Our company is definitely growing in the future. The only thing worrying us is how to manage the growth. If we are going to follow the market’s growth, stay on the top of the market(have dominant share of it), we have to grow as quick as the market grows. Otherwise our customers will look for someone else. It is very difficult to manage at such high growth rate.’ – Company I

Because most of these companies were serving niche markets, while the markets grew out of niche, they had to find new niches. Company J and L were very sober about their current situations and preparing for the future.

‘We are vulnerable to one-product market, so we are interested to expand to other markets with different product ranges. We have a solid hold in the current market, and we have a high degree of penetration into some new markets that are emerging. The feedback from these markets is looking very good for the future. I

think the products we planned for these new markets should see us accelerate our growth even beyond the current growth. In the mean time we are going into automation to reduce manufacturing cost.’ – Company J

‘We know we are not going to hold on this one product for ever, it is going to be taken over by some major international companies as the market for it is growing huge. So we are looking for new ideas and new markets, because our strength is in niche products. ... I don’t think we are going to grow significantly bigger in terms of staff, I feel it has a nice size to work with. In term of new products, when our current products are out of the niche that we initially designed for, we are going to find another niche. ... We have a number of ideas we were working on for the time, but we have to specify the size of market demand.’ – Company L

Company D’s Managing Director was somewhat reluctant to grow with the market, although he complained about overworking on increasing demands. He seemed not to like to hire more people for management reasons.

‘We are expanding. But we should grow faster than we do now, we just don’t have enough time to deal with managerial stuff, and other things related to expanding. The more people you get to help you, the more committee meetings you have, and things go more complicated. And I don’t like to make staff redundant when sales drops off.’ – Company D

Two companies in this study dealing with consumer products, Company H and K were looking for more chances to enter international markets. Company H had a very high growth rate in export(mainly too Australia) in recent years, and it was looking for markets, based on their core product range, in Asian and European countries.

‘We are always looking for new product design, but we are not dreaming of new products. We’ll see the opportunity if it is profitable, and apply a design team on it. Ideally our core products will grow in the market. We are looking for more opportunities in new export markets, especially in Asian countries. We are already

capitalizing there by supplying new product design in joint venture companies.’ –
Company H

Company K’s manufacturing sector used to be only serving the local market, with limited export to Australia. The interviewee thought that the company needed to go export to increase sales because of the limitation of local market. That meant they had to change the focus of the current new product development program, as there were different standards overseas. They were also targeting to develop new market in New Zealand, and redevelop some existing products for overseas.

The Technical Manager of Company G pointed out they were going to keep the nature of the business, which was developing products that helped people with disabilities. They would not do any military or environment-harmful products, no matter how profitable they were. Because the current products involved a lot of computer technology that was changing quickly, and the competition in this area was getting intense, they had to improve their new product development performance to quickly respond to the market demands. They were also looking for new niche markets.

9.6 Companies in the Interviews without Formal New Product Development Processes

9.6.1 Small Companies

In this study, three very small companies mainly responded to the customer requirements when they conducted new product development. They had less than 10 employees, and did not follow a particular process to develop new products. One of the reasons might be that they usually had only one or two people involved in the whole process. It seemed not necessary to have a ‘written paper’ about what to do next. Company N had one person doing new product development, and another partner had part-time involvement. Company O’s R&D strength was the owner himself. These companies had no special marketing personnel. Company M always had customer requirements of ‘solving technical problems’, it was kind of ‘word of mouth’. Company N used external distribution systems to market its products. Company O was directly dealing with its clients.

Their advantage was that they could make exactly what the customers want, no matter how small the quantity was. Normally this kind of products was very specialized, and in the high-end of the markets.

‘90% of the work we do now is in response to the inquiry from our customers. It is very small amount but usually very expensive. A lot of equipment we made is just one.’ – Company O

Company M mostly sub-contracted its products to contract manufacturers mainly because it wanted to be kept as a small R&D company. Company N had some parts of the products sub-contract as it was not necessary to invest in some machinery when there were such services available.

Some of these companies conducted continuous development once the new product was on the market. Company N was making high-end audio equipment for consumer electronics market. It had regular new product introductions to the market. The new product ideas came from the customers. They asked for a new product, but they did not necessarily know what it really was.

‘He(customer) is only moulding his idea from what is currently available. We have to work out how it would really work.’ – Company N

Company M was described by its owner as a scientific development company:

‘Our job is to solve technical problems in technical ways. In general it produces solutions in electronic ways, but often it has much wider knowledge than just electronics. We may be given a problem that has more knowledge in physics or mathematics than in computer and electronics hardware.’ – Company M

Nearly all its seven staff had technology background, and they had many new product ideas came from their ‘active brains’. But actually there were external inputs.

‘There often are small comments made by the industries. We know enough in technology to be able to say it is technically feasible to do the project, and it also needs to be economically feasible.’ – Company M

These companies usually did not invest by themselves in new product development, but with the clients. They did not want to take the risk of failure because they were too small to afford failures.

‘Generally we are only working on the projects that we have money available from clients, and choose interesting ones.’ – Company M

‘We research the best way to do the project, give the client a specification of price, then we start (the project)’ – Company O

These companies had their own specific technology expertise which allowed them develop unique products for the clients. However, they did not have good knowledge in management and marketing. That is why they liked to keep the structure of company as simple as possible, and concentrate on the technical side.

‘I am better to be an engineer than I am a marketing person.’ – Company O

‘Over the years there have been many small companies failed, because they tried to get bigger but they couldn’t handle it. They did not have knowledge in management, marketing, or manufacturing.’ – Company M

They would turn to external resources for help if they had problems in technology.

‘If we need more knowledge than we have, we tend to employ outside consultants or seek help from universities.’ – Company O

‘We keep good relationship with universities and the IRL(Industrial Research Ltd.). Sometimes we need their help on basic research and information’ – Company M

These companies had weaknesses mainly related to the ability of marketing, components purchasing, and information gathering, due to the limited resources available.

‘I would like to have forward information from marketplace, so we can plan our production accordingly. At the moment it is difficult to plan production. We do not know what and how it is going to sell. We do not have warehouses and we can’t overstock the products. We can’t take any notice from New Zealand market because it is too small. I really want a proper forecast, it is easier for the sub-contractor too.’ – Company N

‘We need marketing people, like TRADENZ, around the world who can assist the local companies enter the international markets, and get information about the marketplaces and global competition.’ – Company M

‘Sometimes we can’t have a particular component, or we can’t find a reliable supplier for components.’ – Company O

The interviewees were satisfied with the current situations of their companies. They might like to increase the sales, but they did not want to change the company structure dramatically.

‘I’m quite happy with the current situation: a couple of million dollars turnover and such an acceptable position. I don’t want to change my life quality.’ – Company N

‘I want to remain small. Because it is not money that drives us, it is interest. If we went to be bigger, then I would be involved in management, not in technology. I am not interested in running a big company. I enjoy what I am doing, and I like the life style.’ – Company M

‘I have been through the time when I employed more people, and decided that I am happier to employ fewer people. I can have more free time and I can choose the work that I enjoy doing. It means I can get more technological work done with less managerial work. And I don’t have to find as much work to keep staff employed.’

– Company O

In summary, this kind of small company had an advantage in developing tailored products to meet special customer needs. They were flexible and quick to react to the changes. But the limited resources, both financial and technical, restricted their ability in new product development. They might be in the markets for some time because there were still demands for them. But they could be vulnerable to limited competitive strength. As they were mainly content with things as they were, they were not likely to be the main force of the New Zealand electronics industry going to international markets.

9.6.2 Contract Manufacturing Companies

Two companies in this study were mainly manufacturing companies who accepted contracts to manufacture products for other companies, they would like to be recognized as contract manufacturers. There were also a few other companies with manufacturing facilities doing contract manufacturing while their core business was in their own product ranges. Company E and G tended to give the priority to their own products. If there were spare production capability, they would do contract manufacturing for other companies.

Contract manufacturers emerged in recent years as the result of the local electronics industry’s prosperity. Many companies, like Company B, I, L and M in this research, wanted to concentrate on new product development and marketing, and contract out manufacturing. Some small companies just did not need to invest into their own manufacturing while there was possibility of contract manufacturing.

The two contract manufacturers in this study did not have a new product development facility, but had customer support sections in which they might do some design or modifying work for implementation in the production process. At the time they were fully loaded, and did not need to compete for orders.

Company P was in contract manufacturing for just one and a half years. It used to have its own product ranges, and the design section employed 9 staff for electronic hardware and software development. The decision of turning into contract manufacturing was made because there was a demand, it also was thought influenced by the change of ownership. It seemed a good decision, as they were so busy that they had two shifts in production, and the profitability was high.

‘We were lucky to go into this area when there is a shortage in New Zealand. We are doing very well, and we are going to expand, buying more equipment to enhance the ability of manufacturing a wider range of products.’ – Company P

This company is still selling its own products, but it was not core business any more. It had only three designers left in the design section. Their main task was customer support for contract manufacturing, while they were doing small updating or modifying jobs for their own existing products to meet customer requirement. They were not likely to invest in new product development once the existing products were fading out in the market.

Product quality was viewed as the most important factor in contract manufacturing business, and price was the second important factor. The company had a special test program to assure product quality.

Company Q was established as a purely contract manufacturer, and its major clients included Company B and F. It offered full production engineering, component sourcing, assistance with design upgrades and testing clients’ specifications. It had the flexibility to handle a high capacity assembly line or a limited prototype production run. Five engineers formed the section of ‘Design for Manufacturing’, whose job was to design or arrange products so that they can be manufactured more effectively. They worked with the customers to help them make the products manufactured cheaper, faster or having better quality. They also helped to source components.

It seemed to the company that their business was very good, as they had three shifts in production. The turnover in 1994 was double as in the previous year.

‘We tend to be specialized in high-tech and high-volume products. Our equipment are reasonably flexible, so they can fit with a lot of different jobs. Most of our clients are long-term. They keep coming back to us because we help them with their products. We can provide some suggestions to make the product easy to manufacture.’ – Company Q

A solely contract manufacturer was thought to be more dedicated to the clients. The company emphasized the relationship with their customers. So they had weekly meetings with their major clients to check the schedules and find if there were problems in the production. ‘Delivered the products on time at reasonable price’ was regarded as the most important factor to satisfy clients.

There were some weaknesses in Company Q. The Operation Manager admitted that sometimes the clients were not happy with their service, mainly in two areas, product quality and delivery time. While many of the product quality problems were caused by component faults, if the components were supplied by the client, the company had no control of it. The main reason for the delivery delay was that some products were not designed as they should be. The technical design of products was out of the contract manufacturer’s control, although they could help clients with products for manufacturing.

‘The more control we have during the production, the more we can assure about the product quality. ... We have ISO9002 to control the production process, but we don’t have much control on technical design.’ – Company Q

The fast growth of Company Q was contributed to the New Zealand electronics industry booming in the international market. It kept several major clients, not just one. And it had many smaller customers as well. These clients all had good markets world-wide. One client’s ups and downs would not affect too much on the company’s business. If one client can’t sell well in one market, it or other clients may do well in other markets. If there is a world wide down turn, it would definitely affect contract manufacturers.

Both the contract manufacturing companies had very bright futures, according to the interviewees. The competition was not intense, although there were a few companies doing contract manufacturing. They did not have shortage of orders, there were always customers approaching them. Company Q was considering about having offshore orders from overseas companies. As the New Zealand electronics industry entered the international markets, the contract companies were known overseas. They were building the reputation of flexibility and quick responsibility.

In summary, contract manufacturing is a dependent business. Its prosperity depends on the prosperity of other companies. In an ever changing electronics environment, adaptation was viewed as the key to success. A contract manufacturer should quickly adapt to meet clients' specific manufacturing needs. Several factors seemed important in making a contract manufacturer successful:

- The flexibility to meet the customer requirements
- Deliver in time
- High quality products at reasonable price
- Well trained staff dedicated to customers.

Internationally, there are many contract manufacturing companies working for large and dominant companies in the electronics industry. For example, the giant computer companies like IBM and Apple Computer, are spending more resources on marketing and design, and less on manufacturing their products. They tend to go to contract manufacturing[Pang, 1996]. Some of these contract manufacturers had tremendously increased sales and profits since 1990s[Carbone, 1994; Pang, 1996; Rayner, 1989]. The growing influence of these assemblers was viewed as a direct result of vendors' attempts to slash costs by outsourcing manufacturing. As the New Zealand electronics industry is being more recognized by overseas, it is possible for New Zealand contract manufacturer going internationally for niche markets.

9.7 Conclusion

The mail survey and the interviews revealed that the participating companies in the New Zealand electronics industry conducted new product development activities reasonably well. Many of them had systematic approaches in new product development process, and they appeared striving in the international market as they were continuously growing.

