

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

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
Doctor of Philosophy in Product Development at Massey University

Liangli Kong

1998

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.

ACKNOWLEDGMENTS

I would like to express my heartfelt thanks and appreciation to my supervisors, Professor Mary D Earle, Professor Peter Robertson and Professor Tony Vitalis, for their valuable guidance, assistance and encouragement provided throughout the project. Professor Robertson initially set up the project, and continuously monitored, taught and guided me on the right track. Professor Earle spent her precious time, with her knowledge and experience, guiding me and discussing with me during my thesis writing.

It would be impossible to carry out a project of this nature without the support and participation of the local companies. The companies in the New Zealand electronics industry provided the data needed for this study. Their identity cannot be revealed due to the confidential nature of the information, but I feel grateful towards those who invested their time and efforts to provide data and information for this study.

I also want to thank the staff in the Department of Consumer Technology for their assistance, especially Mrs. Aruna Sheka who helped me in designing the survey questionnaire and preparing the interviews.

Finally, I would like to thank my husband, Xiaoping, for his love, continual encouragement and patience in supporting me as I complete this project. I am also very grateful to my family for their moral support during my study.

Table of Contents

Abstract.....	ii
Acknowledgments.....	iv
Table of Contents.....	v
List of Tables.....	xi
List of Figures.....	xiii
Chapter 1	
The Electronics Industry and New Products.....	1
1.1 Introduction.....	1
1.2 The Electronics Industry.....	1
1.3 Innovation in the Electronics Industry.....	4
1.4 The New Zealand Electronics Industry.....	6
1.5 Factors on New Product Success and Failure.....	8
<i>1.5.1 Common Factors in New Product Success and Failure.....</i>	<i>9</i>
<i>1.5.2 New Product Success and Failure in New Zealand.....</i>	<i>10</i>
1.6 Purpose of the Study.....	11
Chapter 2	
Success and Failure of New Products.....	13
2.1 Introduction.....	13
2.2 Concepts of New Product and New Product Development Process.....	13
<i>2.2.1 New Product.....</i>	<i>13</i>
<i>2.2.2 New Product Development Process.....</i>	<i>15</i>
<i>2.2.3 New Product Success and Failure.....</i>	<i>21</i>
<i>2.2.4 The Level of Research on New Product Success and Failure.....</i>	<i>22</i>
2.3 Measures of Success and Failure in New Products.....	23
2.4 Factors on New Product Success and Failure.....	26
<i>2.4.1 General Areas Related to New Products Success and Failure.....</i>	<i>27</i>
<i>2.4.2 Specific Factors that Impact on New Product Success and Failure.....</i>	<i>29</i>
2.5 Several Key Research Projects on New Product Success and Failure.....	32
<i>2.5.1 SAPPHO Project in UK(1972).....</i>	<i>32</i>
<i>2.5.2 Booz Allen-Hamilton's Project in the USA(1982).....</i>	<i>33</i>
<i>2.5.3 Cooper's Projects in Canada(1979 ~ 1993).....</i>	<i>34</i>
<i>2.5.4 Link's Project in Australia (1987).....</i>	<i>36</i>
<i>2.5.5 Projects in Asian Countries (1993 ~ 1996).....</i>	<i>37</i>
<i>2.5.6 Projects in New Zealand.....</i>	<i>40</i>
2.6 Factors on New Product Success and Failure on the Electronics Industry.....	42
2.7 Factors on New Service Success and Failure.....	44

2.8 Conclusion and the Factors on New Product Success and Failure in the New Zealand Electronics Industry	46
--	----

Chapter 3

Comparing New Product Success and Failure: the Methodology	48
3.1 Introduction	48
3.2 Definition of Terms Used in the Research	48
3.3 Selection of Factors for New Product Success and Failure	49
3.4 Mail Survey: New Product Success and Failure in the New Zealand Electronics Industry	51
3.4.1 Objectives	51
3.4.2 Sampling Design	52
3.4.3 Questionnaire Design	53
3.4.4 Organization of Survey	55
3.4.5 Data Processing Methods	56
3.4.6 Factor Analysis	58
3.5 In-depth Interview: New Product Development and New Product Success and Failure	59
3.5.1 Objectives	59
3.5.2 Selection of Companies for In-Depth Interviews	60
3.5.3 Respondents for the In-Depth Interviews	61
3.5.4 Preparing the Interviewing Topics	62
3.5.5 Qualitative Analysis of the Interview	63

