

Brian Healy

Supervisors: Dr. Michèle O’ Dwyer & Dr. Ann Ledwith

A thesis submitted for the degree of
Doctor of Philosophy
to the
Kemmy Business School
University of Limerick
May 2012
Abstract

This research identifies, clarifies, and evaluates the nature of product advantage and its relationship with new product performance in SMEs. Throughout this thesis a number of research objectives were presented and satisfied; the identification of the nature of product advantage in SMEs; an exploration of the nature of new product performance measurement in SMEs; and an assessment of the interrelationship between product advantage and new product performance in SMEs. In the achievement of the research objectives this thesis supports SMEs in their product advantage endeavours in maximising new product development success.

A review of literature illustrates that ambiguity surrounds the nature of the product advantage and new product performance constructs in SMEs. This study identified the product advantage characteristics that maximise the level of new product performance in SMEs and provides a descriptive model of the manner in which product advantage can predict new product performance measurement outcomes.

The mixed-method methodology adopted for this research employs a structured questionnaire as the quantitative research instrument to test the conceptual model and develop the descriptive model, and case studies as the qualitative research instrument to inform and further explore the research issue. This complementary research approach was selected to alleviate any weaknesses associated with each individual method and to facilitate greater interpretation and understanding of the research issue than would have been achieved in a single method study.

The empirical findings demonstrate that product advantage is a heterogeneous construct comprising of; product innovativeness, product superiority and product meaningfulness components and that each component has a unique role in the development of new products. The product advantage strategy chosen by SMEs is influenced by firm size, customers’ level of involvement in the process, price, market uncertainty, technological uncertainty, competitive intensity and resource uncertainty. Additionally, SMEs use multi-dimensional sets of measures when measuring new product performance. These measures vary depending upon project and business strategy. No one measure is useful for all product types, nor across all firms, however it is wise to use objective customer acceptance measures as they are the only measures statistically found to influence new product success. The relationship between product advantage and new product performance is complex and consists of both direct and indirect interactions. Accordingly, the findings of this thesis will enable SMEs to better position themselves to effectively develop their product advantage strategy, and as such the competitive environment with large firms will become more equitable.
Statement of Original Authorship

The work presented in this thesis is entirely my own work and it is not copied or plagiarised from other sources. Some material has been presented at conference and published prior to submission of the thesis. Details of this material are as follows:


Signed: ___________________________ Date: ________________

Brian Healy
Acknowledgements

During this course of this thesis I have been supported and guided by many people, and I would like to take this opportunity express my sincere thanks to the following:

This thesis would not have been possible without my supervisors; Dr. Michèle O’Dwyer and Dr. Ann Ledwith to whom I will be always grateful for your determined support and guidance, expertise and experience, availability and accessibility and constant patience.

In addition, this research would not have been possible without the access proffered by the case SMEs, who gave of their time, knowledge and expertise.

In recognition of their support, I would like to express my gratitude to my parents, siblings and friends. Thank you.

To Dr. Gerry Golding, Professor Eamonn Murphy and Professor Alistair Anderson, thanks for your advice.

Finally to my colleagues in the Department of Management and Marketing, and the wider University of Limerick campus for their support and expertise.
Table of Contents

ABSTRACT .................................................................................................................. III
STATEMENT OF ORIGINAL AUTHORSHIP ..................................................... IV
ACKNOWLEDGEMENTS ...................................................................................... V
TABLE OF CONTENTS .......................................................................................... VI
LIST OF TABLES ..................................................................................................... X
LIST OF FIGURES ................................................................................................... XIII
ABBREVIATIONS ................................................................................................. XIV

CHAPTER 1 INTRODUCTION .................................................................................. 1
1.1 Introduction .......................................................................................................... 2
1.2 Background to the Research .............................................................................. 4
  1.2.1 Small and medium-sized Enterprises ......................................................... 6
  1.2.2 Innovation and SME’s .................................................................................. 8
  1.2.3 Barriers to Innovation .................................................................................. 12
1.3 Research Aim and Objectives ......................................................................... 14
1.4 Research Approach ........................................................................................... 17
1.5 Outline of thesis ................................................................................................. 18
1.6 Conclusion ........................................................................................................... 20

CHAPTER 2 LITERATURE REVIEW .................................................................... 21
2.1 Introduction .......................................................................................................... 22
2.2 Background Information .................................................................................... 23
  2.2.1 SMEs’ and Product Innovation ............................................................... 24
2.3 Product Advantage ............................................................................................ 28
  2.3.1 Holistic Product Advantage studies ......................................................... 31
  2.3.2 Studies that have identified a multi-dimensional product advantage construct .................................................. 44
2.4 New product performance ................................................................................. 49
2.5 Product Advantage and New Product Performance ....................................... 54
CHAPTER 3 RESEARCH METHODOLOGY ........................................67

3.1 Introduction ........................................................................... 68

3.2 Research Aim and objectives ..................................................70

3.3 Research Philosophy .............................................................71

3.3.1 Positivism/ Quantitative .........................................................73

3.3.2 Interpretivism / Qualitative ....................................................74

3.3.3 Pragmatism / Mixed research ...............................................76

3.4 Research Approach ................................................................78

3.4.1 Research Strategy ...............................................................82

3.4.2 Quantitative Research Methodology ......................................83

3.4.2.1 Design of the Quantitative Research Instrument ....................83

3.4.2.2 Pilot survey .................................................................85

3.4.2.3 Questionnaire Administration ..........................................85

3.4.2.4 Quantitative data analysis ...............................................87

3.4.2.5 Evaluation of the Quantitative Research Design ....................92

3.4.2.5.1 Reliability ...........................................................92

3.4.2.5.2 Validity .............................................................93

3.4.3 Qualitative Research Design ................................................95

3.4.3.1 Case study sample selection ..........................................96

3.4.3.2 Data collection ...........................................................98

3.4.3.2.1 Interviews .........................................................98

3.4.3.2.2 Observation .......................................................102

3.4.3.2.3 Additional methodological aids ................................104

3.4.3.3 Qualitative Analytical Procedure ......................................104

3.4.3.4 Evaluation of the case study research design .......................106

3.4.3.4.1 Internal validity ................................................106

3.4.3.4.2 External validity .................................................106

3.4.3.4.3 Reliability .......................................................107

3.4.3.4.4 Construct validity .............................................107

3.5. Evaluation of the Multi-method research design ......................107

3.6 Conclusion ...........................................................................108

CHAPTER 4 QUANTITATIVE FINDINGS .......................................109

4.1 Introduction ......................................................................110

4.2 Preliminary Statistics ..........................................................113

4.3 Research Model Development ...............................................117

4.3.1 Product advantage structure identification in SMEs. ..............118

4.3.2 New Product Performance structure identification ..............125

4.3.3 Finalised Research Model ....................................................129

4.4 Empirical Findings regarding the nature of Product Advantage in SMEs 134
4.5 An exploration of the nature of new product performance in SMEs ........................................143