Evidence from this study showed that most of their new product successes were based on sound technology expertise and flexibility to quickly response to customer requirement. Their failure in new products more or less related to insufficient marketing research and poor product specification that led to the mismatching between the new product and customer expectation.

Most of the companies were small sized with less than 200 employees. Many of them showed strength of technical expertise in niche market, and they tended to be exporters because the local market is too small. Some of them had transferred from local companies to global companies, and they had built up an international reputation in particular product ranges. These companies also suffered from similar weakness as overseas small companies had, be undercapitalized, having shortage of skilled manpower, and limited local market demand[Bloom, 1992].

The study results suggest some improvements in new product development performance needed for these companies to enhance their ability of developing superior new products to meet customer requirement quickly. As they became export-orientated, the limitation of financial and human resource limit their attempt of growth with market demands. They may need to modify their organizational structure and management style to achieve more effective and efficient performance in new product development.

Some of these companies tended to spend more resources on design and marketing, and less on manufacturing their products. Instead, they relied on contract manufacturers to produce their products. Contract manufacturing companies at a reasonably big scale emerged in the New Zealand electronics industry in the 1990s, and they seemed very prosperous thanks to their clients' success in the international markets.

There were also a number of very small companies with compact structures, who were making customer-designed products for special requirements at very small quantities. They normally had technical experience in special area, and an established client base. They seemed to enjoy running a small business and made no attempt to grow bigger because they wanted to keep it simple.

Chapter 10 Discussion and Conclusions

10.1 Introduction

The research in this thesis investigated new product success and failure in the New Zealand electronics industry. The factors and the activities related to success and failure in developing and marketing new products were studied in fifty-seven New Zealand electronics manufacturers and distributors, using a mail survey and in-depth face-to-face interviews. These companies were, by international standards, small-sized companies with less than 200 employees. The distribution companies mostly provided imported products and services to the local market. They did not undertake any new product development activities, but were involved in launching overseas new products into the local market. Most of the manufacturing companies had very specific product ranges, mainly in industrial products, from health care to communication equipment, from agricultural to defence products. Only seven companies produced solely consumer products, as there were few companies producing consumer electronic products in New Zealand in 1994 - 95, the time of the study.

It was found that the manufacturing companies had specific expertise for their product ranges, and identified special market niches to avoid intense competition with large overseas companies. The study also showed that a number of contract manufacturing companies had emerged recently, as some fast growing New Zealand electronics companies licensed out manufacture of their products. The manufacturing companies covered all the product ranges presented by Cornwall’s report(1994) on the overall New Zealand electronics manufacturing industry. The sizes of the companies were very similar to those in the 1994 research on the innovation environment in mixed New Zealand industries[Frater, Stuart, Rose and Andrews, 1995](see Table 10.1).

Table 10.1 Comparison of Company Sizes

Company Size (Employee Nos.)	Companies in New Product S/F Study	Companies in NZ Innovation Survey*
0 - 9	14.0%	12.0%
0 - 49	55.8%	62.5%
50 - 99	18.6%	16.8%
100 +	25.6%	20.7%
total	100%	100%

* Innovation Survey of Enterprises[Frater, Stuart, Rose and Andrews, 1995]

In this chapter, the factors separating new product success and failure are presented, followed by a discussion of the underlying factors for the new product success and failure. There is a discussion on the influence that the nature and size of a company has on the factors that separated new product success and failure. The chapter concludes with an examination of new product development practices, as well as an evaluation of new product development in the New Zealand electronics companies.

10.2 Factors Separating New Product Success and Failure

This study tested the importance twenty-four factors, which described product nature, market characteristics and company resources and skills, on new product success and failure at the project-level. Each of the factors was scored by the respondents on how well they described a specific successful new product, and a specific failed new product, on a scale from “Strongly Agree” to ‘Strongly Disagree’.

10.2.1 Important Factors in Separating New Product Success and Failure

The factors that showed significant difference between successful and failed new products(SL < 0.001) were the most important factors in separating new product success from failure. They are ranked in Table 10.2 in the sequence of the significance level of difference between new product success and failure.

Table 10.2 The Important Factors in Separating New Product Success and Failure

Rank	Factor	Success		Failure		SL
		MD	SD	MD	SD	
1	Good understanding of buyer behaviour	2.28	0.79	3.60	1.06	1.15E-07*
2	Good value for money	1.88	0.76	3.17	1.10	2.12E-07
3	Made to meet users' needs	1.65	0.74	2.71	1.25	5.05E-05
4	Less after- sale problems	2.03	0.90	3.27	1.55	3.32E-04
5	The consumer had great need for product type	2.18	0.80	3.03	1.06	3.51E-04
6	Allowed greater pricing flexibility	2.79	1.28	3.91	1.23	3.65E-04
7	Attractive in appearance	2.11	0.63	2.97	1.21	7.21E-04

1 to 6 scale was used, where 1 = Strongly Agree, 6 = Strongly Disagree.

MS: Mean Score

SD: Standard Deviation

SL: Significance level of differences between success and failure mean scores

* E-07 equals to the minus seventh power of ten.

For six of these factors, successful products had mean scores well below the middle point of 3.5 on the scale, with low standard deviations. This means that these factors were very common among the successful products. In contrast, failed products' mean scores were relatively higher for each of these factors, most of which were close to or exceeded the middle point of 3.5, with higher standard deviations. It could be assumed that these factors were much less common in failed products. For example, respondents reported that 62% of the successful products were shown to be 'Good understanding of buyer behavior', compared to only 14% of the failed products; 80% of the successful products were described as 'Good value for money', compared to only 26% of the failed products; 74% of the successful products and 36% of the failed products were 'Attractive in appearance'. For 'Allowed greater pricing flexibility', some 42% of the successful products had greater pricing flexibility, compared to only 15% of the failed products. The differences between new product success and failure were very clear for these factors.

These important factors linked strongly the relationship between customer needs and successful new products. The clear message is for new product development to create a new product that offers real benefits to customers and meets their needs. This should be the core objective when starting a new product project.

10.2.2 Factors with Moderate or No Significant Effect

Some factors which may be important for new product development, did not distinguish between new product success and failure. For example, 'Project supported by senior executives' was identified as an important factor for 86% of the successful products and 61% of the failed products. Its significance level of difference between successful and failed products was $0.001 < SL < 0.01$, so it was viewed as only a moderate-important factor in separating new product success and failure. 'Superior in quality' was also only a moderate-important factor although it was an important factor to new product success; 69% of the successful products were 'Superior in quality', compared to 50% of the failed products.

The non-important factors, which scored slight difference or were identical between new product success and failure, can be divided into two groups:

- | | |
|---|--|
| <ul style="list-style-type: none">● Market environment | <ul style="list-style-type: none">● Product development group |
| Intense price competition in market | Very experienced project team |
| Many competitors in market | Multi-functional development group |
| Market growth was high | Adequate financial resources |
| Market size was large | |

The factors related to market environment did not separate new product success and failure, because most of the companies were small sized and they served very specific niche markets, which were small in size and, maybe had low growth, with fewer competitors. ‘Multi-functional development group’ not showing significant difference between successful and failed products, is probably also due to the small company size; multi-functional teams were not formally structured where a single person might play several roles during product development. The experience of the project team did not differentiate new product success and failure; 64% of the successful products and 59% of the failed ones were developed by very experienced project teams. This implied that the companies had adequate experience in new product development.

10.2.3 Comparison with Other Research in New Product Success and Failure

As a comparison, Table 10.3 presents the factors and their impacts in separating new product success and failure, found from the current study and from other studies in different countries.

The results of the current study basically supported Cooper’s NewProd research projects[Cooper, 1979a and 1984b; Cooper and Kleinschmidt, 1987a and 1990a], but had some differences. For example, superior technology was found as one of the most important factors in Cooper’s studies, but it only appeared to have moderate influence in the current study. This may be because many companies in this research were innovation focused; they set up the new product goal as providing a technical solution to users’ problems. So the initial objective was to compete on the basis of technical superiority. Cooper’s studies found that having a large and growing market with strong customer needs helped pave the way for success, while the current study revealed market size and growth had very little influence in separating new product success and failure. This was because the current research studied mainly small companies who were looking for market niches where market size and growth were less important than in previous research.

Table 10.3 Factors Impact in Separating New Product Success and Failure

*** significant impact, ** moderate impact, * slight or no impact

(Factors ranked in their importance in differentiating new product success and failure in the current study.)

Factors	NZ	CAN	US	AUS	UK	CN
Good understanding of buyer behavior	***	***			***	***
Good value for money	***	***	***	***		***
Made to meet users' needs	***	***		***	***	***
Less after-sale problems	***		***	**	***	
The consumer had great need for product type	***	**		***		***
Allowed greater pricing flexibility	***	*	***	***		*
Attractive in appearance	***			***	***	
Project supported by senior executives	**	***	***		***	
Adequate distribution resources	**			***		
Strong sales force launch effort	**	**	***	***	***	*
Superior in quality	**	***		***	***	***
First on the market	**	*	**	*		***
Better suited to our firm's technology	**	***	***	***	*	**
Technically superior to competitors	**	***	**		**	
Frequent new product introductions in market	*	**				***
Customers satisfied with existing products	*	**				***
Adequate advertising skills	*	**	***			*
Market growth was high	*	**		**		***
Adequate financial resources	*	**				***
Market size was large	*	**		**		***
Multi-functional development group	*		***			
Many competitors in market	*	*	*		*	***
Very experienced project team	*	***	**		**	**
Intense price competition in market	*	*	*		*	***

NZ: The current study in New Zealand

CAN: NewProd Project in Canada[Cooper, 1979a]

US: Stanford Innovation Project in the US[Maidique and Zinger, 1984]

AUS: Link's Project in Australia[Link, 1987]

UK: SAPPHO Project in the UK[SPRU, 1972]

CN: Song and Parry's project in China[Song and Parry, 1994]

Focusing on the electronics industry, the comparisons with the Stanford Innovation Projects[Maidique and Zinger, 1984 and 1990] and with Yap and Souder's project(1994) revealed one major difference. Previous research projects found that a multi-functional approach in new product development, and effective internal communications were very important to new product success, but the current study did not strongly support these

findings. One of the possible reasons is the size of the companies. The current study had a sample of companies mainly having less than 100 employees and less than NZ \$10 million annual sales. Such compact business units might not have as much internal communication problems as large companies. They did not actually consider the importance of multi-functional new product development or interdepartmental communications. In fact, from the interviews, some respondents indicated that internal communication became an issue as the company was growing. For those rapidly expanding companies, effective internal contact appeared to be essential to the new product outcomes, and they tended to improve their internal communication systems. Therefore they transferred their organizational structures from department-based to product-range-based, which meant that they adopted multi-functional approaches for new product development.

The differences between the current study and previous research in the Asia-Pacific region[Mishra, Kim and Lee, 1996; Song and Parry, 1994; Song, Montoya-Weiss and Schmidt,1997] may be attributed to different stages of national economic development, different country cultures, temporal differences in data collection, or the different industries represented in the sampling frame. For example, in the research in China, sales force/launch effort and pricing flexibility did not have strong impact in separating new product success and failure, but were found to have significant impact in the US and Australian studies. The factors of market size, growth and competition, which did not show significant impact in separating new product success and failure in the current study and the Canadian research, appeared as strong influences in the Chinese study. This may be because China is a developing country in which the economy is not as developed as in western countries, the market potential is huge and the customers are unsophisticated, and the marketing and distribution systems are not well established.

Comparing the findings of this research to other research in New Zealand, two studies investigating only new product success emphasized the importance of top management support[West, 1980; Kerr, 1995]. In the current study, top management support was a very important factor for successful products, but it was only a moderate-important factor in separating successful and failed products. The findings of this research, it may be argued, therefore justify the use of the comparison methodology employed. Research on the New Zealand innovation environment[Frater, Stuart, Rose and Andrews, 1995] identified the relative importance of factors influencing innovation within companies, and found that the majority of respondents considered internal factors as encouraging to innovation. The most important factors encouraging innovation were top management leadership, owner input, customers, firm culture, teamwork, and marketing. Skills availability was an inhibiting factor

concerning more than 50% of respondents. That research was at company-level while the current one was at project-level, so they had different focuses. But both studies emphasized the importance of contacts and relationships with customers, and marketing activities.

10.3 Underlying Factors for New Product Success and Failure

Factor analysis resulted in eight underlying factors for successful new products, and seven underlying factors for failed new products. These underlying factors explained over 80% of the variance of the 24 original factors, therefore they described those original factors reasonably well. Most of the underlying factors for successful and failed products were similar, although they were in different orders in explaining the original factors' variance.