Chapter 4

The Companies Surveyed in the New Zealand Electronics Industry	64
4.1 Introduction	64
4.2 Descriptions of the Companies in Mail Survey	64
4.2.1 Nature of Business	64
4.2.2 Companies' Main Business	64
4.2.3 Company Size and Annual Sales	65
4.2.4 Age of Company	66
4.2.5 Exporting Products	66
4.2.6 Overseas Subsidiaries	67
4.2.7 New Product Activities	67
4.3 Groups of the Companies	68
4.3.1 Business Nature and Product Type	68
4.3.2 Business Nature and Company Size	69
4.4 The Companies in the In-Depth Interview	70
4.5 Discussion	72

Chapter 5

Importance of Factors on New Product Success and Failure in the New Zealand Electronics Industry	74
5.1 Introduction	74
5.2 The Survey Data	74
5.3 The Determinants of New Product Success	75
5.4 The Causes of New Product Failure	78
5.5 Comparison of Factors' Impact on New Product Success and Failure.....	80
5.6 The Distributions of the Factors Agreement Scores on New Product Success and Failure	82
5.6.1 <i>Factors with Significant Difference between New Product Success and Failure..</i>	83
5.6.2 <i>Factors with Moderate Difference between New Product Success and Failure....</i>	86
5.6.3 <i>Factors that Were Identical or Slightly Different between New Product Success and Failure</i>	90
5.7 Factor Analysis: The Underlying Factors for New Product Success and Failure	95
5.7.1 <i>The Underlying Factors for New Product Success.....</i>	95
5.7.2 <i>The Underlying Factors for New Product Failure.....</i>	97
5.7.3 <i>Comparison of Underlying Factors in New Product Success and Failure</i>	99
5.8 Discussion and Conclusion	101

Chapter 6

Factors' Contribution to Separating New Product Success and Failure.....	103
6.1 Introduction	103
6.2 The Very Important Factors in Distinguishing New Product Success and Failure.....	104
6.3 The Moderate Factors in Separating New Product Success and Failure	108
6.4 The Non-Important Factors in Separating New Product Success and Failure	111
6.5 The Impact of Company Size on New Product Success and Failure	115
6.6 Comparison to Other Research Projects	118
6.6.1 <i>Comparison to Cooper's Research.....</i>	118
6.6.2 <i>Comparison to the Studies in the Electronics Industry.....</i>	119
6.6.3 <i>Comparison to Other Studies in the Asia-Pacific Region.....</i>	120
6.6.4 <i>Comparison to the Studies that Applied Factor Analysis.....</i>	122
6.7 Conclusion	123

Chapter 7

Manufacturers and Distributors: The Differences of the Factors on New Product Success and Failure.....	124
7.1 Introduction	124
7.2 The Two Groups of Companies: Manufacturers and Distributors.....	124

7.3 Factors' Impact on New Product Success in Manufacturing and Distribution	
Companies	125
7.3.1 <i>Made to Meet Users' Needs</i>	127
7.3.2 <i>Allowed Greater Pricing Flexibility</i>	127
7.3.3 <i>Better Suited to Our Firm's Technology</i>	128
7.3.4 <i>Adequate Distribution Resources</i>	128
7.3.5 <i>Adequate Financial Resources</i>	129
7.3.6 <i>Project Supported by Senior Executives</i>	129
7.3.7 <i>Adequate Advertising Skills</i>	130
7.3.8 <i>Attractive in Appearance</i>	130
7.3.9 <i>Strong Sales Force/Launch Effort</i>	131
7.3.10 <i>First on the Market</i>	131
7.3.11 <i>'Intense Price Competition in Market', 'Many Competitors in Market'</i>	132
7.3.12 <i>Summary</i>	133
7.4 Factors' Impact on New Product Failure in Manufacturing and Distribution	
Companies	134
7.4.1 <i>Superior in Quality</i>	134
7.4.2 <i>Intense Price Competition in Market</i>	135
7.4.3 <i>Better Suited to Our Firm's Technology</i>	136
7.4.4 <i>Market Size was Large</i>	136
7.4.5 <i>Customer Satisfied with Existing Products</i>	137
7.4.6 <i>Market Growth was High</i>	137
7.4.7 <i>Multi-functional Development Group</i>	138
7.4.8 <i>Technically Superior to Competitors</i>	138
7.4.9 <i>Strong Sales Force Launch Effort</i>	139
7.4.10 <i>Very Experienced Project Team</i>	139
7.4.11 <i>Adequate Financial Resources</i>	140
7.4.12 <i>Frequent New Product Introductions in Market</i>	140
7.4.13 <i>Summary</i>	141
7.5 Factors that Separated New Product Success and Failure for Manufacturing	
and Distribution Companies	142
7.5.1 <i>Important Factors in Separating New Product Success and Failure for</i>	
<i>Manufacturing Companies</i>	142
7.5.2 <i>Important Factors in Separating New Product Success and Failure for</i>	
<i>Distribution Companies</i>	144
7.5.3 <i>Comparisons of the Important Factors in Separating New Product Success</i>	
<i>and Failure for Manufacturing and Distribution Companies</i>	146
7.6 Discussion and Conclusion	147