4.6 The relationship between Product Advantage and New Product Performance ................................152
  4.6.1 Objective customer acceptance measures .................................................................153
  4.6.2 Development time measures .......................................................................................155
  4.6.3 Measures aimed at reducing subjective customer dissatisfaction measures ....................156

4.7 Emerging Issues ..................................................................................................................161

4.8 Conclusion ..........................................................................................................................162

CHAPTER 5 CASE STUDIES ....................................................................................................165

5.1 Introduction ..........................................................................................................................166

5.3 New Product Development Overview .................................................................................167
  5.3.1 Company A ....................................................................................................................169
  5.3.2 Company B ....................................................................................................................174
  5.3.3 Company C ....................................................................................................................177
  5.3.4 Company D ....................................................................................................................180
  5.2.5 Summary of NPD activities in Case study companies ..................................................183

5.3 Qualitative findings regarding Product Advantage in SMEs .............................................184
  5.3.1 Product Innovativeness .................................................................................................185
  5.3.2 Product Superiority .......................................................................................................188
  5.3.3 Product Meaningfulness ...............................................................................................191
  5.3.4 Factors influencing product advantage .........................................................................195
      5.3.4.1 Company A ............................................................................................................195
      5.3.4.2 Company B ............................................................................................................197
      5.3.4.3 Company C ............................................................................................................198
      5.3.4.4 Company D ............................................................................................................199
  5.3.5 Product Advantage Summary .......................................................................................200

5.4 Qualitative findings regarding New Product Performance measurement in SMEs ............202

5.5 Summary of Case Studies ....................................................................................................205

5.6 Conclusion ..........................................................................................................................211

CHAPTER 6 DISCUSSION CHAPTER .....................................................................................213

6.1 Introduction ..........................................................................................................................214

6.2 Discussion of the Research Objective 1 ............................................................................215
  6.2.1 The Product advantage concept ..................................................................................215
  6.2.2 Product Advantage practices in SMEs ..........................................................................218
      6.2.2.1 Factors influencing product advantage ................................................................224

6.3 Discussion of the Research Objective 2 ............................................................................230
  6.3.1 The structure of new product performance measurement ............................................231
  6.3.2 The performance of the new product ...........................................................................232
  6.3.3 The new product performance measures used by SMEs .............................................237
      6.3.3.1 The influence of product type on SME NPP measurement ..................................241
6.4 Discussion of Research Objective 3 ........................................................................ 244
  6.4.1 Objective customer acceptance ........................................................................ 248
  6.4.3 Development time measures .......................................................................... 250
  6.4.1 Measures aimed at reducing Subjective customer dissatisfaction ................. 252

6.5 Reflection on the methodological approach ....................................................... 254

6.5 Conclusion........................................................................................................... 256

CHAPTER 7 CONCLUSIONS, CONTRIBUTIONS AND IMPLICATIONS .... 259

7.1 Introduction........................................................................................................... 260

7.2 Conclusions Regarding the Research Aim ......................................................... 262
  7.2.1 Research Objective 1: To investigate the nature of Product Advantage in SMEs ... 262
  7.2.2 Research Objective 2: To investigate the nature of New Product Performance measurement in SMEs ........................................................................................................... 268
  7.2.3 Research Objective 3: To determine the relationship between product advantage and new product performance in SME ........................................................................................................... 272
  7.2.4 Research Aim: How does product advantage influence new product performance in SMEs. .... 275

7.3 Contributions of this Research ........................................................................... 278

7.4 Implications of this Research ............................................................................. 280
  7.4.1 Implications for NPD theory ............................................................................ 280
  7.4.2 Implications for SME owner/managers .............................................................. 282
  7.4.4 Implications for Policy Makers ........................................................................ 283

7.5 Limitations ........................................................................................................... 283

7.6 Future Research .................................................................................................. 285

7.7 Conclusion .......................................................................................................... 286

REFERENCES ........................................................................................................... 287

APPENDIX A: QUANTITATIVE QUESTIONNAIRE .................................................. 305

APPENDIX B: INTERVIEW TOPIC LISTS ............................................................. 311

APPENDIX C: INTERVIEW TRANSCRIPTS ............................................................ 315
List of Tables

Table 2.1: Previous conceptualisations of Product Advantage in Literature ............... 28
Table 2.2: Identified Product Advantage Characteristics ........................................... 42
Table 2.3: Identified relationships between product advantage and new product performance ................................................................................................................. 59
Table 3.1: Strengths and Weaknesses of positivist research........................................ 74
Table 3.2: Strengths and weaknesses of Interpretivist research................................. 75
Table 3.3: Strengths and weaknesses of mixed-method research.............................. 77
Table 3.4: Summary of Survey Respondents (N=123)................................................ 86
Table 3.5: Summary of Statistical Tests Used ............................................................... 87
Table 3.6: Revised research matrix ............................................................................. 91
Table 3.7: Reliability of Scale Coefficients ................................................................. 92
Table 3.8: Summary of Case Study Companies ......................................................... 97
Table 3.9: Interview Protocol .................................................................................... 101
Table 4.1: Participant information (N=123) ............................................................. 113
Table 4.2: Product strategy by Firm Size (N=116) .................................................... 114
Table 4.3: The rate of product success versus failure (N=118) ............................... 115
Table 4.4: Impact of product outcome on Organisational Performance .................. 117
Table 4.5: Correlation analysis between Product Advantage characteristics and Product Success (N=123) ........................................................................... 120
Table 4.6: Pattern Matrix for PCA with Oblimin Rotation of Three Factor Solution for Product Advantage Scale for all SMEs (N=123) ................................................. 122
Table 4.7: Pattern Matrix for PCA with Oblimin Rotation of Four Factor Solution for New Product Performance Scale for all SMEs (N=123) .............................. 126
Table 4.8: Pattern Matrix for PCA with Oblimin Rotation of Three Factor Solution for New Product Performance Scale for all SMEs (N=123) .............................. 127
Table 4.9: NPP structure with scale items ................................................................. 129
Table 4.10: Revised research matrix ........................................................................ 132
Table 4.11: Product Advantage values characterised by Product Outcome ............ 135
Table 4.12: Product components categorised by Product Outcome ....................... 136
Table 4.13: SME Product Advantage values categorised by Firm Size (N=123) ...... 136
Table 4.14: Product component values categorised by Firm Size (N=123) .......... 138
Table 4.15: SME Product Advantage Values categorised by Firm Type (N=90) ...... 139
Table 4.16: Product component values categorised by firm type (N=90) ............ 140
Table 4.17: SME Product Advantage Values categorised by product strategy(N=116) ...................................................................................................................... 140
Table 4.18: Product component values categorised by product strategy (N=116) ...... 141
Table 4.19: New product performance values characterised by Product Outcome (N=118) ...................................................................................................................... 143
Table 4.20: NPP dimensions categorised by Product Outcome (N=106) ............... 145
Table 4.21: OLS regression of NPP dimensions ....................................................... 145
Table 4.22: New Product Performance values categorised by Firm Size (N=123) ..... 145
Table 4.23: NPP dimensions categorised by firm size (N=123) ............................. 147
Table 4.24: New Product Performance categorised by Firm Type (N=90) ............. 147
Table 4.25: NPP dimension values categorised by firm type ................................. 149
Table 4.26: New Product Performance values categorised by Product Strategy(N=123) ...................................................................................................................... 149
Table 4.27: NPP dimension values categorised by Product Strategy .................... 150
Table 4.28: Linear regression modelling objective customer acceptance measures (N=123) ...................................................................................................................... 154
Table 4.29: Linear regression modelling development time measures (N=123) ...... 155
Table 4.30: Linear regression modelling measures aimed at reducing subjective customer dissatisfaction (N=123) ........................................................................................................ 156
Table 4.31: Stepwise Regression modelling new product performance .................. 157
Table 4.32: Summary of hypotheses testing .................................................................................................................... 158
Table 5.1: Summary Table of the Case study Companies ...................................................... 169
Table 5.2: Significance of Product Innovativeness characteristics to case SMEs ....... 187
Table 5.3: Significance of Product Superiority characteristics to case SMEs ............ 190
Table 5.4: Significance of Product Meaningfulness characteristics to case SMEs ...... 194
Table 5.5: Summary of NPP measured used by the case study companies ............... 204
Table 6.1: NPP structure with scale items ......................................................................................... 232
Table 6.2: Summary of NPP measured used by the case study companies ............... 237
Table 6.3: Tested research matrix ......................................................................................................................... 247
List of Figures