Similar underlying factors were 'Market strength', 'Product superiority', 'Product benefit', 'Company resources', 'Marketing competitiveness (and dynamism)', and 'Product development team (and market environment)'(refer Section 5.7 for full descriptions of each underlying factor). One needs to note the relationship between these underlying factors and the grouping of the original factors into 'Nature of Product', 'Market Characteristics', and 'Skills and Resources'. Most of the original factors in these groups were divided between the underlying factors as shown in Table 10.4.

Table 10.4 Relationship between Underlying Factors and Original Factor Groups

Original Factor Grouping	Underlying Factors
Nature of Product	Product superiority Product benefit
Market Characteristics	Market competitiveness (and dynamism) Consumer knowledge
Skills and Resources	Marketing strength Company resources P.D. Team (and market environment)
	Top management support Existence of competitor products

A few factors appeared in other underlying factors. From 'Nature of Product', the factor 'Allowed greater pricing flexibility' appeared in 'Marketing Strength', because pricing was actually a marketing activity; and 'Better suited to firm's technology' went to the underlying factor 'Company resources', as technology availability was company resources. 'Good understanding of buyer behavior' in the group 'Skills and Resources' moved to the underlying factor 'Consumer knowledge', as it was really about knowing customers. One factor was not significant in the factor analysis, 'First in the market' was found to have only moderate impact on new product success and failure. These underlying factors listed in Table 10.4 could be suitable for further research in new product success and failure.

The three underlying factors showing difference between successful and failed products were 'Consumer knowledge' and 'Top management support' which only appeared in successful products, and 'Existence of competitor products' which only appeared in failed products. It appeared that 'Consumer knowledge', which included 'Good understanding of buyer behavior' and 'Consumer had great need for the product type', had a key role in driving new products to success. 'Existence of competitor products' was a barrier to new product introduction, and it was an important dimension of new product failure. As 'Project supported by senior executives' in the underlying factor 'Top management support' for successful products also appeared in the underlying factor 'Product benefit' for failed products, the difference between successful and failed products was less significant than for 'Consumer knowledge'. Therefore, the results of the factor analysis confirmed the importance of consumer related factors to new product success and failure.

Compared with previous studies that used factor analysis[Cooper, 1979a; Link, 1987], the current study had a relatively narrow set of underlying factors used to explain new product success and failure. One possible reason was that this study focused on one particular industry rather than mixed industries. Small sample size and fewer variables also affected the results of this study. Both Cooper and the current study stated the importance of market/consumer knowledge and product superiority/uniqueness, while Link's results stressed the importance of launch execution. He presumed that this was because most new products in this Australian study were reactive or imitative rather than innovative, so their successes have been more dependent on launch execution.

Compared with Kerr's factor analysis in New Zealand small-sized companies(1995) which only focused on new product success, the current study confirmed his findings of 'top management support', 'good customer research and marketing' and 'product with relative advantage'. As this study was at project-level, it did not directly support Kerr's other two

factors, ‘creative company environment’ and ‘company technology synergy’. But the current study’s underlying factors ‘Product development team’ and ‘Company resources’ reflected the company’s overall structure and resources.

10.4 Impacts of Company Nature and Size on the Factors Separating New Product Success and Failure

In comparing manufacturing and distribution companies, the current study found that the two groups of companies had obvious differences in the most important factors separating new product success and failure(see Table 10.5).

Table 10.5 The Most Important Factors in Separating New Product Success and Failure in Manufacturing and Distribution Companies

Rank	Manufacturers	Distributors
1	Good understanding of buyer behaviour	Better suited to our firm's technology
2	Good value for money	Technically superior to competitors
3	Allowed greater pricing flexibility	Good understanding of buyer behaviour
4	First on the market	Good value for money
5	Project supported by Senior Executives	Attractive in appearance
6	Strong sales force launch effort	Adequate distribution resources
7	Made to meet users' needs	Superior in quality
8	Customers satisfied with existing products	Less after-sale problems

Manufacturing companies agreed strongly that new product success was related to close relationships with customers. They agreed that to be better than their competitors, they had to understand users’ needs well and to develop new products that provided customers with specified features that met customers’ requirements. Their market research was aimed at identifying the market where customers had great need for the product, and specifying the customer needs. The new product development team who worked closely with the users of the new products and developed new products with unique features at reasonable prices, had higher chance of success in new product introduction.

The distribution companies related their new product successes to substantial technical knowledge about the products, and adequate marketing research before launching a new product to identify the target market. While distributors have no control on how a new product is developed and manufactured, they have the control in choosing the products for the

right market at the right time. This requires that they have the ability to identify the market needs and to select available products to meet the needs. It is still unknown what kinds of processes the electronics distributors applied to select new products, but this study provided some indications of the type of products likely to be successful in the market: technically superior with high quality and attractive appearance.

No previous study was found that compared manufacturers and distributors regarding new product success and failure. There were a number of studies investigating new service success and failure[de Brentani, 1989; Cooper and de Brentani, 1991; Atuahene-Gima, 1996], but they focused on industrial financial services, insurance, banks, transportation and communication services, rather than distribution. Cort, Stith and Lahoti(1997)-stated that as the functions of industrial distributors generate value for both their suppliers and customers, their competency may be founded in expertise, technology, position in the supply chain, contact with market, or other assets. This point was somewhat proven by the current study, because technological fitness between company and new products, good understanding of buyer behavior, and less after-sales problems, were found important in separating new product success and failure for the distributors.

Company size had an influence on the important factors separating new product success and failure. Small companies emphasized their flexibility of providing 'customer-made' service to make new products suit users' needs. It was understood that small companies in this study had very close relationships with their clients, as many of them dealt directly with clients, and customer-designed products for clients. So they were able to deeply understand client requirements and made the product to meet them. Normally this kind of company was run by the owner, who was also the key person dealing with clients and developing products, and had full authority to decide product price. Due to the limitations of human resources, they only conducted small projects which mostly were financially supported by clients so that they did not have to take risks. Therefore they did not have worries about financial resources.

Medium sized companies also had limited customer base because of their size, but they served more customers than smaller companies. They normally had direct contact with customers to understand their needs, and made products meeting their needs. Their products were developed for a number of clients, not just one. So they needed good after-sales services to satisfy customers. Large companies were more concerned about strong financial support and distribution resources, because they had higher marketing goals for their products. They targeted niche markets, but had relatively large product volumes. They needed more financial resources to run the business than small companies, because they had new product projects

which required more people and money. A cost-effective and well planned new product development process was likely to keep the development cost within the budget.

10.5 New Product Development Practices in the New Zealand Electronics Companies

The in-depth interviews showed that the participating companies in the New Zealand electronics industry were active in new product development. Many of them served niche markets, and they tended to be exporters because the local market is too small. Most of the medium and large companies had a formal or semi-formal new product development process, and their new product successes were based on sound technological expertise and on flexibility to quickly respond to customer requirements. They turned their advantages in technology and flexibility to full account, and gained international recognition. They were in accord with the international trends of innovation companies spending more on developing and marketing, less in manufacturing of their products[Pang, 1996], the outcome being the emergence of contract manufacturing businesses in the industry.

A number of very small companies with less than 10 employees in the New Zealand electronics industry who focused on customer-made products did not have a formal process in new product development, but they tended to go through some specific stages. They conducted customer study rather than market study, as they had direct contact with customers. Their strengths were their experience in the specific business, and thorough understanding of customer requirements. The owners mostly ran the business for personal interests rather than only profitability. They were enjoying their present situations, and were not willing to expand their business. It reflected a kind of Kiwi life style.

The mail survey investigated eight activities in the new product development process for their impacts on separating new product success and failure. Clear market strategy was the most important factor to separate new product success and failure. The differentiation between new product success and failure was influenced more by market and consumer related activities than technical activities, during the new product development process. This did not mean that technical activities were not important, in fact several respondents attributed their new product success to sound technical assessment. Because these activities were undertaken similarly in successful and failed products, they did not indicate the difference between new product success and failure.

Pre-development activities in the new product development process, such as idea generation, preliminary market and technical assessment, and financial analysis were important to new product success. This finding was supported by previous research [Khurana and Rosenthal, 1997]. The front-end activities help clarify the product concept, define product and market requirements, and develop plans, schedules, and estimate the project's resource requirements. In fact, from both the mail survey and the interviews, a number of new product failures were viewed as, either not meeting customer requirements, or being costly, or taking too long to develop. It seemed that the product concept was not clearly defined, and the development schedule and budget were not well planned, before the development started.

The survey also found that using idea-generation techniques to develop the new product concept was the least used of these eight activities conducted by the companies. This was probably because many small companies only responded to customer requests for new products, they did not need a formalized technique to create new product concepts. From the interviews, in some companies, new product ideas arose from anywhere within the company, and the staff were encouraged to think of new product ideas. A few companies used a specific procedure to create new product concepts. Those companies using idea-generation techniques mostly were a larger size, and their new product development process was well planned and documented.

The new product development activities identified in previous research as being important were not used extensively by the sample companies in this study. In fact, all of the new product development activities tested in the survey, for successful and failed products, had low scores. The percentages of 'Agree', for the successful products hardly exceeded 50%, and were even lower for the failed products (see Table 10.6). A similar finding was reported by Cooper and Kleinschmidt (1986), who found market-related tasks were the weakest activities conducted in 203 new product projects. It indicated that there was much room for improvement in the typical new product development process.

Table 10.6 The Quality of Undertaking New Product Development Activities

NPD Activities	Percentage of 'Agree'	
	Success	Failure
Developed using idea-generation techniques	31%	36%
Undertook preliminary market assessment well	50%	13%
Undertook sound technical assessment	64%	36%
Undertook financial analysis well	50%	15%
Undertook prototype development well	64%	42%
Undertook prototype test well	57%	46%
Undertook in-depth consumer evaluation	40%	4%
Developed with a clear market strategy	62%	19%

A major point from both the survey and the interviews was the time that the new product was introduced to the market. One respondent in the survey stated that keeping ahead of competitors was the most important factor of new product success. Two respondents admitted their new products failed because they introduced the new products to the market later than their competitors. Several interviewed companies applied an effective new product development process which allowed them to develop new products faster than their competitors, therefore they were able to keep ahead in the market. Some companies in the interviews admitted that they sometimes took longer time to develop new products than they expected, hence lost the chance in the market. In today’s dynamic environment, fast-changing technology and market needs, shorter product life cycles, and increased global competition are necessitating faster new product development. But speeding up in new product development should not be at the expense of quality of execution of new product development activities; simple short-cuts in some stages of the process might lead to a new product’s poor performance in the market[Bayus, 1997]. There are several suggestions for hastening the new product development[Hall and Jackson, 1992].

Most of the companies in the interviews were confident about their current situations regarding new product development, but admitted they had weaknesses. As summarized in Table 10.7, the companies’ strengths were in two groups: marketing or technical skills/knowledge, and the culture and people in the company. Their weaknesses were mostly related to management skills and resources needed for the market growth. But there was also some indication of ineffective new product development. Two companies seemed to have serious problems in their organizational structure, and/or internal and external communications.

Table 10.7 Strengths and Weaknesses of Companies in New Product Development

Strength	Weakness
Technical capability(4)	Inappropriate management skills(3)
Company culture and people(4)	Lack of skilled people and/or materials(3)
Niche market player(2)	Inadequate financial resources(2)
Flexibility and responsiveness to market and technology(2)	Ineffectiveness in NPD(2)
Constant and close relationship with customers(2)	Poor internal and external communication(2)

Note: Numbers in the brackets indicated the number of companies.

10.6 Evaluation of New Product Development Activities in the New Zealand Electronics Companies

In this study, the important factors which differentiated between new product success and failure can all be grouped under the relationship of the product to the market/customers. The important activities in the new product development process, ‘developed with a clear market strategy’, ‘undertook preliminary market assessment well’, and ‘undertook in-depth consumer evaluation’, again emphasized the importance of the market and the customers in product development.

Many small companies did have close relationships with customers, but as they grew, they had problems in maintaining these relationships. All of the electronics manufacturing companies were in niche markets, and there was the problem of maintaining the product/customer relationship as the niche markets grew. Although the large companies had a formal product development process, some important activities related to the customers were weakly handled, which in some cases directly led to new product failure. Based on the findings of this research, guidelines for the evaluation of the activities in new product development in the New Zealand electronics companies are presented to help them overcome their weaknesses, improve their performance in product development, increase the chance of new product success. In particular the guidelines indicate how new product development can change as the market grows.