Chapter 8

New Product Development Activities and Their Effect on New Product

Success and Failure.....	149
8.1 Introduction.....	149
8.2 New Product Development Activities: their Importance to New Product Success and Failure.....	149
8.2.1 <i>Developed with a Clear Market Strategy</i>	150
8.2.2 <i>Undertook Preliminary Market Assessment Well</i>	151
8.2.3 <i>Undertook In-Depth Consumer Evaluation</i>	152
8.2.4 <i>Undertook Financial Analysis Well</i>	153
8.2.5 <i>Undertook Prototype Development and Test Well</i>	154
8.2.6 <i>Undertook Sound Technical Assessment</i>	155
8.2.7 <i>Product Concept was Developed Using Idea-Generation Techniques</i>	156
8.3 Respondents' Comments.....	157
8.4 Summary and Discussions.....	158

Chapter 9

New Product Development Processes in the New Zealand Electronics Industry 160

9.1 Introduction.....	160
9.2 The Companies in the Interviews.....	160
9.3 Formal New Product Development Process.....	161
9.3.1 <i>New Product Idea Generation and Up-front Activities in New Product Development</i>	164
9.3.2 <i>The Relationship of New Product Development Team with Customers and Markets</i>	167
9.4 The Most Important Factor in New Product Success and Failure.....	169
9.5 The Company's Recent Situation and Future.....	174
9.5.1 <i>The Strengths and Weaknesses of the Companies</i>	174
9.5.2 <i>The Companies' Future</i>	179
9.5.3 <i>Other Issues</i>	182
9.6 Companies in the Interviews without Formal New Product Development Processes.....	184
9.6.1 <i>Small Companies</i>	184
9.6.2 <i>Contract Manufacturing Companies</i>	188
9.7 Conclusion.....	191

Chapter 10	
Discussion and Conclusions	194
10.1 Introduction.....	194
10.2 Factors Separating New Product Success and Failure	195
10.2.1 Important Factors in Separating New Product Success and Failure	195
10.2.2 Factors with Moderate or No Significant Effect.....	196
10.2.3 Comparison with Other Research in New Product Success and Failure	197
10.3 Underlying Factors for New Product Success and Failure	200
10.4 Impacts of Company Nature and Size on the Factors Separating New Product Success and Failure	202
10.5 New Product Development Practices in the New Zealand Electronics Companies ..	204
10.6 Evaluation of New Product Development Activities in the New Zealand Electronics Companies	207
10.6.1 Coping with Niche Market Growth.....	207
10.6.2. Improvement of NPD Process for the New Zealand Electronics Companies...	210
10.7 Limitation of the Study	214
10.8 Recommendations for Future Research	215
10.9 Conclusions.....	215
References.....	217
Appendixes	226
Appendix I - Cover Letter for the Mail Survey.....	227
Appendix II - Mail Survey Questionnaire	228
Appendix III - Contact Fax for Interview.....	239
Appendix IV - Interview Questions.....	241
Appendix V - Mail Survey Data.....	243
Appendix VI - Percentage of Factor Agreement Scores.....	245
Appendix VII - Respondents' Comments in the Mail Survey	247
Appendix VIII - Percentage of Factor Agreement Scores for Manufacturing and Distribution Companies	253
Appendix IX - Factors Ranked by Significance Levels of Difference between New Product Success and Failure for Manufacturing and Distribution Companies.....	255
Appendix X - Factor Analysis Results.....	257