Figure 1.1: Outline of Chapter 1 ................................................................. 4
Figure 1.2: Innovation Activity Rates ......................................................... 11
Figure 1.3: Depiction of the core Research Issue ........................................... 15
Figure 1.4: Outline of this Thesis ................................................................. 20
Figure 2.1: Outline of Chapter 2 ................................................................. 23
Figure 2.2: Product Innovation Types ........................................................... 24
Figure 2.3: Product Advantage ................................................................. 48
Figure 2.4: New Product Performance ......................................................... 54
Figure 2.5: Research Model ................................................................. 63
Figure 3.1: Outline of Chapter 3 ................................................................. 69
Figure 3.2: Research Process Chart ............................................................. 81
Figure 4.1: Stage One of the research Process ............................................ 110
Figure 4.2: Outline of Chapter 4 ................................................................. 112
Figure 4.3: Organisational Performance comparison of successful versus unsuccessful products ................................................................. 116
Figure 4.4: Research model of the research aim ........................................ 131
Figure 4.5: Descriptive model of the Relationship between Product Advantage and New Product Performance ................................................................. 159
Figure 5.1: Stage two of the research process ........................................... 166
Figure 5.2: Outline of Chapter 5 ................................................................. 167
Figure 5.3: Product Advantage coding framework ....................................... 185
Figure 6.1: Outline of Chapter 6 ................................................................. 214
Figure 7.1: Outline of Chapter 7 ................................................................. 261
Abbreviations

B2B  Business-to-Business
B2C  Business-to-Consumer
CSO  Central Statistics Office
DTM  Development Time Measures
EFA  Exploratory Factor Analysis
FA   Factor Analysis
LED  Light Emitting Diode
NCC  National Competitiveness Council
NPD  New Product Development
NPP  New Product Performance
OCAM Question Customer Acceptance Measures
OECD Organisation for Economic Co-operation and Development
OEM  Original Equipment Manufacturer
PA   Product Advantage
R&D  Research and Development
SCS  Subjective Customer Satisfaction Level
SMEs Small and medium-sized enterprises
Chapter 1 Introduction
1.1 Introduction

This thesis presents an examination of the new product development process (NPD) in Small and Medium-sized Enterprises (SMEs) for the purpose of identifying, clarifying and evaluating how product advantage influences new product performance. SMEs are a vital component of most economies (McIntyre, 2009) and the ability to effectively launch new products is an essential activity for success, survival, renewal and growth (Miles and Darroch, 2006; Brown and Eisenhardt, 1995). Strong conceptual and empirical evidence shows that product advantage consistently appears as the most important product characteristic in explaining the adoption and success of new products (Nakata et al., 2006; Langerak et al., 2004) and is a potential source of competitive advantage for many firms (Brown and Eisenhardt, 1995). Indeed Cooper and Kleinschmidt (1991) highlight that product advantage is the number one factor found in successful products. However, the nature of product advantage in SMEs is to-date unclear.

Consequently, this research focuses on SMEs seeking to create product advantage capabilities as part of an approach to generate higher value. Literature provides many examples, based on ‘good practice’ of successful new NPD, yet the strategies employed to change and overcome the resource constraints that SMEs face in creating a NPD capability have largely been overlooked. If SMEs are to improve their business processes, and participate in effective cost efficient new product development then increased understanding of the nature of product advantage and its relationship with new product performance is necessary. Confronted with increasing competition, decreasing product life cycles, product imitations and the increasing intensity of product change; a key quest for SMEs is to build observable product advantages into their new products in order to increase product adoption. In short, SMEs would benefit from
introducing explicit product advantage project priorities early in the NPD process in order to minimise risk. The aim of this thesis is this to understand the nature of product advantage, diagnose the advantages that have the potential to increase new product performance, and propose effective measurement and evaluation metrics. This aim is achieved by (1) establishing the nature of and any influencing factors on product advantage practices in SMEs, (2) identifying current new product performance measurement practices and (3) illustrating the relationship between product advantage and new product performance in SMEs. By investigating the nature of, and the relationship between, product advantage and performance in Irish SME’s, this research provides empirical evidence to support SMEs’ in new product development.

This scope of this thesis was determined by conscious exclusionary and inclusionary decisions that were made throughout the development of the proposal. This thesis accepts the existence of a relationship between product advantage and new product performance as presented in literature (Ledwith and O’Dwyer, 2008; Blankson et al., 2006; Blankson and Ming-Sung Cheng, 2005; Verhees and Meulenberg, 2004; Langerak et al., 2004; Becherer et al., 2001) and focuses on this relationship within SMEs developing new products. Insofar as this is the primary goal, other forms of innovation (process, organisational, management, production, commercial/marketing or service) were deemed outside of the scope of this study. The choice of sample was made because SMEs constitute the majority of enterprises in Ireland and are a vital component of the economy, particularly in manufacturing where they dominate the economic landscape (Larsen and Lewis, 2007). The study explores innovations in the manufacturing sector given that a higher proportion of SMEs in this sector are producing product innovations over that in the services sector (Forfas, 2009). To enhance validity and ensure sufficient data, respondents were asked to focus their
responses on their most recently launched product innovation, launched within the previous three years.

Figure 1.1 outlines the sections in this chapter.

Section 1.2 contains a background to this project, a review of SMEs and innovation activity in Ireland is conducted and the questions that emerge from the background information detailed. Section 1.3 details the research issue, aims and objectives of this thesis and in Section 1.4 the approach taken to investigate the research issue is outlined. Section 1.5 provides a brief overview of the complete thesis, and finally Section 1.6 concludes the chapter.