10.6.1 Coping with Niche Market Growth.

Niche markets are defined as small specialty product markets, in which large companies are not interested because of the limited profit, small quantity, or requirement of flexibility[Yap and Souder, 1994]. Many companies in the study addressed a specific product area as their

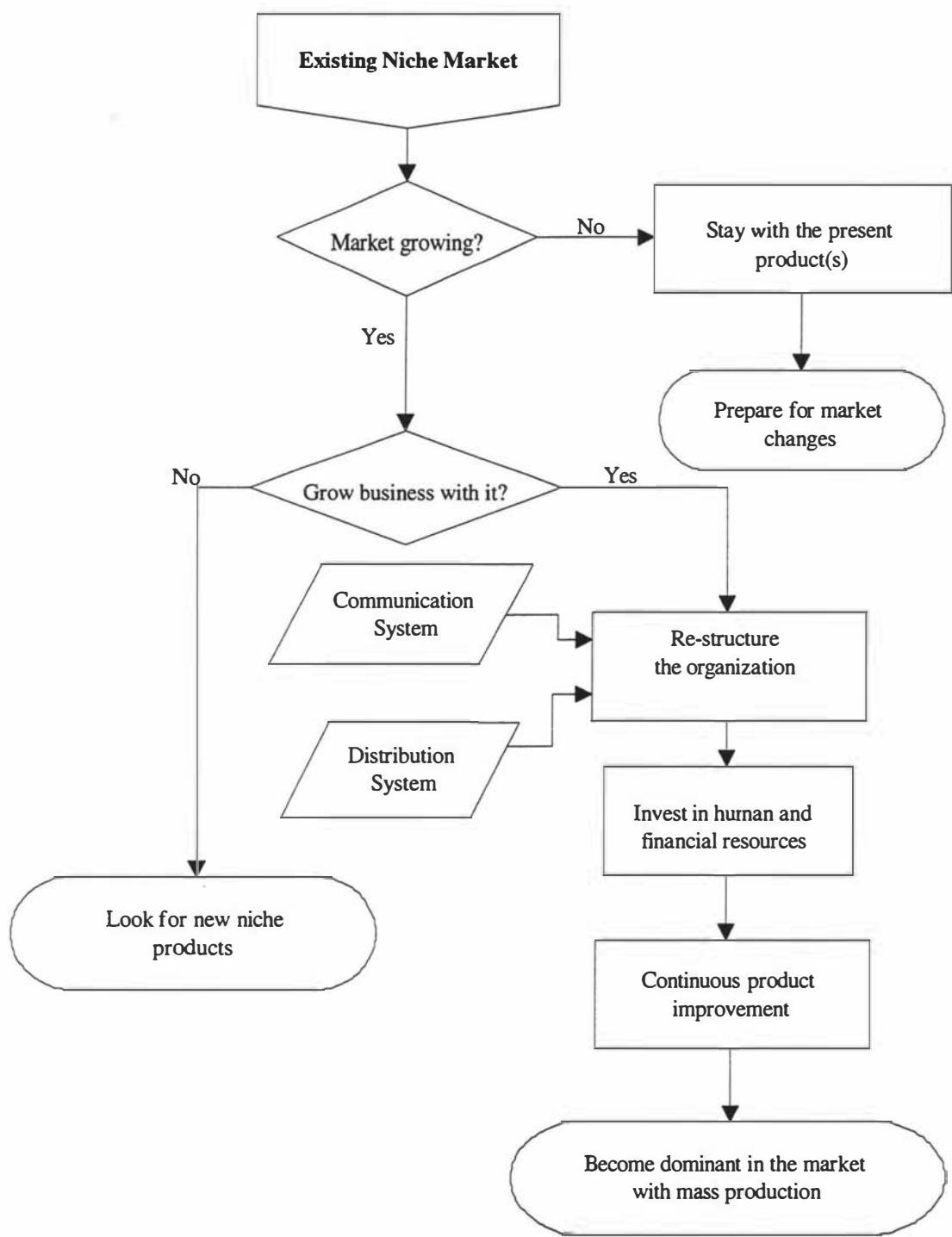
niche markets. They chose niche markets to stay away from intense competition with large overseas companies, because they were small and limited in technology and financial resources. Several niche markets were identified in this study. They were telecommunication equipment, health care products, and agriculture equipment (Table 4.4). From the successful experience of some companies, niche products were chosen to suit the company's technology specialty and operational vision.

Because market size changes along with the changes in customer demands and technology, the niche market does not stay the same all the time. It may grow up to a large market due to changes of, for example, the public acceptance of a new technology application. What will these companies do if this happens? There are two options to cope with a growing niche market: quit from the existing niche and look for a new one, or stay and grow with it.

Look for a new niche market. If for some reasons, the company is unable to grow along with the market, it may face the danger of being swallowed by much larger later-comers. Therefore to avoid this happening, it has to turn to new niche markets that suit its current situation. A few companies in this study saw themselves as technology innovators, and had no ambition to grow into a high-volume product market. So they had to be prepared to look for new products which could replace the old ones. They might start to develop the new product for a particular customer, and then look for other customers who are interested in the new product or a similar concept. As the company has knowledge and experience for the present niche market, it could be a good idea to stay with the familiar market and to look for new product ideas for it. The company needs to keep an eye on the present market, while looking for new product ideas for new markets that might become a new niche. It is always very wise for small companies to keep working on new product ideas as 'paper-products'; when there is a need in the market, the company can quickly respond to the market and be ahead of competitors.

Grow with the niche market. When a niche market grows out of the niche for which the company initially developed products, the company could adjust its operation and grow with the market. The company has advantages in competing with other companies, because it is the first one in the market and may have major market share initially, and has an established reputation in the market. With growth, the company has to invest more financial and human resources, adjust the product development process, and change the organizational structure accordingly, as shown in Figure 10.1.

Figure 10.1 Coping with Growing Niche Markets



When a company is small, internal and external communications are very simple and direct, and formal departments for each task seem not necessary. When the company grows bigger, the natural contact between product developers and customers disappears. Internal communications also become difficult as people are located in different departments according to their tasks. So the company will need to introduce a communication system to

aid crucial information flow, from market/customers to new product development team, and between departments. Another close relationship that disappears when a company grows is the direct one-to-one sales to customer. The company has higher volume products, therefore it has to introduce a distribution system into the marketing. If the company is not big enough to establish its own distribution system, it may need the assistance of external distribution companies.

As the company grows, in terms of both employees and sales, reshaping the organization structure is inevitable. The restructure is aimed to make the new product development more effective and efficient. For example, a middle sized company with a functional department structure, such as marketing department and technical department, probably changes to a group structure based on product range, when it becomes a large company. Each group has its own technical and marketing facility that are under control of the group leader, and new product development is undertaken within the group. This structure makes it easy to manage the routine tasks which concentrate on one product range.

In terms of product development, the company concentrates on improvement of existing products rather than creation of brand new products, as it needs to maintain its position in the market. Continuous product improvement, which includes extending product range, revising existing products with the latest technology or for changing customer requirements, could lead the company to increase its market share, and possibly become dominant in the market.

There are many successful stories in the world of a small company becoming internationally dominant in a certain product market. But the company needs to be aware of the risk of growing, as the dramatic changes in the company culture and managing style will require large investment in financial and human resources. Running a large company needs more management skills, and the business strategy becomes more complex. The limitations of both capital, and people with either strong management skills or technological knowledge, are the main obstacles for a company to grow. Quite a few companies in this study grew rapidly in recent years, but they admitted that managing the growth was a hard job.

10.6.2 Improvement of NPD Process for the New Zealand Electronics Companies

The study suggested that a well planned and disciplined new product development process was crucial to new product success for the large and medium sized companies. A formal or semi-formal process did not mean a rigid step-by-step sequential process, rather it was

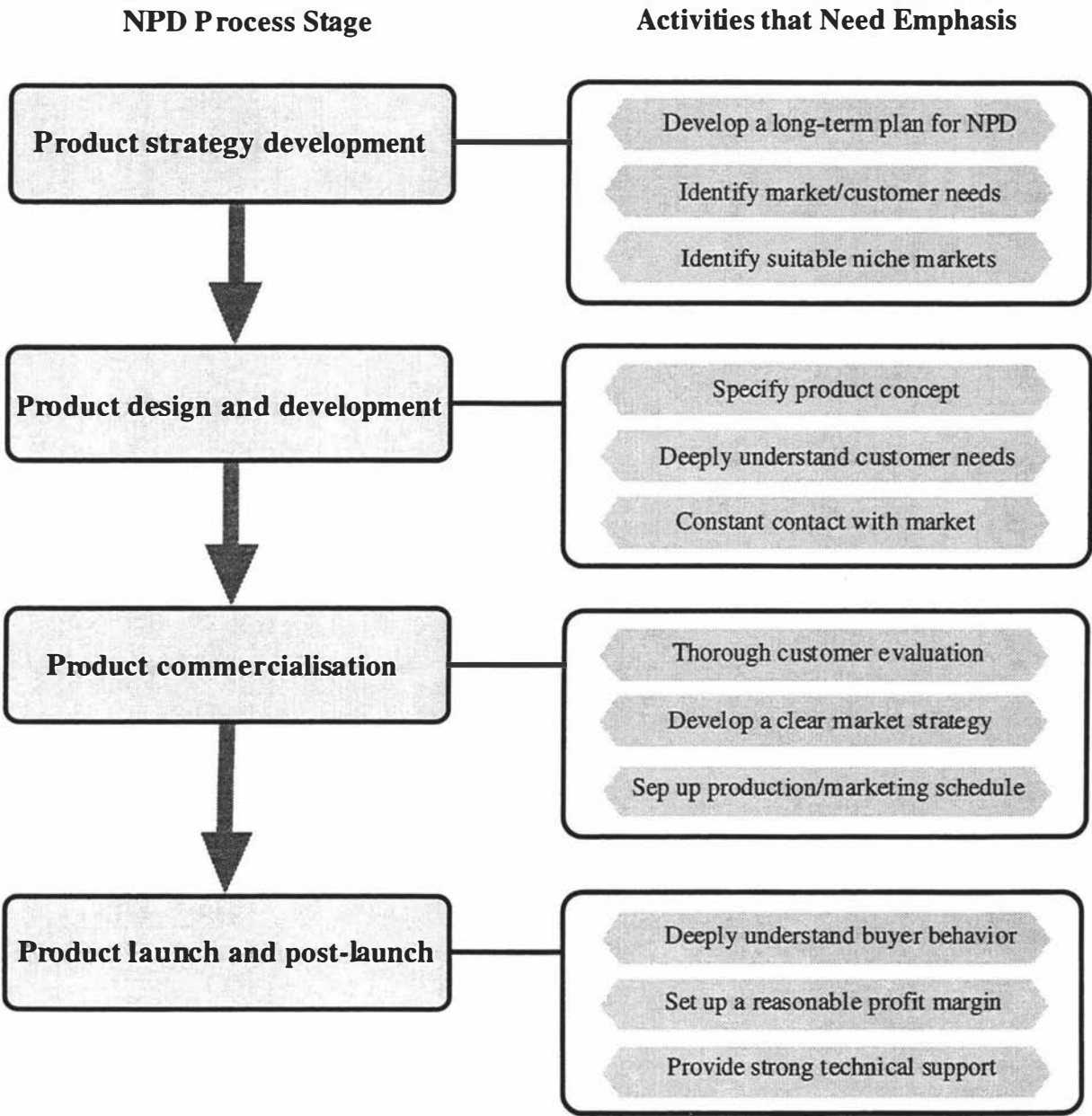
flexible, changing with the product type and the degree of innovation. The process was also changing with time and when applying new product development techniques. Such a new product development process means a conceptual and operational model for moving the new product project from ideas through to launch. It is a blueprint for managing the new product development process to improve efficiency and effectiveness. Operationally this process breaks the new product process into a series of multi-functional stages, with multiple and parallel activities.

There are many new product development processes. The type of a new product development process is largely dependent on the company's business style, product range, and size. A simple four-stage process as shown in Figure 10.2 can be used to classify the activities in new product development[Earle, 1997]. Although some product development processes may have more detailed stages, they all can be grouped into these four stages.

The companies who managed a new product program without a clear process in place showed less confidence in the future success for their new products. Those companies, who applied a formal new product development process and continuously tried to improve it to achieve the best practice in new product development, apparently made significant growth in business. For the small companies, they did not have a formal process and they could perform effectively in an informal way to transfer customer requirements or problems into technical solutions. But they established close and constant relationships with customers to deeply understand their problems and then to specify the most suitable solutions.

According to this study, a number of activities showed strong influence in driving new products to success, and needed particular attention in the medium and large companies in the New Zealand electronics industry, to enhance performance in new product development,. These critical activities are grouped in each of the four stages of the new product development process in Figure 10.2.