List of Tables

Table 1.1 Electronic Products Classified by Sector	3
Table 1.2 Some Common Factors in New Product Success and Failure	10
Table 2.1 Core Measures of New Product Success and Failure.....	25
Table 2.2 Suggested Success and Failure Measures for Project-level Research	26
Table 2.3 Common Factors in New Product Success and Failure.....	30
Table 2.4 Important Factors in New Product Success and Failure in the Electronics Industry	43
Table 2.5 Important Factors in Success and Failure for Products and Services.....	46
Table 3.1 Four Main Groups of Factors for the Current Study.....	49
Table 3.2 The Factors on New Product Success and Failure for the Current Study	50
Table 3.3 In-Depth Interview Topics	62
Table 4.1 Companies Grouped by Business Nature and Product Type	69
Table 4.2 Companies Grouped by Business Nature and Employee Number.....	69
Table 4.3 Companies Grouped by Business Nature and Annual Sales	70
Table 4.4 The Companies in the In-Depth Interview.....	71
Table 5.1 Factors Ranked by Percentage of ‘Agree’ for Successful Products.....	76
Table 5.2 Factors Ranked by Percentage of ‘Disagree’ for Failed products.....	79
Table 5.3 Factors Ranked by Significant Differences of Mean Scores for Agreement between New Product Success and Failure.....	81
Table 5.4 Underlying Factors for New Product Success	96
Table 5.5 Underlying Factors for New Product Failure.....	98
Table 5.6 Comparison of Factors Underlying New Product Success and Failure.....	102
Table 6.1 The Very Important Factors in Separating New Product Success and Failure.	104
Table 6.2 Main Causes of Failure of the Products Which Were ‘Made to Meet Users’ Needs’	106
Table 6.3 The Moderately Important Factors in Separating New Product Success and Failure.....	108
Table 6.4 The Non-Important Factors in Separating New Product Success and Failure..	111
Table 6.5 Important Factors in New Product Success and Failure for Small Companies (Annual Sales \$3 million or less).....	116
Table 6.6 Important Factors in New Product Success and Failure for Medium Companies(Annual Sales \$3 million - \$10 million).....	116
Table 6.7 Important Factors in New Product Success and Failure for Large Companies(Annual Sales over \$10 million).....	117
Table 6.8 Comparison of Underlying Factors in Canadian and Chinese Studies.....	122

Table 7.1 Different Impacts of the Factors on Successful Products Between Manufacturers and Distributors	126
Table 7.2 Common Factors for Manufacturing and Distribution Companies in New Product Success	133
Table 7.3 Different Impacts of the Factors on Failed Products between Manufacturers and Distributors.....	134
Table 7.4 Commonly Missed Factors for Manufacturing and Distribution Companies in New Product Failure.....	141
Table 7.5 Important Factors in Separating New Product Success and Failure for Manufacturing Companies	142
Table 7.6 Important Factors in Separating New Product Success and Failure for Distribution Companies.....	144
Table 7.7 Factors' Different Impact on Separating New Product Success and Failure in Manufacturing and Distribution Companies.....	146
Table 8.1 The Importance of Factors in Separating New Product Success and Failure ...	150
Table 10.1 Comparison of Company Sizes.....	194
Table 10.2 The Important Factors in Separating New Product Success and Failure.....	195
Table 10.3 Factors Impact in Separating New Product Success and Failure.....	198
Table 10.4 Relationship between Underlying Factors and Original Factor Groups	200
Table 10.5 The Most Important Factors in Separating New Product Success and Failure in Manufacturing and Distribution Companies	202
Table 10.6 The Quality of Undertaking New Product Development Activities	206
Table 10.7 Strengths and Weaknesses of Companies in New Product Development	207