1.2 Background to the Research

Research on best practices in new product development (NPD) are over-reliant on large firms studies (Laforet, 2008), which presents a problem when the results of NPD research is applied to smaller firms. Applying the recommendations from large firm studies to smaller firms is problematic because small firms are generally more constrained by a lack of resources and are thought to be more informal, adaptive, responsive and creative than their larger counterparts (McIntyre, 2009). The consequence of this assumption is that the best practices derived from studies based on
large firms have become the accepted standards with which small firms are compared (McIntyre, 2009). Against this standard, smaller firms often appear lacking in formality, planning and strategy when compared to their larger counterparts (McIntyre, 2009), which is often an unfair and misleading comparison (Allocca and Kessler, 2006; Massey, 2002).

The ability to effectively launch new products is a key success factor in both large and small firms (Cooper, 2001) and launching winning products remains essential for SMEs survival and growth. However, NPD is more precarious in SMEs than in larger firms - primarily because of the financial expenditure associated with research and development (R&D), production tooling, manufacture and product launch. SMEs are often more sensitive to the financial risks associated with NPD due to limited resources and indeed unsuccessful NPD can spell disaster for small businesses (McIntyre, 2009). It is thus necessary to support SMEs in their NPD endeavours and a potential support is in relation to product advantage - product advantage being the number one factor affecting product success (Nakata et al., 2006; Bonner and Walker, 2004; Langerak et al., 2004; Kaleka, 2002; Parry and Song, 1994; Cooper, 1994; Montoya-Weiss and Calantone, 1994; Craig and Hart, 1992).

Product advantage is depicted as the superiority and/or differentiation of a product over competitive offerings (Henard and Szymanski, 2001), it is the degree to which a new product is perceived as superior to those of its competitors and determines whether or not it is a market success (Nakata et al., 2006; Langerak et al., 2004; Cooper, 1994). Previous studies surrounding product advantage have generally been based around a number of product characteristics that foster new product success such as low cost; high quality; performance superiority and product uniqueness (Calantone and Cooper, 1981;
Cooper and Kleinschmidt, 1987; Rothwell et al., 1974; Ziger and Maidique, 1990). But to date it is still not sufficiently clear how new product features are related to the advantages of the new product and how these advantages can be measured. Similarly, the effect of the causal relationships between product advantage and new product performance is also unclear - especially in the SME domain where little research has been conducted.

Additionally, NPD strategies have been found to vary depending on the industry sector (Karakaya and Kobu, 1994) and also on the technology level of a firm (Meyer and Roberts, 1986; Bacon et al., 1994), however, whether product advantage decisions is dependent on sector, firm size or product type has not yet been investigated. Cooper (1994) proposed a framework to suggest that new product success is a function of the relationships among new product strategy, the market (customers’ needs and wants), competition, components of the new product launch (marketing, sales force, advertising) and the product itself (features, benefits).

To facilitate the investigation of the relationship between product advantage and performance, the following section provides an overview of NPD in the context of Irish SMEs. Two areas are addressed in this section; first, SMEs are introduced and second, innovation and the innovation activity rates of Irish SMEs are outlined.

1.2.1 Small and medium-sized Enterprises

The European Commission’s recommendation 2003/361/EC as published in the Official Journal of the European Union identifies ‘[An enterprise is] “any entity engaged in economic activity, irrespective of its legal form” (Article 1); and that
“The category of micro, small and medium-sized enterprises (SME’s) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro” (Article 2).

SMEs’ currently account for over 95% of firms and two-thirds of private sector employment in OECD economies (OECD, 2005). According to the European Commission (2003) in the enlarged European Union some 23 million SME's provide around 75 million jobs and represent 99% of all enterprises. Current statistics vary, but a general view is that more than 90% of companies in the EU fall into the ‘SME’ category, with nearly 60% being micro businesses having less than 10 employees. SMEs contribute between 25%-35% of world exports of manufactured goods and account for a small share of foreign direct investment (OECD, 2000).

In Ireland, SMEs constitute the majority of enterprises accounting for 97% of all enterprises and from many points of view are the most important contributors to the economy (Forfes, 2006). According to the Fofas Report on Small Business Forum (2006), there are approximately 250,000 small firms operating in Ireland employing approximately 777,000 people. The Small Firms Association (2005) identified that small firms provide the foundation to the country’s economy - 60% of Gross Domestic Product (GDP) and 51% of private sector employment. Since 1975, 75% of all jobs created in Ireland have been in SME sector (Observatory of European SMEs, 2002).

The pivotal role of the indigenous enterprise sector of the economy is well documented in literature. In particular, the important role of SMEs, in enhancing national competitiveness was identified by Ruane and Gorg, (1999) and an essential element in a successful formula for achieving economic growth (Vosloo, 1994; Rupert, 1994), job creation and social progress (OECD, 2005).
1.2.2 Innovation and SME’s

Innovation is the cornerstone of competitiveness in a knowledge-driven economy (N.C.C, 2004). It is “the creative process that transforms technology and new discoveries and processes into commercial value” (N.C.C, 2004) and has been a dominant factor in maintaining worldwide competitiveness (Lin and Chen, 2007). Innovation fuels organisational growth, drives future success and is the engine that allows businesses to sustain their viability in the global economy (Gaynor, 2002). Indeed Rogers (2004:141) regards innovation “as a key ingredient in business success”.

It is through innovativeness that industrial managers devise solutions to business problems and challenges, which provide the basis for the survival and success of the firm (Hult et al., 2003). Although a commitment to innovation has long been considered important for the success of small firms (Fiol, 1996), increased understanding is needed regarding the drivers of innovation in SMEs and how these drivers operate via innovativeness to collectively influence performance (Hult et al., 2003). The dynamic environment in which SMEs operate (in competition with larger powerful firms with larger resource bases) argues the need for effective innovation, which is reflected in the ability of a firm to introduce new products to capitalise on marketplace opportunities (Miles and Darroch, 2006; Miller and Friesen, 1983).

In the classical view of innovation advanced by Schumpeter (1934), the role of the entrepreneur can only be understood if it is placed against the background of innovation and as such innovation is synonymous with entrepreneurship. Schumpeter (1934) sees the entrepreneur as the agent of change, and innovation as the driver of change from routine economic growth to ‘dynamic’ economic development. Innovation refers to the introduction of a new product or a new quality of product, a new method of production,
a new market, a new source of raw materials or half-manufactured goods and finally implementing the new organisation of any industry (Schumpeter, 1934, 1939).

An innovation is defined as a product, service or process that is new or perceived as new by its developers (Van de Ven, 1986) and its positive contribution to business performance is generally agreed. Research has shown that innovation stimulates a ventures growth (Wolff and Pett, 2006; Motwani et al., 1999; Hax and Majluf, 1991) and also provides a key source of competitive advantage (Lewis et al., 2002). The long-term health of many organisations is tied to their ability to provide existing and new customers with a continuing stream of new products and services (Yoon and Lilien, 1985). Therefore, in relation to innovation efforts, when advantages are built into new products, the products should be better received in the marketplace, and have higher new product performance (Nakata et al., 2006).