Figure 10.2 The Activities in NPD Process that Need Emphasis



Long-term planning of new product development is essential to a company’s future growth. It aims to effectively manage the relationship between the resource availability, new product outcomes and market needs. Nevertheless, some companies found it difficult to forecast market needs. Many companies in the New Zealand electronics industry were players in niche markets, and their ability to identify niche markets, suitable for the company style and size, was an advantage. And as stated in the last section, being aware of the changes in the niche market and being able to cope with the changes was very important for the company. Companies need to keep an eye on changes in the market, and new technology. Flexibility

and responsiveness was a strong point of many New Zealand companies. They were able to respond to the changes quickly by utilizing the state-of-the-art technology in new products to better meet the customer needs.

At the stage of 'Product design and development', up-front or pre-development activities showed significant influence on new product success, and they were built into the process in a consistent and systematic way. The seeds of success and failure are sown in the first few steps of the new product development project[Cooper, 1993]. More than one new product in this study failed because of poor product concept specification before physical development. The right product concept specification is based on constant and close relationship with customer, and thorough understanding of customers' needs.

In 'Product commercialization', customer evaluation before product launch was a poorly conducted activity in this survey, only 40% of the successful products and 4% of the failed products were tested by in-depth customer evaluation. It showed a strong influence in driving a new product to success. Customer evaluation is a continuing activity through out the new product development. Using prototype models and particularly completed products to gauge customers' reactions and to seek feedback was helpful in finding and solving problems promptly. A clear market strategy has been proven by this study as one of the very important factors to drive a new product to success. As a formal marketing strategy for the new product, its aim is to form a consistent marketing mix which includes products, price, distribution and services provided for the target market. A few interviewed companies seemed not to have a strategic plan for marketing new products, and they admitted that they needed to put more effort into it. Several companies in this study emphasized the importance of right delivery time, production and marketing schedules were set up parallel to the new product development, to enable the company to deliver new products earlier than their competitors.

'Product launch and post-launch' was a relatively weak part in the new product development process for these manufacturing companies, because of their limited marketing resources. Improvement in several activities would likely increase the chance of new product success. It was found that good understanding of buyer behavior was very important in separating new product success and failure. It is also important to set a reasonable profit margin for new products, as some customers are very price-concerned, and pricing flexibility is one of the key factors to attract them. Strong technical support gives customer confidence in the new products, and helps to establish long-term relationship with customers.

10.7 Limitation of the Study

Although this study has identified a set of factors that significantly influenced the new product success and failure in the New Zealand electronics industry, the findings and results had their limitation. Several issues were:

- 1. The lack of clear definitions of the factors.** The factors contributing to new product success and failure were not clearly defined in this research, nor indeed in previous research[Balachander and Friar, 1997]. It was possible for the respondents to have different understanding of them, which could affect the validation of the findings.
- 2. The type of new product.** The mail survey did not ask respondents what type of new product they chose for the study, i.e. if it was a brand new product for the market, or an improvement of an existing product. So it was impossible to identify whether there were links between the degree of product innovation and new product success and failure. Nevertheless one previous study indicated that the degree of innovation did not necessarily reflect the degree of new product success; more important were the degree to which a company was market-orientated in carrying out a new product innovation, and the ability of the company to adopt structures that facilitated the flow of crucial information from the marketplace [Calatone, di Benedetto and Bhoovaraghavan, 1994].
- 3. The data collection methodology.** The analysis of the mail survey and face-to-face interview only reflected the perceptions of respondents in the companies. Because only a single person was surveyed or interviewed in each company, it was not possible to assess the validity and reliability of the information provided by these key informants. Therefore, the results of this study should be viewed as tentative.
- 4. The limitation of sample.** The sample size for quantitative analysis was 40, and the group samples of company type and size were even smaller. The small sample size affected the accuracy of the analysis, in particular, the factor analysis. And the mixed sample of different company types and sizes of companies weakens the meaning of overall results, although it was useful for group comparison.

10.8 Recommendations for Future Research

Considering some areas that still need further investigation, the following options are recommended for further research on this topic:

- * Investigate the new product development methodologies used in the small companies who are expanding their business with increasing market demands, and also in those companies who want to stay small. It could be a program-level research which focuses on a company's overall new product development performance, and identifies company characteristics that are important to new product success.
- * Study in more detail the activities of distribution companies in new product introduction. Since this study only compared the manufacturing and the distribution companies on the listed factors for new product success and failure, it is necessary to gather more information on how the distribution companies select new products for their business. It could also identify the relationships between manufacturers and distributors. A comparison of manufacturing companies' new product launching activities with those of the distributors could be useful.
- * Conduct in-depth case studies in selected companies to investigate in detail on the new product development activities. Take the most important factors that were found from this study, especially those customer-related factors, into individual new product development projects. It could identify how the new product development practitioners perceive the definitions of these factors, and how they incorporate them into new product development activities.
- * Apply the suggested improvements in the new product development process with a sample group of companies and evaluate the project efficiency, financial performance and market performance of the new products developed.

10.9 Conclusion

This study, focused on the New Zealand electronics companies, has identified a set of factors that were significantly important in separating new product success and failure. The results strongly indicated the relationships between new product success and the synergy of customer needs with product specification. New products success was based on the new product

development team fully understanding customers' needs, wants and their behavior, at the beginning and right through the whole process of new product development. A new product was likely to be successful, if it met the users' needs, had superior quality, unique features, a high performance/price ratio, and few after-sales problems. The market environmental factors, which described market size, growth, and competition, were found to have little or no impact on separating new product success and failure, although it was important for project selection to look for attractive markets where customers had great needs for the product type.

Investigating the new product development processes in these companies, a well planned and disciplined new product development process was found essential to the medium and large sized companies. Close and constant contacts with market and customers were the basis of an efficient new product development process. The study emphasized the importance of the up-front activities in creating product concept definition prior to product development. A clear market strategy was a key to launch new products successfully.

Most of the manufacturing companies were niche market players, and tended to develop new products to meet customers' specific requirements. They emphasized the importance of pricing flexibility and first on the market to separating new product success and failure. The distribution companies focused on the local markets, by providing selected products to meet market needs. Their new product success and failure was differentiated by technology fitness between the company and the new product, and technical superiority of the new product. Company size was found to affect new product performance, small companies concentrated on providing tailored-products to solve customers' specific problems, and large companies tended to offer customers strong technical support and services. The large companies stressed the importance of sufficient financial and distribution resources to new product success and failure.

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APPENDIX

Appendix I - Cover Letter for the Mail Survey

Appendix II - Mail Survey Questionnaire

Appendix III - Contact Fax for Interview

Appendix IV - Interview Questions

Appendix V - Mail Survey Data

Appendix VI - Percentage of Factor Agreement Scores

Appendix VII - Respondents' Comments in the Mail Survey

Appendix VIII - Percentage of Factor Agreement Scores for Manufacturing and
Distribution Companies

Appendix IX - Factors Ranked by Significance Levels of Difference between New Product
Success and Failure for Manufacturing and Distribution Companies

Appendix X - Factor Analysis Results

[Name]

[Title]

[Company]

[Postal Address]

22 November 1994

Dear _____

I am a postgraduate student in the Department of Consumer Technology at Massey University. I am conducting a nation-wide survey to gather information on new product success and failure.

The purpose of this research is to determine the opinions of yourself, and other experts, on the factors that may influence a new product's performance in the market. Your answers will enable us to gain an insight into why some new products succeed while others fail. The results of this study will help assess the attractiveness of new product proposals and design an early warning device for product development.

I would be grateful if you could assist me in my research by answering the questionnaire enclosed and providing any comments that you have on the subject. I have provided a freepost envelope (no stamp required) for you to return the questionnaire in.

Your prompt reply would be appreciated as the feedback is important to the accuracy of the research. All information received will be treated confidentially and used only in combination with those of other managers and executives of electronics firms all over New Zealand.

If you are interested in receiving a summary report on the findings of this research, please request the results in a separate letter.

Thank you for your assistance.

Yours Sincerely

Liangli Kong

Confidential

**A SURVEY OF
FACTORS INFLUENCING
NEW PRODUCT SUCCESS/FAILURE**



**Department of Consumer Technology
Massey University**

November 1994

1. Firstly, please tick the type of products your company deals with mainly:

Industrial☐

Consumer☐

Both☐

Other (specify)☐ _____

2. On average, how many **new** products do you introduce to the market per year?

Average number of new products launched per year is _____

We'd like you to select two products developed and/or commercialised by your firm in the last two years, one a clear 'success' in terms of profit, and the other a clear 'failure'. (i.e. where the product's profitability exceeded or fell short of the minimum acceptable profitability for that type of venture.) SECTION I requires you to think about the successful product and answer the questions. SECTION II consists of similar questions as SECTION I, but requires you to think about the product that was unsuccessful.

SECTION I - Successful Product

On the following pages are statements (or factors) that may influence a product's performance in the market. They have been broadly grouped under the headings:

Nature of Product, Project Activities, Market Characteristics, and Skills and Resources.

A: Nature of Product

Thinking about the 'successful' product, please indicate how well each of the statements below describes the product.

Please circle the number that best represents how strongly you agree or disagree the statement describes the product.

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Superior in quality	1	2	3	4	5	6	NA
2 Technically superior to competitors	1	2	3	4	5	6	NA
3 Better suited to our firm's technology	1	2	3	4	5	6	NA
4 Attractive in appearance	1	2	3	4	5	6	NA

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
5 First on the market	1	2	3	4	5	6	NA
6 Made to meet users' needs	1	2	3	4	5	6	NA
7 Allowed greater pricing flexibility	1	2	3	4	5	6	NA
8 Good value for money	1	2	3	4	5	6	NA
9 Less after-sale problems	1	2	3	4	5	6	NA
10 Others (please specify)	1	2	3	4	5	6	NA
	1	2	3	4	5	6	NA
	1	2	3	4	5	6	NA

11 Please mention the most important **product feature** that may have influenced the success of the product:_____

12 Please use the space below to make any other relevant comments you may have:

Companies that are solely distributors may skip section B and go to section C.

B. Project Activities

The following statements describe various steps in the process of new product development and related activities.

Thinking about the selected 'successful' product, please indicate your agreement or disagreement with how well the statements describe the project undertaken.

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Product concept was developed using idea-generation techniques	1	2	3	4	5	6	NA

		Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
2	Undertook sound technical assessment	1	2	3	4	5	6	NA
3	Undertook preliminary market assessment well	1	2	3	4	5	6	NA
4	Undertook financial analysis well	1	2	3	4	5	6	NA
5	Undertook prototype development well	1	2	3	4	5	6	NA
6	Undertook prototype test well	1	2	3	4	5	6	NA
7	Undertook in-depth consumer evaluation	1	2	3	4	5	6	NA
8	Developed with a clear market strategy	1	2	3	4	5	6	NA
9	Others (please specify)	1	2	3	4	5	6	NA
	_____	1	2	3	4	5	6	NA
	_____	1	2	3	4	5	6	NA

10 Please mention the most important **project activity** that may have influenced the success of the product:_____

11 Please use the space below to make any other relevant comments you may have:

C. Market Characteristics

Below are statements that describe the market situation. Note that market is defined both geographically and in terms of target users.

Please circle the number that best describes the market scenario for the successful product.

		Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1	Market size was large	1	2	3	4	5	6	NA

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
2 Market growth was high	1	2	3	4	5	6	NA
3 The consumer had great need for product type	1	2	3	4	5	6	NA
4 Intense price competi- tion in market	1	2	3	4	5	6	NA
5 Many competitors in market	1	2	3	4	5	6	NA
6 Customers satisfied with existing products	1	2	3	4	5	6	NA
7 Frequent new product introductions in market	1	2	3	4	5	6	NA
8 Others (please specify)							
	1	2	3	4	5	6	NA
	1	2	3	4	5	6	NA

9 Please mention the most important **market feature** that may have influenced the success of the product:_____

10 Please use the space below to make any other relevant comments you may have:

D. Skills and Resources

The following factors relate to the strength of the skills and resources that were available for the successful product.

Please indicate the extent to which you agree/disagree with the statements.

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Very experienced project team	1	2	3	4	5	6	NA
2 Multi-functional develop- ment group	1	2	3	4	5	6	NA

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
3 Good understanding of buyer behaviour	1	2	3	4	5	6	NA
4 Project supported by Senior Executives	1	2	3	4	5	6	NA
5 Adequate financial resources	1	2	3	4	5	6	NA
6 Strong sales force launch effort	1	2	3	4	5	6	NA
7 Adequate advertising skills	1	2	3	4	5	6	NA
8 Adequate distribution resources	1	2	3	4	5	6	NA
9 Others (please specify)							
_____	1	2	3	4	5	6	NA
_____	1	2	3	4	5	6	NA

10 Please mention the most important **skill** or **resource** that may have influenced the success of the product:_____

11 Please use the space below to make any other relevant comments you may have:

SECTION II - Failed Product

Now thinking about the failed product, please answer the following section.
Please circle the number that applies.