List of Figures

Figure 1.1 NZ Electronics Industry Structure	7
Figure 2.1 Six-Steps New Product Development Process	16
Figure 2.2 Seven-Steps New Product Development Process	17
Figure 2.3 General Areas Related to New Product Success and Failure	28
Figure 4.1 Company's Employees	65
Figure 4.2 Company's Annual Sales in 1993	65
Figure 4.3 Company's Age (Years)	66
Figure 4.4 Exporting Products	66
Figure 4.5 Frequency of New Product Introductions	67
Figure 4.6 R&D Expenditure	68
Figure 5.1 Distribution of Scores on 'Good Understanding of Buyer Behavior'	83
Figure 5.2 Distribution of Scores on 'Good Value for Money'	83
Figure 5.3 Distribution of Scores on 'Made to Meet Users' Needs'	84
Figure 5.4 Distribution of Scores on 'Less After-Sale Problems'	84
Figure 5.5 Distribution of Scores on 'The Consumer had Great Need for Product Type' ..	85
Figure 5.6 Distribution of Scores on 'Allowed Greater Pricing Flexibility'	85
Figure 5.7 Distribution of Scores on 'Attractive in Appearance'	86
Figure 5.8 Distribution of Scores on 'Project Supported by Senior Executives'	86
Figure 5.9 Distribution of Scores on 'Adequate Distribution Resources'	87
Figure 5.10 Distribution of Scores on 'Strong Sales Force/Launch Effort'	87
Figure 5.11 Distribution of Scores on 'Superior in Quality'	88
Figure 5.12 Distribution of Scores on 'First on the Market'	88
Figure 5.13 Distribution of Scores on 'Better Suited Our Firm's Technology'	89
Figure 5.14 Distribution of Scores on 'Technically Superior to Competitors'	89
Figure 5.15 Distribution of Scores on 'Frequent New Product Introductions in Market' ..	90
Figure 5.16 Distribution of Scores on 'Adequate Advertising Skills'	90
Figure 5.17 Distribution of Scores on 'Customer Satisfied with Existing Products'	91
Figure 5.18 Distribution of Scores on 'Market Growth Was High'	91
Figure 5.19 Distribution of Scores on 'Adequate Financial Resources'	92
Figure 5.20 Distribution of Scores on 'Market Size Was Large'	92
Figure 5.21 Distribution of Scores on 'Multi-functional Development Group'	93
Figure 5.22 Distribution of Scores on 'Many Competitors in Market'	93
Figure 5.23 Distribution of Scores on 'Very Experienced Project Team'	94
Figure 5.24 Distribution of Scores on 'Intense Price Competition in Market'	94
Figure 6.1 Success Rate of New Products Classified by 'First to the Market'	110
Figure 7.1 Distributions of Scores on 'Made to Meet Users' Needs'	127

Figure 7.2 Distribution of Scores on ‘Allowed Greater Pricing Flexibility’	127
Figure 7.3 Distribution of Scores on ‘Better Suited to Our Firm’s Technology’	128
Figure 7.4 Distributions of Scores on ‘Adequate Distribution Resources’	128
Figure 7.5 Distributions of Scores on ‘Adequate Financial Resources’	129
Figure 7.6 Distribution of Scores on ‘Project Supported by Senior Executives’	129
Figure 7.7 Distribution of Scores on ‘Adequate Advertising Skills’	130
Figure 7.8 Distribution of Scores on ‘Attractive in Appearance’	130
Figure 7.9 Distribution of Scores on ‘Strong Sales Force/Launch Effort’	131
Figure 7.10 Distribution of Scores on ‘First on the Market’	131
Figure 7.11 Distribution of Scores on ‘Intense Price Competition in Market’	132
Figure 7.12 Distribution of Scores on ‘Many Competitors in Market’	132
Figure 7.13 Distribution of Scores on ‘Superior in Quality’	135
Figure 7.14 Distribution of Scores on ‘Intense Price Competition in Market’	135
Figure 7.15 Distribution of Scores on ‘Better Suited to Our Firm’s Technology’	136
Figure 7.16 Distribution of Scores on ‘Market Size was Large’	136
Figure 7.17 Distribution of Scores on ‘Customer Satisfied with Existing Products’	137
Figure 7.18 Distribution of Scores on ‘Market Growth was High’	137
Figure 7.19 Distribution of Scores on ‘Multi-functional Development Group’	138
Figure 7.20 Distribution of Scores on ‘Technically Superior to Competitors’	138
Figure 7.21 Distribution of Scores on ‘Strong Sales Force Launch Effort’	139
Figure 7.22 Distribution of Scores on ‘Very Experienced Project Team’	139
Figure 7.23 Distribution of Scores on ‘Adequate Financial Resources’	140
Figure 7.24 Distribution of Scores on ‘Frequent New Product Introductions in Market’	140
Figure 8.1 Distribution of Scores on ‘Developed with a Clear Market Strategy’	151
Figure 8.2 Distribution of Scores on ‘Undertook Preliminary Market Assessment Well’	152
Figure 8.3 Distribution of Scores on ‘Undertook In-Depth Consumer Evaluation’	153
Figure 8.4 Distribution of Scores on ‘Undertook Financial Analysis Well’	153
Figure 8.5 Distribution of Scores on ‘Undertook Prototype Development Well’	154
Figure 8.6 Distribution of Scores on ‘Undertook Prototype Test Well’	155
Figure 8.7 Distribution of Scores on ‘Undertook Sound Technical Assessment’	155
Figure 8.8 Distribution of Scores on ‘Product Concept was Developed Using Idea- Generation Techniques’	156
Figure 10.1 Coping with Growing Niche Markets	209
Figure 10.2 The Activities in NPD Process that Need Emphasis	212