Innovation embodies “a process that begins with an invention, proceeds with the development of the invention, and results in the introduction of a new product, process or service to the marketplace” (Edwards and Gordon, 1984:01) and involves the commercialisation of new or improved products and processes (Rogers, 1998). An initial aspect of the innovation process is the ability of the firm to generate “new” ideas, where “new” means new to the firm, but not necessarily new to the wider economy (Rogers, 2004). Second, firms need to evaluate these ideas in a technological and economic sense. Third, ideas that seem economically and technologically sensible may need substantial additional investment in research, development and design before they can be integrated into the firm’s processes or, in the case of product innovations, launched as new products. In the case of the latter, a fourth stage is the marketing of the new product or service. Needless to say, these aspects should not be viewed as a linear
feedback is important between the different stages (Rogers, 2004). All of the stages require some level of investment by the firm and the ability of the firm to make appropriate investment decisions of this kind will determine the innovativeness of the firm (Rogers, 2004) and the new products potential success.

However, despite of the large volume of innovation studies - the debate on the relationship between firm size and innovativeness has become the second largest body of literature in industrial economics (Cohen, 1995), there is a deficiency on research on innovation in SMEs (Laforet, 2011). A significant amount remains unknown about the ingredients for successful innovation in SMEs (Brown, 1998), its inputs and outputs. The relative cost of innovation may be more significant to SMEs than to large firm due to SMEs limited available resources such as labour, finance, and material (Laforet, 2011). Therefore, it is essential that SMEs avoid unintended or harmful outcomes of innovation and fostering a better understanding of innovation in SMEs is critical to overcome and avoid such barriers. Even though the pitfalls of unsuccessful innovations are grave and product failure rates in SMEs are high, with only one in four new products surviving (Cooper, 2001), some research suggests that small firms which innovate increase their chances of survival and growth (de Jong and Marsili, 2006; Cefis and Marsili, 2003). Innovation is then a beneficial activity for SMEs to engage in.

The CSO/ Forfas Community Innovation Survey (2006-2008) found that there are significant differences in the rates of innovation activity for differing sizes of firms. Large firms (250+ employees) are the most innovation active enterprises across the Irish economy, with an activity rate of 85.8%, ahead of the activity rates for small and medium sized firms which are 44.6% and 69.5% respectively. There is also variance
across sectors in the Irish economy with higher activity in the industrial sector than in the services sector (See Figure 1.2).

Figure 1.2: Innovation Activity Rates
(Source: CSO/ Forfas Community Innovation Survey 2006-2008)

Figure 1.2 indicates that firm size influences innovation activities with large firms producing more than twice as many innovations as small firms and almost one third more than medium sized firms.

Although the common feature of large and small firms is their requirement to innovate in a competitive marketplace, both groups face unique challenges and enjoy advantages over each other. In a dynamic and competitive landscape with limited resources SMEs must evolve their strategies to remain competitive. Typically, SMEs cannot compete directly with larger firms in reducing product manufacturing costs (Lee et al., 2001) therefore; they frequently focus on niche markets and product lines with higher product margins. A good strategy for an SME would be to use the advantages of informal, adaptive, responsive and creative processes to enable the development of successful new products.
The positive outcomes of product innovation include an enhancement of SMEs’ reputation and image, an increase in operational efficiency, and cost benefits resulting in a better business financial performance, recruitment of more skilled workforce, and greater in-house expertise leading to further innovation (Laforet, 2011). The negative outcomes of innovation relate to management, operational issues, and financial risks; including costs, uncontrollable business growth, companies’ image and reputation loss, employees and customers’ issues as well as health, safety, and environmental impacts (Laforet, 2011). However, innovation is a key driver of growth performance, and its contribution to economic growth is likely to increase (OECD, 2010) and as a result the positive benefits of innovation clearly outweigh the downside of innovation activities.

1.2.3 Barriers to Innovation

SMEs size mitigates against the potential influence they can exert in their markets, but it can afford them competitive advantage (Hill, 2001). Also SME’s size facilitates flexibility, strong relationships with customers, better internal communication and cross-functional coordination, and an ability to respond rapidly to changing environments. But SME’s also have certain disadvantages in relation to both human and financial resources which often may hinder product innovation developments. Cultural barriers to innovation such as reluctance to change, tendency to ignore procedure, focus on short-term requirements, lack of strategic vision and the diffusion of a blame culture also exist in the SME domain (Scozzi et al., 2005). Many of these barriers can be attributed to the little attention devoted to organisational and managerial problems, especially in the field of innovation (Scozzi et al., 2005) in SMEs.
Schumpeter (1942) hypothesised that small firms are at a disadvantage as their financial strength might not allow them to innovate effectively. Karlsson and Olsson (1996) found that SME’s are usually locally based and strongly influenced by what happens in their home community and this can quite often also exert a negative influence on innovation. SME’s may also suffer a disadvantage in conducting research and development (R&D) because of the inherent risks associated with economies of scale and economies of scope in production (Acs and Audretsch, 1990; Rothwell and Zegveld, 1982). In addition, high costs often involved in the innovation process constitute a significant barrier for entry for the SME. Nevertheless, there is little ambiguity in that firms need to create patterns of innovation to sustain an advantage over competition (Tushman et al., 1997).

International studies of SME attitudes and behaviour towards NPD reveal common challenges of resource limitations, skills deficiencies and organisational issues (Owens, 2007; Murphy and Ledwith, 2007; de Jong and Vermeulen, 2006; Siu et al., 2006; Xueli et al., 2002). Laforet (2008) identified that small firms have little choice when it comes to innovation and often are forced to defend their current position while large firms have the resources to develop more innovative products. However, Laforet (2008) notes that there is no conclusive result as to whether larger firms are able to produce more innovative products than smaller firms’, indeed here the field appears level. While larger firms typically have more resources to support radical innovation, they may be too bound by conventional thinking and formal processes to fully realise their potential (Allocca and Kessler, 2006; Laforet, 2008). Mosey (2005) suggests that SMEs can compete directly with large firms by developing products using novel, simpler technologies to develop new products with clear advantages. Accordingly, and by using the advantages of a flexible structure, better internal communications, the ability to
respond rapidly to changing environments, and close relationship with customers effectively in developing their product advantage strategy, the competitive environment with large firms will become more equitable and SMEs’ will be in a better position to compete thus enhancing competitiveness.

1.3 Research Aim and Objectives

As previously noted in Sections 1.1 and 1.2, little research has been undertaken on the nature of product advantage and its causal relationships with new product performance in SMEs. The nature of product advantage and new product performance in SMEs is thus vague and ill-defined. The purpose of this thesis is to identify the nature of product advantage and new product performance measurement in SMEs and then detail the interactions between them. This presents as the following Research Aim:


Essentially, it is argued that product advantage is a heterogeneous phenomenon that impacts the performance of a new product at varying dimensions. Understanding the interactions between product advantage and new product performance is essential for SMEs to defend or advance its innovative position. To this end the thesis will focus on SMEs in Ireland manufacturing either industrial or consumer products.