A. Nature of Product

		Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1	Superior in quality	1	2	3	4	5	6	NA
2	Technically superior to competitors	1	2	3	4	5	6	NA
3	Better suited to our firm's technology	1	2	3	4	5	6	NA
4	Attractive in appearance	1	2	3	4	5	6	NA
5	First on the market	1	2	3	4	5	6	NA
6	Made to meet users' needs	1	2	3	4	5	6	NA
7	Allowed greater pricing flexibility	1	2	3	4	5	6	NA
8	Good value for money	1	2	3	4	5	6	NA
9	Less after-sale problems	1	2	3	4	5	6	NA
10	Others (please specify)							
	_____	1	2	3	4	5	6	NA
	_____	1	2	3	4	5	6	NA

11 Please mention the most important **product feature** that may have influenced the failure of the product:_____

12 Please use the space below to make any other relevant comments you may have:

Companies that are solely distributors may skip section B and go to section C.

B. Project Activities

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Product concept was developed using idea-generation techniques	1	2	3	4	5	6	NA
2 Undertook sound technical assessment	1	2	3	4	5	6	NA
3 Undertook preliminary market assessment well	1	2	3	4	5	6	NA
4 Undertook financial analysis well	1	2	3	4	5	6	NA
5 Undertook prototype development well	1	2	3	4	5	6	NA
6 Undertook prototype test well	1	2	3	4	5	6	NA
7 Undertook in-depth consumer evaluation	1	2	3	4	5	6	NA
8 Developed with a clear market strategy	1	2	3	4	5	6	NA
9 Others (please specify)							
_____	1	2	3	4	5	6	NA
_____	1	2	3	4	5	6	NA

10 Please mention the most important **project activity** that may have influenced the failure of the product:_____

11 Please use the space below to make any other relevant comments you may have:

C. Market Characteristics

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Market size was large	1	2	3	4	5	6	NA
2 Market growth was high	1	2	3	4	5	6	NA
3 The consumer had great need for product type	1	2	3	4	5	6	NA
4 Intense price competition in market	1	2	3	4	5	6	NA
5 Many competitors in market	1	2	3	4	5	6	NA
6 Customers satisfied with existing products	1	2	3	4	5	6	NA
7 Frequent new product introductions in market	1	2	3	4	5	6	NA
8 Others (please specify)							
_____	1	2	3	4	5	6	NA
_____	1	2	3	4	5	6	NA

9 Please mention the most important **market feature** that may have influenced the failure of the product:_____

10 Please use the space below to make any other relevant comments you may have:

D. Skills and Resources

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
1 Very experienced project team	1	2	3	4	5	6	NA
2 Multi-functional development group	1	2	3	4	5	6	NA

		Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree	Not applicable
3	Good understanding of buyer behaviour	1	2	3	4	5	6	NA
4	Project supported by Senior Executives	1	2	3	4	5	6	NA
5	Adequate financial resources	1	2	3	4	5	6	NA
6	Strong sales force launch effort	1	2	3	4	5	6	NA
7	Adequate advertising skills	1	2	3	4	5	6	NA
8	Adequate distribution resources	1	2	3	4	5	6	NA
9	Others (please specify)							
		1	2	3	4	5	6	NA
		1	2	3	4	5	6	NA

10 Please mention the most important **skill or resource** that may have influenced the failure of the product:_____

11 Please use the space below to make any other relevant comments you may have:

Just so that I can classify the information you have given, please answer the following questions about your company. Be assured that your responses will be treated confidentially.

1 What is the nature of the main business carried out at your company?
(Please tick one or more of the following categories.)

- Distribution☐
- Manufacturing☐
- Retailing☐
- Others (specify)☐

2

Does your company export?

Yes

No

☐

☐

If yes, where is your main market?

3

Is your company a subsidiary of an overseas company?

Yes

No

☐

☐

If yes, where is the parent company located?

4

The number of employees at your location is:

5

The age of your company is:

6

Does your company carry out Research and Development activities?

Yes

No

☐

☐

If yes, approximately what percentage of the annual budget (gross sales) was spent on R&D work in 1993?

% of Annual Budget.

7

The approximate Annual Sales (gross) of your company in 1993 was:

Less than \$1/2 million

\$1/2 million to \$3 million

Over \$3 million to \$5 million

Over \$5 million to \$10 million

Over \$10 million

☐

☐

☐

☐

☐

Thank you for your co-operation.

Please return the completed questionnaire in the provided free-post envelope.

FACSIMILE MESSAGE

To:	From: Liangli Kong
At:	At: Consumer Technology Dept. Massey University Private Bag 11222 Palmerston North
Fax:	Fax: +64-6-351-4324
Phone:	Phone: +64-6-351-4316

Date:

Number of Pages (including this cover sheet): 2

Dear

I am a postgraduate student in the Department of Consumer Technology at Massey University. I recently conducted a nation-wide survey to gather information on factors influencing new product success and failure. I am now carrying out in-depth case studies with a few selected companies in order to get an understanding of product development in the New Zealand electronics industry. As part of this phase of the research, I wish to speak to the R&D Manager or Design Manager and seek an appointment for next week. I have provided a brief outline of the topics that I would like to cover in the interview.

Your prompt reply would be appreciated as the feedback is important to the research. All information received during the interview will be treated confidentially and used only in combination with those of other managers of electronics firms in New Zealand.

Thank you for your assistance.

Yours Sincerely

Liangli Kong

INTERVIEW TOPICS

1. General Information

- Brief history of company
- The range of products
- Company size and philosophy

2. New Product Development

- Process
- New product success/failure rate, examples
- Factors influencing success/failure
- Attitude to product innovation

3. Competition

- Who they are
- Barriers, weaknesses, strengths and challenges
- Current position of company and future plans

1. Focus on Your Company

- Brief history of your company
- Structure of your company
 - R&D department -- Staff Qualification?
 - Technical
 - Marketing
 - The percentage of total employees?
- The range of products
 - The history of these products
- Turnover/year -- the increasing rate
- Export? (percentage of all sales)

2. Focus on Your Products:

- How many new products do you introduce to market every year?
- How do you define a new product?
- Do you follow any particular process of product development?
 - How do you decide to develop a new product? (Initial Idea Generation)
- Do you evaluate whether a product meet the expectation at the market ? How do you do it?
- How do you define a failed product? Which stage?
 - (during development, after launched to market?)
- Could you give me some examples of successful/failed products you had involved in their PD?
- The details about reasons of failure and determinants of success
- For the product that you think was successful in the market, what is the most important advantage to your competitors?
- Any problems during developing process?
 - Technical, marketing, communication, or material and components supply?
 - NPD cost?
- Does your company have any other problems during the NPD process?
 - Internal---Human, technical, finance, etc.
 - External--- with suppliers, clients, retailers, etc.

- Do you have competitors who are making similar products in NZ or overseas?

3. About Your Company

- Do you measure the success/ failure rate for new products once they are on the market? How do you do it?
- Is your company satisfied with the current success rate of new products?
- Does your company spend more on new product development than before? (reason?)
- Do you do your own distribution?
- How do you do product promotion?
- What is your information channel? How do you get the newest technology information?
- How can you get information of your competitors?
- In your point of view, is that true for today's new product success, advanced marketing and management skills are more important than sole technology superiority?
- Do you think your company has any weaknesses? What are they? If possible, how do you think to overcome them?
- What is the current situation of your company regarding new product introductions?
- What do you think the opportunities for your company in the future?
(the market, the PD process etc.)
- What do you think of current situation of NZ electronic industry?
- Do you think the government should support more the firms to enter international market? Any possible policy change?
- What do you think the role of some associations and trade boards (e.g. DSIR) in the industry? Do you have any link with them? Any benefit?
- Above all what do you think the most important factor(s) for a successful product in the electronics industry?
- Do you picture a model of an 'ideal' company?

CO.ID	B.TYPE	P.TYPE	EMPY	AGE	SALES	NP FQ	R&D	R&D EXPD	EXPT	SUBSD	AS1	AS2	AS3	AS4	AS5	AS6	AS7	AS8	AS9	BS1	BS2	BS3	BS4	BS5	BS6	BS7	BS8	CS1	CS2	CS3	CS4	CS5	CS6	CS7	
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2	D	I	120	100	5	12	y		n	y	2	1	1	2	2	3	3	2	3	3	1	2	3	1	1	2	1	4		3	2	3	2	5	
3	M/D	I/C	20	18	2	2	y	5	y	n	2	4	4	2	4	1	2	2	2	3	3	3	3	2	2	5	3	3	2	2	5	5	2	2	
4	M/D	I	20	48	2	3	y	4	y	n	3	3	2	2	4	2	1	1	2		2	2	2	2	2	3	2	4	3	2	6	5	3	5	
5	M	I	85	40	5	1	y	1	y	n	3	2	3	2	5	2	5	2	2	3	2	5	6	5	6	6	4	4	5	2	2	2	4	5	
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7	M/D	I	24	25	3	0	y		y	n	3	3	2	2	3	1	3	3	2	2	2	3	3	3	3	4	3	5	4	2	4	5	2	4	
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9	D	I	12	20	2	10	y	6	n	y	2	1	2	2	1	2	3	1	2	2	2	3	2	4	4	3	3	2	2	3	4	5	4	4	
10	D	I	38	87	5	6	n		n	n	1	3			5	3	5	2	1									2	4	3	4	3	4	5	
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12	D	I	15	52	5		y		n	n	3	3	2	2	4	2	2	2	4																
13	M/D	I/C	18	80	4	2	n		y	n	1	1	2	3	3	1	2	2	1	2	2	1	3	2	2	1	1	2	2	2	2	4	3	3	
14	D	I	7	18	2	4	n		n	n	1	1				1		1	1									5	5	2	1	1	3	3	
15	M	I	35	29	4	1	n		y	n	2	2	3	3		2	3	2	2									3	3	3	2	2	3	3	
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20	D	C	200	60	5		y		n	y	2	1	2	2	1	2	4	3	2										3	5	2	2	2	3	2
21	M	I/C	18	7	2	1-2	y	4	y	n	1	1	3	1	1	1	1	1	2	1	3	2	2	2	3	3	1	1	1	3	3	1	3	5	
22	D	I/C	10	18	3	4	y	3	y	y	3	3	2	1	5	2	5	2	1									1	1	1	1	1	4	4	
23	M/D	I	32	30	4	10	y	10	y	y	3	3	5	3	5	3	2	2	2	4	4	5	3	3	3	2	2	3	2	2	2	3	3	3	
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29	M	C	450	80	5	4	y	5	y	n	1	1	3	3	2	2	4	3	1	3	2	3	4	2	1			1	2	3	3	4	3	4	
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32	D	I	35	25	4	6	n		n	y	3	2	2	1	6	1	3	1	1									2	1	3	1	3	4	5	
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34	M/D	I	22	27	2	2	y	1	y	n	2	2	3	3	2	1	5	4	4	5	6	6	6	6	6	6	3	5	2	2	3	5	3	5	
35	M/D	I	14	12	2	1	y	4	y	n	1	1	3	2	4	1	4	2	2	3	1	2	2	2	3	4	1	3	3	1	5	5	4	6	
36	M	I/C	10	20	2	2	y	6	y	n	2	2		2	3	1	1	1	2		1	2	1	2	1	2	2	1	2	2	2	2	4	2	
37	M/D	C	70	14	5	12	n		y	n	2	3	2	2	2	1	1	1	2																
38	M	I	24	17	2	2	y	11	y	n	2	1	3	3	1	2	3	2	2	3	1	3	2	1	1	3	2	2	3	2	2	2	2	1	
39	M	I	7	10	1	3	y	10	y	n					1	1		1						1	1					1					
40	M	I	130	20	5	0.5	y	4.6	y	n	1	1	1	2	1	1	2	2	2	3	2	4	2	2	2	2	1	1	1	2	2	2	6	3	

DS1	DS2	DS3	DS4	DS5	DS6	DS7	DS8	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	CF1	CF2	CF3	CF4	CF5	CF6	CF7	DF1	DF2	DF3	DF4	DF5	DF6	DF7	DF8	
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3	2	2	2	2	2	3	2	2	2	2	3	2	2	2	2	3										2	1	2	1	1	1	1	2	2	4	5	5	5	5	3
3	5	3	2	2	3	6	3																																	
2	3	1	4	4	5		2	1	2	3		1	2	5	3		3	2	6	3	2	2	3	6	4	3	6	6	6			1	3	3		2				
1	2	2	1	3	1	2	2	2	2	4	1	3	2	5	2	5		3	4	4	2	2	3	4	2	3	3	2	2	3	2	3	2	3	1	2	4	4	4	
2	3	2	2	2	2	2	2	4		3	3	1	2	2	2	3		3	4	2	2	3	4	2	2	2	3		6		3	2	2	2	2	2	1	2	2	
1	2	2	1	2	4	5	3	2	3	3	4	2	1	3	4	3	2	1	2	2	2	1	3	2	4	3	2	3	3	4	4	1	2	3	2	2	3	3	4	
2	4	4	1	1	2	2	2	2	3	3	6	6	4	4	3	3	3	3	3	3	4	4	3	1	5	2	2	1	1	5	1	1	1	3	4	3	4	3	3	

Successful Products

Factor Name	Agree		S-Agree		S-Disagree		Disagree		NA		Useful	Total
Superior in quality	69%	27	28%	11	3%	1	0%	0	3%	1	39	40
Technically superior to competitors	69%	27	23%	9	8%	3	0%	0	3%	1	39	40
Better suited to our firm's technology	50%	18	42%	15	6%	2	3%	1	10%	4	36	40
Attractive in appearance	74%	26	26%	9	0%	0	0%	0	13%	5	35	40
First on the market	55%	21	16%	6	11%	4	18%	7	5%	2	38	40
Made to meet users' needs	85%	34	15%	6	0%	0	0%	0	0%	0	40	40
Allowed greater pricing flexibility	42%	16	32%	12	13%	5	13%	5	5%	2	38	40
Good value for money	83%	33	15%	6	3%	1	0%	0	0%	0	40	40
Less after-sale problems	82%	32	10%	4	5%	2	3%	1	3%	1	39	40
Market size was large	49%	18	24%	9	11%	4	16%	6	8%	3	37	40
Market growth was high	50%	18	22%	8	14%	5	14%	5	10%	4	36	40
The consumer had great need for product type	68%	26	26%	10	5%	2	0%	0	5%	2	38	40
Intense price competition in market	54%	20	19%	7	16%	6	11%	4	8%	3	37	40
Many competitors in market	35%	13	30%	11	11%	4	24%	9	8%	3	37	40
Customers satisfied with existing products	32%	12	27%	10	32%	12	8%	3	8%	3	37	40
Frequent new product introductions in market	16%	6	24%	9	24%	9	35%	13	8%	3	37	40
Very experienced project team	64%	23	19%	7	8%	3	8%	3	10%	4	36	40
Multi-functional development group	46%	16	26%	9	17%	6	11%	4	13%	5	35	40
Good understanding of buyer behaviour	62%	24	33%	13	5%	2	0%	0	3%	1	39	40
Project supported by Senior Executives	86%	32	11%	4	3%	1	0%	0	8%	3	37	40
Adequate financial resources	62%	23	16%	6	14%	5	8%	3	8%	3	37	40
Strong sales force launch effort	49%	19	23%	9	10%	4	18%	7	3%	1	39	40
Adequate advertising skills	44%	16	22%	8	11%	4	22%	8	10%	4	36	40
Adequate distribution resources	65%	24	22%	8	11%	4	3%	1	8%	3	37	40

Failed Products

Factor Name	Agree		S-Agree		S-Disagree		Disagree		NA		Useful	Total
Superior in quality	50%	17	26%	9	18%	6	6%	2	3%	1	34	35
Technically superior to competitors	42%	14	39%	13	18%	6	0%	0	6%	2	33	35
Better suited to our firm's technology	32%	11	35%	12	18%	6	15%	5	3%	1	34	35
Attractive in appearance	36%	12	36%	12	15%	5	12%	4	6%	2	33	35
First on the market	26%	9	23%	8	23%	8	29%	10	0%	0	35	35
Made to meet users' needs	49%	17	31%	11	9%	3	11%	4	0%	0	35	35
Allowed greater pricing flexibility	15%	5	18%	6	30%	10	36%	12	6%	2	33	35
Good value for money	26%	9	46%	16	14%	5	14%	5	0%	0	35	35
Less after-sale problems	30%	9	30%	9	17%	5	23%	7	14%	5	30	35
Market size was large	37%	13	20%	7	31%	11	11%	4	0%	0	35	35
Market growth was high	29%	10	35%	12	21%	7	15%	5	3%	1	34	35
The consumer had great need for product type	35%	12	41%	14	12%	4	12%	4	3%	1	34	35
Intense price competition in market	45%	15	27%	9	15%	5	12%	4	6%	2	33	35
Many competitors in market	38%	13	21%	7	21%	7	21%	7	3%	1	34	35
Customers satisfied with existing products	39%	12	39%	12	10%	3	13%	4	11%	4	31	35
Frequent new product introductions in market	31%	10	25%	8	22%	7	22%	7	9%	3	32	35
Very experienced project team	59%	19	31%	10	9%	3	0%	0	9%	3	32	35
Multi-functional development group	50%	16	31%	10	13%	4	6%	2	9%	3	32	35
Good understanding of buyer behaviour	14%	5	34%	12	31%	11	20%	7	0%	0	35	35
Project supported by Senior Executives	61%	20	18%	6	9%	3	12%	4	6%	2	33	35
Adequate financial resources	44%	15	32%	11	15%	5	9%	3	3%	1	34	35
Strong sales force launch effort	13%	4	39%	12	23%	7	26%	8	11%	4	31	35
Adequate advertising skills	23%	7	26%	8	29%	9	23%	7	11%	4	31	35
Adequate distribution resources	33%	10	33%	10	20%	6	13%	4	14%	5	30	35

The Most Important Factors in New Product Success

(The statements in brackets[] are additional comments, and the numbers in () indicates the number of respondents who made the choice.)

1. Nature of Product

- Technical specification
- Performance/Specification
- Technological/performance breakthrough
- Technical advanced(4)
- Visual display
- Quality product
- The range -- i.e. the variations
- Innovative design
- Customer Convenience
- Simplicity
- Reliability
- Essential to user industry
- Feature built in to suit our prospective clients
- Extra low wattage
- Designed to suit user
- Flexibility of application(2)
- Flexibility
- Price(2)
- Niche market, right time
- Meet/Exceed customers expectations
- Meet users needs
- Provided capabilities that were previously not possible
- Consumer appeal of packaging, product design
- Filled need that most other product do not fully fill
- Speed
- Modularity
- Value for money -- i.e. price
- Performs tasks well that it was designed for
- Size
- No other competitors [either local and overseas] offers the same technical features

2. Project Activities

- Research before development
- Constant liaison with customer
- Being aware of price/performance need from customer point of view [Being a user of our designs makes a new design easier to achieve Success]

- Delivery deadline
- Needed by user to make their business easier
- Design thoroughly tested to ensure performance and reliability requirement were met
- Marketing
- Determination of correct technical solution
- Undertook in-depth customer evaluation + Better testing by client who assisted to enhancement program
- Solving technical production problems
- Specification of user interface
- Product was developed to meet proven demand
- Technical aspect
- Market demand
- Clear market strategy and in-depth customer evaluation
- Customer research/analysis
- Co-operation with the first client -- we developed it in co-operation with the client
- Same hardware used for a range of products
- Sound technical assessment(2)
- Shorter delivery times
- Prototype testing and critical evaluation

3. Market Characteristics

- Good export sales backed local market support
- The customer had great need for product type(2)
- Cost effectiveness
- Price
- Company's reputation for this type of product
- Simplicity at very reasonable cost
- Diverse market -- many industries
- Indifferent customer service
- Ability to deliver on time
- Intense price
- Filling a need
- Range of products
- Market growth
- Technical superiority
- Market potential
- Packaging
- International market
- Quality and performance/user friendly
- Need
- We generally keep ahead of the opposition with frequent technological advance

- We predicted a swing from features to price
- Speed -- we market it as the fastest drive market leader in other overseas markets
- Improved performance of customer equipment filled with product
- Ease of use
- Preparation and understanding of market before release
- NZ Product [A complex industrial product requires technical assistance + service from a local company]

4. Skills and Resources

- Suitably skilled research staff [Lack of international market awareness reduced export success to non-mainstream foreign countries]
- Technical support/resource first class
- Hard work and personal Sacrifice
- Distribution network
- Years experience in matching machines to people
- Sales engineer experience
- Being there with the products
- All staff use product at home
- Salespeople
- Multi-functional development team
- Technical skills
- Understanding of customer requirement
- Excellent consumer requirement analysis of what we need to do and the ability to use latest technology to achieve which was basically new to us
- Understood requirements
- Features, benefits, pricing
- Experienced project team(2)
- Innovation
- Single person project
- Distribution
- Technical sales staff promotion
- 'Flair'
- Direct mail advertising to make customers aware
- A product champion who has good understanding of market
- Technical field support
- Senior management backing demonstration units
- Years in the business -- we know about these things
- Technical back up
- Understanding of buyer behaviour(2)
- Engineering design
- Development skill
- Design and manufacturing techniques

The Most Important Factors in New Product Failure

(The statements in brackets[] are additional comments, and the numbers in () indicates the number of respondents made the choice.)

1. Nature of Product

- Technical innovation too high
- Made to meet users' needs
- Experience and reference sites
- Too expensive for features provided
- Mechanical part of system did not perform accurately [The designed instrument did what it was intended to do, but mechanics did not. Also system checking and installation very difficult.]
- Probably the price, but may possibly have been that it was not easy to use.
- Application
- Too difficult to commission
- Packaging
- Poor product staff support
- Incorrect product for our customer base
- Technical Superior
- Did not capture the imagination
- Lack of flexibility and range
- 'Styling' and 'Size Conception'
- Not widely promoted in the trade
- Product was not good value for money
- Design
- Customer did not want it
- Product reliability
- Took too long to get component product to the market and our window of opportunity had closed
- Inadequate performance
- Product cost higher than expected
- Price(2)
- Compatibility [Too many existing name brands]
- Too complex, too expensive to make
- Ease of use
- Too advanced for users
- Perceived lack of technical features

2. Project Activities

- Lack of aware of niche market size
- Product may be over specified for users needs
- Preliminary market assessment

- Lack of simplicity in design
- Market assessment flawed
- Aimed too high
- Development not through
- Failed to check customer requirement
- Market not interested
- Too expensive
- Lack of clear strategy
- Product concept
- Design did not match market requirement
- Prototype development -- too long
- Lack of in-depth customer evaluation
- Mechanical development
- Market assessment inaccurate
- Not realising the strength of established brands
- Problems with key component
- Prototype test
- Misunderstood the precise needs of customers

3. Market Characteristics

- Not much 'need' for the product
- Customer did not need the product(3)
- Established competitors
- Although existing products was time consuming in application, our product proved more difficult to use even though it was faster
- Distrust of technology [Products using the technology had been launched years earlier but failed to perform]
- Conservatism by customers
- Poor understanding of market
- Incorrect timing to launch new product
- Size
- No clear image and benefits
- Customer satisfaction with current products
- Price(3)
- Product was not promoted to the correct market
- Too many competitors with consequent price/feature war
- Failure to meet performance specification
- Lack of markets
- Intense price competition
- Awareness of technology
- Time to market -- satisfied when we arrived
- Not a 'Name' brand

- Market assessment targeted product at wrong consumers
- Hard to use
- Public need for product
- Market maturity not looking for a simple product

4. Skills and Resources

- TV advertisement content
- Too easy to over-design a product
- Not enough advertising promotion
- Qualified engineers
- Poor marketing and communication
- Lack of development resource/capacity
- It was a 'technical challenge' product without sound commercial pre-evaluation
- Lack of customer communication -- human error
- End users do not buy from market we service
- 'An add on -- not researched'
- Distribution
- Project team
- Inadequate selling skills
- Failed to change perception of market
- Lack of marketing work done in evaluating customer demands
- Lack of understanding of buyer's behaviour(2)
- No understanding the buyers preference
- Method of introduction