To facilitate an investigation of the research aim three research objectives, two exploratory (Research Objectives 1 and 2) and one causal (Research Objective 3) have been established:

Research Objective 1: To investigate the nature of product advantage in SMEs.
Research Objective 2: To investigate the nature of new product performance measurement in SMEs.

Research Objective 3: To determine the relationship between product advantage and new product performance in SMEs.

The research aim is important on several theoretical and practical grounds. This thesis addresses two critical areas associated with NPD; 1) product advantage, and 2) new product performance as depicted in Figure 1.3, and increases understanding of the interactions between these two critical areas in SMEs.

![SME PRODUCT ADVANTAGE STRATEGY](image)

**Figure 1.3: Depiction of the core Research Issue**

Varying definitions (holistic and multi-dimensional) of product advantage identify certain conceptual ambiguities associated with the construct and clarifying this is the basis for Research Objective 1. To aid in the investigation of Research Objective 1, a section of the literature review will explore previous definitions and measurement of the product advantage construct.

New product performance is the performance of the new product against certain pre-defined organisational measures; it is an output of the new product development process. Measuring new product success has remained elusive (Huang et al., 2004) and
there is little consensus amongst studies as to the measurement of new product performance especially in SMEs. The uncertainty associated with new product performance measurement in SMEs forms the justification of Research Objective 2. As a result a section of the literature will denote a review of new product performance measurement in SMEs.

Finally, a review of the NPD literature highlighting the factors critical to new product performance identifies product advantage as the most powerful differentiating factor between successful and unsuccessful new products (Nakata et al., 2006; Bonner and Walker, 2004; Langerak et al., 2004; Kaleka, 2002; Song and Parry, 1994; Montoya-Weiss and Calantone, 1994; Cooper et al., 1994; Craig and Hart, 1992). A positive relationship between product advantage and performance has been identified in many studies that found that product advantage is positively and significantly linked to the market and financial performance of a new product in large firms (Langerak et al., 2004; Song and Montoya-Weiss, 2001; Li and Calantone 1998; Song and Parry, 1997a; Cooper, 1994). But the relationship between product advantage and performance is different in small and large firms (Ledwith and O’ Dwyer, 2008; Verhees and Meulenberg, 2004; Pelham, 1999). Ledwith and O’ Dwyer (2008) found that product advantage has no impact on new product performance in small firms, thereby identifying uncertainty on the impact of product advantage on new product performance, which is the origin for the development of research objective 3. A section of the literature will detail the existing relationship between product advantage and new product performance.

The cumulative contribution to knowledge of this thesis is the clarification of the nature of product advantage (Research Objective 1) and new product performance
measurement (Research Objective 2) in SMEs. The determination of the mode of the relationship/interactions between product advantage and new product performance in the SME domain (Research Objective 3) has both theoretical and practical implications.

1.4 Research Approach

This thesis is both exploratory and causal in nature in that it seeks to explore product advantage and new product performance measurement practices in SMEs and investigate the causal relationship between them, building theory, developing a descriptive model and exploring it.

In accordance with Shaw (1999), the aims and objectives of any research project are largely determined by existing knowledge. In addressing this issue and to facilitate the investigative process, a research model of the research aim is constructed in Chapter 2. The research model is underpinned by a synthesis of the literature on product advantage, new product performance and product development in SMEs.

First, a critique of the literature on the nature of product advantage in SMEs in carried out, so as to ground Research Objective 1 against its current theory. Second, new product performance measurement is grounded in its theoretical base to underpin Research Objective 2. Third, the research model of the relationship between product advantage and new product performance is presented, to visualise Research Objective 3. Finally, empirical evidence is provided to, explore the applicability of the proposed nature of product advantage and new product performance measurement from a firm perspective, and examine the relationship between them.
To satisfy the exploratory and causal elements of this thesis a multi-method complementary research process is employed. First, quantitative research methods are used to test theory and advance the research model of the research aim. Second, the causal relationship between product advantage and new product performance, as depicted by the advanced research model, is tested and a descriptive model presented. Finally, qualitative research methods are used to increase understanding and inform on the exploratory research objectives 1 and 2 in the SME domain.

This complementary research approach was selected because quantitative designs are suited to establishing relationships between variables, but are weak in establishing the reasons for them, whereas qualitative methods help in developing explanations for the relationships. By using a complementary multi methodology weaknesses associated with each individual method are alleviated and greater interpretation and understanding of the research issue than would have been achieved in a single method study is gained.

1.5 Outline of thesis

This chapter, Chapter 1, contains an introduction to the research topic and issues covered in the thesis. Chapter 1 outlines the aims and objectives of the research, the approach taken and gives an outline of the thesis. The literature review is contained in Chapter 2 which outlines the current literature of the areas of product advantage and new product performance and culminates in the presentation of a research model outlining the nature of product advantage and new product performance and their causal relationships.
Chapter 3 outlines the research methodology for the thesis and gives an explanation of the purpose of the inquiry and the philosophy used. An explanation of quantitative and qualitative research methods is provided and the research plan – (the complementary mixed-method approach) - used in this thesis is detailed. Finally the analytical method used in interpreting the data is outlined the issues of reliability and validity of data discussed.

Chapters 4 and 5 outline the primary research undertaken as part of this thesis. Chapter 4 details the quantitative element of this thesis and Chapter 5 details the qualitative element. A detailed analysis of the quantitative and qualitative element of this thesis demonstrating the empirical evidence in relation to each of the research objectives is presented. Chapter 6 presents the discussion of the research issue by combing the quantitative and qualitative findings relative to each Research Objective and provides a deeper understanding of the issues under investigation.

Finally Chapter 7 concludes the thesis. Conclusions are drawn from the research, contributions to knowledge, and the theoretical and practical implications of the research are detailed. Figure 1.4 illustrates the outline of this thesis.
1.6 Conclusion

To conclude, this chapter has introduced the main topics under investigation in the research issue; product advantage and new product performance. The significance of this thesis has been discussed and the research aim, objectives and approach taken, presented. Also an outline of the subsequent chapters of this thesis has been provided. In the next chapter, Chapter 2 a more detailed analysis of the relevant literature is provided and the development of research model to aid in the investigation of the Research Aim commences.
Chapter 2 Literature Review
2.1 Introduction

The ambition of this thesis is to investigate new product development (NPD) in SMEs for the purpose of identifying, clarifying and evaluating how product advantage influences new product performance. This ambition is expressed in the following Research Aim:


To facilitate this investigation, two exploratory research objectives (Research Objective 1 and Research Objective 2) and one causal research objective (Research Objective 3) have been established:

1. To investigate the nature of product advantage in SMEs.
2. To investigate the nature of new product performance measurement in SMEs.
3. To determine the relationship between product advantage and new product performance in SMEs.

This chapter provides a critique of the relevant NPD literature that underpins the research aim. Although literature on product advantage and new product performance in large firms is vast, on SMEs the literature is scant. Therefore, the approach taken to reviewing the literature in this chapter is to examine product advantage and new product performance in the general literature and explore its applicability to small firms. Pursuing this approach ensures that a comprehensive review of the research aim is possible and allows for the identification of gaps in the literature.

This chapter first presents an overview of product innovation and SMEs in Section 2.2. Second, a synthesis of literature on product advantage (Research Objective 1) and new product performance (Research Objective 2) is outlined in Sections 2.3 and 2.4.
respectively. Third, the relationship between product advantage and new product performance (Research Objective 3) is documented in Section 2.5. Section 2.6 presents the proposed research model for this study and Section 2.6 concludes this chapter. Figure 2.1 details the Chapter outline:

![Figure 2.1: Outline of Chapter 2](image)

**2.2 Background Information**

To date a significant proportion of NPD research has concentrated on identifying the product characteristics that are linked to product success, that is, studies (for example Hsieh et al., 2008; Calantone et al., 2006; Hua and Wemmerlov, 2006; Song and Noh, 2006; Cooper, 2001; Song and Montoya-Weiss, 2001) have sought to identify what firms should prioritise in their NPD processes. Innovation policies have been developed based on the evidence derived from such studies, however, these policies have had mixed results for different sized firms. The following section presents the review of literature appropriate to SMEs and product innovations.
2.2.1 SMEs’ and Product Innovation

Product innovation is increasingly valued as a key component of the sustainable success of a business’s operations (Henard and Szymanski, 2001). Cooper and Kleinschmidt (1987:169) concluded that “New products are vital to the growth and prosperity of most manufacturing firms”. In relation to SME product innovation statistics, the Irish CSO/Forfas Community Innovation Survey 2006-2008 (2009:08) defines product innovation as “the introduction of a new good (or service) or a significantly improved good (or service) with respect to its capabilities. The product innovation could either be new to the market or new to the firm”.

The CSO/Forfas Community Innovation Survey 2006-2008 identified that within the Irish economy 27.8% of firms had a product innovation for a good or service in the period surveyed. Variance in sectors was noted, with 32.8% of firms in the industrial sector and 24.8% of firms in the services sector producing a product innovation. Within these sectors there was also a notable difference in relation to firm size (see Figure 2.2), with higher levels of innovative activity associated with large firms than for SMEs, confirming previous literature that innovative activity is influenced by firm size (Cohen and Klepper, 1996).

![Product Innovation types by Sector and Size](image)

**Figure 2.2: Product Innovation Types**
Total spending on innovation activities across the Irish economy was estimated to have been €5.3bn in 2008 which equates to 11% of total turnover. Variance was also noted in relation to firm size and product strategy, with new-to-market product innovations accounting for 5% of large firms’ turnover, and for 6% and 3.9% of SMEs turnover respectively.

Although statistics reveal that SMEs lag behind large firms when it comes to product innovation activity, their size does afford SME’s some advantages in the product innovation process (Scozzi et al., 2005). SMEs are flexible and have strong relationships with customers thus enabling a more rapid response to technical and market shifts, and they usually have good internal communications, which is often coupled with a dynamic and entrepreneurial management style (Scozzi et al., 2005). Additionally, innovation in small firms, although not at the same level, can be quite often more efficient and effective than their larger counterparts (Scozzi et al., 2005).

Roper (1997:523) looked at product innovation as a means of growth for small firms and identified that “Innovation in small firms is important both because of its direct contribution to the competitiveness of those companies but also because of the potential for the small firm sector to act as an initiator, catalyst and medium for wider technical change”. Roper (1997) highlighted that the output of innovative small firms was growing significantly faster than that of non-innovators. It was found that because of their closeness to the market, small firms may be the first to appreciate a market opportunity and develop a suitable technological response or because of their organisational and functional flexibility, small firms may be the first to adopt new technologies developed elsewhere (Roper, 1997). Additionally, the OECD (2000) highlights that relative to larger firms, SMEs produce two and a half times as many
innovations as large firms per employee and that they can better respond to changing market conditions, evolving consumer preferences and shorter product life cycles by customising and differentiating products. Indeed, Herbig, et al. (1994) found that SMEs can bring innovations more quickly to market.

On the other hand, there are several obstacles to innovation in SME’s such as; a lack of financial resources, an inadequacy of management and marketing, a lack of skilled workers, weaknesses in external information and linkages, and difficulties in coping with government regulations (Scozzi et al., 2005), all of which may cause barriers to product development. Additionally, SMEs typically cannot directly compete with larger firms to reduce product manufacturing costs (Lee et al., 2001), and must focus on niche markets and product lines with higher margins. By developing products to service niche markets and smaller market opportunities, not seen as important to larger firms (Lee et al., 2001). SMEs are able to avoid direct competition with their larger counterparts (Murphy and Ledwith, 2007). However, this situation is now tentative with McAdam et al. (2004:03) pointing out that “Niche markets, once the preserve of SMEs, are now being aggressively targeted by larger companies”. SMEs thus face the additional risk of developing small markets into larger ones, only to have larger companies move in and compete directly with them (Lee et al., 2001).

There is little doubt that the ability to effectively launch new products remains a key factor for success for both large and small firms (Cooper, 2001) but there is doubt as to who has the advantage in the process. Laforet (2008) notes that in the field of product innovations there is no conclusive result as to whether larger firms are able to produce more innovative products than smaller ones. While larger firms typically have more resources to support radical innovation, they may be too bound by conventional
thinking and formal process to fully realise their potential (Laforet, 2008; Allocca and Kessler, 2006). Although SMEs’ may not be as constrained by formalised processes, they are constrained by limited resources and must overcome these constraints with creativity to fully realise their innovative potential. In realising their innovative potential Mosey (2005) suggests that SMEs can directly compete with large firms by developing products using novel, simpler technologies.

In summation, literature provides many examples based on ‘good practice’ of successful NPD, yet the strategies employed to change and overcome the resource constraints that SMEs face to create a NPD capability have largely been overlooked. In conjunction with the current economic environment, it is clear that manufacturing organisations must rethink their strategy and enter the debate on how more innovative practices might enable them to create higher value and ultimately to improve their competitive position. Of particular importance within this debate is the significance of SMEs “as they are the life blood of modern economies” (Ghobadian and Gallear, 1996:83). This thesis highlights that a possible means for SMEs to develop NPD capabilities is in relation to product advantage and its ability to be the number one determinant of new product success.

The remainder of this chapter thus provides a review of literature on product advantage and new product performance so as to provide the foundation for the investigation of the Research Aim. Section 2.3 presents a review of literature on product advantage so as to underpin the investigation of Research Objective 1. Section 2.4 presents a review of literature on new product performance so as to reinforce the investigation of Research Objective 2 and Section 2.5 documents the relationship between product advantage and new product performance, Research Objective 3.
2.3 Product Advantage

Among the factors critical to new product performance, product advantage recurs as the most powerful differentiating factor between successful and unsuccessful new products (Nakata et al., 2006; Langerak et al., 2004; Bonner and Walker, 2004; Kaleka, 2002; Cooper et al., 1994; Song and Parry, 1994; Montoya-Weiss and Calantone, 1994; Craig and Hart, 1992). Indeed strong conceptual and empirical evidence shows that product advantage consistently appears as the most important product characteristic in explaining the adoption and success of a new product (Montoya-Weiss and Calantone, 1994). Confronted with increasing competition, decreasing product life cycles, product imitations and the increasing intensity of product change, a key quest for SMEs is to build observable product advantages into their new products in order to increase product adoption.