Manufacturing Companies

Factor Name	Successful Products				Failed Products			
	Agree	S-Agree	S-Disagree	Disagree	Agree	S-Agree	S-Disagree	Disagree
Superior in quality	69%	25%	6%	0%	64%	29%	7%	0%
Technically superior to competitors	75%	13%	13%	0%	50%	36%	14%	0%
Better suited to our firm's technology	27%	67%	7%	0%	36%	36%	21%	7%
Attractive in appearance	69%	31%	0%	0%	43%	36%	7%	14%
First on the market	69%	13%	0%	19%	14%	36%	21%	29%
Made to meet users' needs	88%	12%	0%	0%	64%	21%	7%	7%
Allowed greater pricing flexibility	50%	25%	13%	13%	7%	29%	29%	36%
Good value for money	88%	12%	0%	0%	36%	36%	14%	14%
Less after-sale problems	81%	13%	0%	6%	36%	36%	9%	18%
Market size was large	56%	13%	13%	19%	36%	7%	36%	21%
Market growth was high	44%	31%	6%	19%	21%	29%	21%	29%
The consumer had great need for product type	65%	29%	6%	0%	38%	46%	8%	8%
Intense price competition in market	44%	38%	13%	6%	57%	14%	21%	7%
Many competitors in market	44%	25%	19%	13%	50%	14%	21%	14%
Customers satisfied with existing products	25%	25%	38%	13%	29%	57%	7%	7%
Frequent new product introductions in market	19%	19%	31%	31%	43%	29%	14%	14%
Very experienced project team	63%	13%	19%	6%	64%	36%	0%	0%
Multi-functional development group	56%	19%	19%	6%	57%	36%	0%	7%
Good understanding of buyer behaviour	63%	25%	13%	0%	7%	36%	36%	21%
Project supported by Senior Executives	94%	6%	0%	0%	64%	21%	7%	7%
Adequate financial resources	50%	19%	19%	13%	43%	43%	7%	7%
Strong sales force launch effort	38%	19%	25%	19%	0%	31%	38%	31%
Adequate advertising skills	29%	21%	21%	29%	8%	33%	33%	25%
Adequate distribution resources	53%	27%	13%	7%	17%	42%	33%	8%

Distribution Companies

Factor Name	Successful Products				Failed Products			
	Agree	S-Agree	S-Disagree	Disagree	Agree	S-Agree	S-Disagree	Disagree
Superior in quality	73%	27%	0%	0%	44%	11%	33%	11%
Technically superior to competitors	73%	27%	0%	0%	33%	44%	22%	0%
Better suited to our firm's technology	78%	22%	0%	0%	20%	30%	10%	40%
Attractive in appearance	100%	0%	0%	0%	33%	44%	0%	22%
First on the market	50%	10%	10%	30%	40%	0%	20%	40%
Made to meet users' needs	73%	27%	0%	0%	30%	60%	0%	10%
Allowed greater pricing flexibility	10%	50%	20%	20%	22%	11%	22%	44%
Good value for money	82%	18%	0%	0%	20%	60%	0%	20%
Less after-sale problems	73%	18%	9%	0%	30%	30%	0%	40%
Market size was large	70%	10%	10%	10%	50%	40%	10%	0%
Market growth was high	56%	0%	22%	22%	30%	40%	30%	0%
The consumer had great need for product type	50%	40%	10%	0%	40%	30%	20%	10%
Intense price competition in market	70%	0%	30%	0%	78%	22%	0%	0%
Many competitors in market	50%	40%	0%	10%	56%	11%	22%	11%
Customers satisfied with existing products	30%	20%	40%	10%	78%	11%	0%	11%
Frequent new product introductions in market	20%	10%	30%	40%	44%	0%	22%	33%
Very experienced project team	56%	22%	0%	22%	63%	13%	25%	0%
Multi-functional development group	50%	13%	25%	13%	38%	13%	50%	0%
Good understanding of buyer behaviour	73%	27%	0%	0%	20%	30%	30%	20%
Project supported by Senior Executives	80%	20%	0%	0%	60%	10%	10%	20%
Adequate financial resources	89%	0%	11%	0%	44%	22%	11%	22%
Strong sales force launch effort	64%	18%	0%	18%	10%	60%	0%	30%
Adequate advertising skills	55%	27%	9%	9%	22%	33%	11%	33%
Adequate distribution resources	80%	10%	10%	0%	22%	44%	0%	33%

Manufacturing Companies

Factor	Mean Score		SL
	Success	Failure	
Good understanding of buyer behaviour	2.31	3.79	4.54E-04
Good value for money	1.71	3.00	1.64E-03
Allowed greater pricing flexibility	2.63	3.93	5.51E-03
First on the market	2.25	3.79	9.28E-03
Project supported by Senior Executives	1.56	2.43	0.0165
Strong sales force launch effort	3.13	4.31	0.0218
Made to meet users' needs	1.53	2.36	0.0291
The consumer had great need for product type	2.12	2.85	0.0394
Adequate distribution resources	2.67	3.42	0.0827
Attractive in appearance	2.13	2.86	0.0950
Less after-sale problems	2.13	2.91	0.1198
Frequent new product introductions in market	3.69	2.86	0.1375
Market growth was high	2.81	3.57	0.1469
Customers satisfied with existing products	3.38	2.79	0.1733
Market size was large	2.63	3.29	0.2597
Adequate advertising skills	3.43	3.92	0.3451
Technically superior to competitors	2.13	2.43	0.4091
Multi-functional development group	2.63	2.36	0.5161
Very experienced project team	2.25	2.00	0.5561
Better suited to our firm's technology	2.67	2.86	0.6178
Superior in quality	2.13	2.21	0.7859
Intense price competition in market	2.75	2.64	0.7960
Many competitors in market	2.88	3.00	0.8171
Adequate financial resources	2.75	2.79	0.9315

Distribution Companies

Factor	Mean		SL
	Success	Failure	
Better suited to our firm's technology	2.11	3.80	4.31E-3
Technically superior to competitors	1.73	2.89	6.49E-3
Good understanding of buyer behaviour	2.18	3.60	6.84E-3
Good value for money	1.91	3.30	7.92E-3
Attractive in appearance	1.75	3.11	8.35E-3
Adequate distribution resources	1.90	3.56	0.0114
Superior in quality	1.91	3.11	0.0210
Less after-sale problems	2.00	3.70	0.0242
Customers satisfied with existing products	3.30	2.00	0.0327
Strong sales force launch effort	2.36	3.60	0.0825
Made to meet users' needs	2.09	2.80	0.0875
Adequate financial resources	2.00	3.00	0.0932
Adequate advertising skills	2.64	3.67	0.0957
Project supported by Senior Executives	2.00	2.80	0.1266
The consumer had great need for product type	2.50	3.00	0.2588
Frequent new product introductions in market	3.80	3.11	0.3756
Allowed greater pricing flexibility	3.50	4.00	0.3893
First on the market	3.10	3.70	0.4682
Intense price competition in market	2.20	1.89	0.5361
Multi-functional development group	2.63	3.00	0.6040
Many competitors in market	2.30	2.56	0.7025
Very experienced project team	2.67	2.50	0.7941
Market growth was high	2.89	2.90	0.9861
Market size was large	2.50	2.50	1.0000

----- F A C T O R A N A L Y S I S -----

 FACTOR 6 FACTOR 7 FACTOR 8

DS7

DS8

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
		*				
AS1	.88829	*	1	4.87311	20.3	20.3
AS2	.82240	*	2	3.25324	13.6	33.9
AS3	.67344	*	3	2.53322	10.6	44.4
AS4	.60042	*	4	2.33057	9.7	54.1
AS5	.77027	*	5	1.98760	8.3	62.4
AS6	.73280	*	6	1.63141	6.8	69.2
AS7	.81875	*	7	1.41464	5.9	75.1
AS8	.75576	*	8	1.28613	5.4	80.5
AS9	.88825	*				
CS1	.64307	*				
CS2	.75283	*				
CS3	.87668	*				
CS4	.82877	*				
CS5	.87005	*				
CS6	.64888	*				
CS7	.87674	*				
DS1	.80702	*				
DS2	.85826	*				
DS3	.92393	*				
DS4	.88868	*				
DS5	.90644	*				
DS6	.81656	*				
DS7	.79751	*				
DS8	.86408	*				

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 13 ITERATIONS.

01-Dec-97 SPSS Release 4.0 for Macintosh

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----- F A C T O R A N A L Y S I S -----

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
AS1			.87759		
AS2			.72364		
AS3			.51601		
AS4				.72342	
AS5		.52599	.58466		
AS6			.55208		
AS7				.53516	
AS8				.85819	
AS9				.54575	
CS1					
CS2					
CS3					
CS4					.89968
CS5					.83542
CS6		.63650			
CS7		.71748			
DS1		.81455			
DS2		.63272			
DS3					
DS4					
DS5					
DS6	.84070				
DS7	.85659				
DS8	.72596				
	FACTOR 6	FACTOR 7	FACTOR 8		
AS1					
AS2					
AS3		.60783			
AS4					
AS5					
AS6					
AS7					
AS8					
AS9					
CS1					
CS2					
CS3	.70463				
CS4					
CS5					
CS6					
CS7					

----- F A C T O R A N A L Y S I S -----

	FACTOR 6	FACTOR 7	FACTOR 8
DS1			
DS2	.54399		
DS3	.94014		
DS4			.84209
DS5		.87298	
DS6			
DS7			
DS8			

FACTOR TRANSFORMATION MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
FACTOR 1	.58156	.15759	.38987	.23933	.41011
FACTOR 2	.03889	.66562	-.31893	.33042	-.47901
FACTOR 3	-.46922	-.04800	.56302	.62923	-.04470
FACTOR 4	-.08292	.69777	.34570	-.38835	.18761
FACTOR 5	.45360	-.01496	-.31015	.43754	.17497
FACTOR 6	-.41344	.16901	-.37518	.28063	.45851
FACTOR 7	-.20219	.08120	-.22146	-.07755	.56949
FACTOR 8	.12520	.08693	.15420	.10289	.00040

	FACTOR 6	FACTOR 7	FACTOR 8
FACTOR 1	.31039	.36149	.18018
FACTOR 2	.23088	-.00620	.24851
FACTOR 3	-.15504	-.13520	.14243
FACTOR 4	-.41748	-.06706	-.14812
FACTOR 5	-.61369	-.29482	-.11065
FACTOR 6	.07900	.43235	-.42142
FACTOR 7	.22066	-.51118	.51299
FACTOR 8	.46956	-.55800	-.64074

----- F A C T O R A N A L Y S I S -----

	FACTOR 6	FACTOR 7
DF 1	.54667	
DF2	.57342	
DF3		
DF4		
DF5		
DF6		
DF7		
DF8		

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
		*				
AF 1	.79480	*	1	5.12809	21.4	21.4
AF2	.87646	*	2	4.65425	19.4	40.8
AF3	.88874	*	3	3.61132	15.0	55.8
AF4	.94261	*	4	2.24004	9.3	65.1
AF5	.67714	*	5	1.87040	7.8	72.9
AF6	.79426	*	6	1.67312	7.0	79.9
AF7	.88898	*	7	1.31860	5.5	85.4
AF8	.85256	*				
AF9	.86545	*				
CF 1	.76831	*				
CF2	.68752	*				
CF3	.72901	*				
CF4	.85589	*				
CF5	.95990	*				
CF6	.96009	*				
CF7	.91863	*				
DF 1	.93582	*				
DF2	.89622	*				
DF3	.74260	*				
DF4	.88690	*				
DF5	.86194	*				
DF6	.96070	*				
DF7	.96979	*				
DF8	.78150	*				

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----- F A C T O R A N A L Y S I S -----

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 12 ITERATIONS.

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
AF1		.83537			
AF2		.90389			
AF3		.58514			
AF4		.60246			-.60768
AF5					
AF6		.86964			
AF7			.75692		
AF8					
AF9					.78767
CF1	.56993				
CF2	.73002				
CF3	.67590				
CF4	.88823				
CF5	.93456				
CF6					
CF7	.79933				
DF1				.93550	
DF2				.82116	
DF3			.53241		
DF4					-.62365
DF5					
DF6			.90234		
DF7			.89352		
DF8			.57345		

	FACTOR 6	FACTOR 7
AF1		
AF2		
AF3		
AF4		
AF5		
AF6		
AF7		
AF8		
AF9		

----- FACTOR ANALYSIS -----

	FACTOR 6	FACTOR 7
CF1	.51843	
CF2		
CF3		
CF4		
CF5		
CF6		.96677
CF7		
DF1		
DF2		
DF3		
DF4	.66113	
DF5	.84297	
DF6		
DF7		
DF8		

FACTOR TRANSFORMATION MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
FACTOR 1	-.24689	.82455	.17359	.45250	-.03734
FACTOR 2	.90812	.14120	.32142	.09627	.17637
FACTOR 3	-.22178	-.26045	.84036	.02195	-.09552
FACTOR 4	.19274	.10582	-.10227	-.21451	-.88534
FACTOR 5	-.00681	.28093	-.16666	-.51089	.39323
FACTOR 6	.14356	-.19815	-.34395	.63328	-.03907
FACTOR 7	-.08584	-.32088	-.06182	.27825	.13563

	FACTOR 6	FACTOR 7
FACTOR 1	-.00114	.15124
FACTOR 2	-.04378	.09888
FACTOR 3	.40881	.00718
FACTOR 4	.18196	.27973
FACTOR 5	.63228	.27900
FACTOR 6	.61890	-.19031
FACTOR 7	-.12263	.88033