Product advantage has been a key concept in many empirical studies, as an independent variable, dependent variable or moderator, but in spite of the progress made by previous research, the conceptualisation of product advantage remains rather vague and its measures are not definite. Prior studies have used widely varying conceptualisations and operationalizations of this construct and consequently, conceptual weaknesses include an unrefined and uni-dimensional conceptualisation and a failure to distinguish the perspective taken (customers’ or firms). These flaws in conceptualisations have been carried through to the measurement of product advantage, which is often uni-dimensional and based on single items (See Table 2.1).

Table 2.1: Previous conceptualisations of Product Advantage in Literature

<table>
<thead>
<tr>
<th>Definition – Product Advantage is</th>
<th>Cooper 1979</th>
</tr>
</thead>
<tbody>
<tr>
<td>the extent to which the product offers unique benefits to the customer, higher quality than competitive offerings, reduces</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Reference</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>customer costs, how innovative the product is, is superior in the eyes of customers and whether the new product solves a customer problem</td>
<td>Calantone and di Benedetto (1988)</td>
</tr>
<tr>
<td>the benefits that customers get from the new product</td>
<td>Cooper (1994)</td>
</tr>
<tr>
<td>a differentiated product that delivers unique benefits and superior value to the customer</td>
<td>Montoya-Weiss and Calantone (1994)</td>
</tr>
<tr>
<td>the customer’s perception of product superiority with respect to quality, cost-benefit ratio, or function relative to competitors.</td>
<td>Atuahene-Gima (1995)</td>
</tr>
<tr>
<td>the relative superiority of the new product over competition. Product advantage is identified as encompassing unique benefits to customers, high quality, problem-solving, innovativeness and radically different from competitors.</td>
<td>Montoya-Weiss and Calantone (1994)</td>
</tr>
<tr>
<td>the general characteristics of the product offering relating to innovativeness, technology, per unit price, mechanical/technical complexity, custom product or not and investment.</td>
<td>Mishra et al. (1996)</td>
</tr>
<tr>
<td>uniqueness, quality, problem-solving capability, innovativeness, technical performance, and the ability to meet customers’ needs compared to other competitive offerings</td>
<td>Song and Parry (1997b)</td>
</tr>
<tr>
<td>a product’s perceived superiority relative to competitive products.</td>
<td>Song and Monoya-Weiss (2001)</td>
</tr>
<tr>
<td>the superiority and/or differentiation of the product over competitive offerings</td>
<td>Henard and Szymanski (2001)</td>
</tr>
<tr>
<td>associated with permitting customers to perform new tasks, meeting customer needs, and providing unique features for the customer.</td>
<td>Bastic (2004)</td>
</tr>
<tr>
<td>competitiveness and the satisfaction of customer needs</td>
<td>Blankson et al. (2006)</td>
</tr>
<tr>
<td>the degree to which a new product is perceived as superior to those of its competitors and mainly determines whether or not it is a market success.</td>
<td>Nakata et al. (2006)</td>
</tr>
<tr>
<td>the degree to which a product offering is superior to that of competing products</td>
<td>Calantone et al. (2006)</td>
</tr>
<tr>
<td>the perceived level of a product’s design, attributes, and quality relative to competitors</td>
<td>Hua and Wemmerlov (2006)</td>
</tr>
<tr>
<td>as certain product’s predominance providing customers’ superior than competitors’ benefits. These benefits are quality, features, technical performance and the capability to satisfy consumer needs.</td>
<td>Hsieh et al. (2008)</td>
</tr>
</tbody>
</table>
A critique of the studies (see Table 2.1) reveals little consistency in definition or in elements of the product advantage construct. Table 2.1 identifies a plethora of different characteristics, ranging from superiority, cost, customer, quality, technology, design, benefits, differentiation, problem solving and positive and negative impacts of innovativeness that have been identified as elements of product advantage and numerous definitions. However, although consensus is not reached in literature on a definition of product advantage, there is uniformity across definitions that product advantage represents elements pertaining to the product offering, formalises the advantages of the product that influences the purchasing decisions of consumers and forms the compelling reasons for product adoption by the marketplace.

But to date, it is still not sufficiently clear how new product characteristics are related to the advantages of the new product and how these advantages can be measured. It is not clearly known what product advantage is, how it can be measured and how specific characteristics influence new product performance. Additionally, product advantage research has evolved in two distinct phases (compounding the issues of clarity and indefinite conceptualisation) with earlier studies looking at a holistic single-dimensional construct and more recently studies identifying a delineated multi-dimensional version. It is argued that the lack of consistency and comparability (see Table 2.1) in the conceptualisation and measurement of product advantage across studies is a liability for research, and may cause contradictory and confusing implications for new product management. There is thus a need for a consistent, explicit definition and measurement scale for product advantage.
The following Section 2.3.1 examines the studies that took a holistic approach to the study of product advantage, in other words the studies that examined product advantage as a single dimensional monolithic construct and Section 2.3.2 examines the studies that took a multi-dimensional approach. In doing so, the evolution of product advantage can be mapped, the characteristics that define the construct can be identified and the most important advances in its conceptualisation and measurement detailed. The outcome of which is the precision, clarity and advancement in construct measurement required.

2.3.1 Holistic Product Advantage studies

Research into product advantage originated in the 1970s’, with seminal studies by Robert Cooper seeking to identify the determinants of new product success. Cooper (1979) conceptualised both the viewpoints of the customer and competitor, by defining product advantage as the extent to which the product offers unique benefits to the customer, whether the new product is of higher quality than competitive offerings, the extent to which it reduces customer costs, how innovative the product is, whether it is superior in the eyes of customers and whether the new product solves a customers’ problem. A subsequent study by Cooper (1983:248) examining the impact of new product development on firm performance highlighted new product innovativeness, high-technology, customer needs and uniqueness as the most important attributes of differential advantage reporting that “programs that have a major impact on the firm involve highly innovative and high-technology products – ones that feature several differential advantages (offer unique features to the customer and permit the customer to do a unique task)” indicating that differentiation is the key to product success.
Further advancing the notion of product advantage as key to success, Cooper and Kleinschmidt (1987) identified product advantage as one of nine drivers of new product success among large manufacturing firms, concluding that product superiority is the number one factor influencing commercial success for large firms. This was further supported by Cooper (1998:37) who identified “the most important single success factor was having a superior new product that delivered significant and unique benefits to the end user”. Similarly, Cooper (1990) concluded that superior products are more likely to succeed in the marketplace. Indeed, Kleinschmidt and Cooper (1991) indicate that the greatest advantage is found in innovative products as innovative products offer unique opportunities for product advantage and differentiation. The aforementioned large firm studies (Cooper, 1998, 1991, 1990, 1983, 1979; Kleinschmidt and Cooper, 1991; Cooper and Kleinschmidt, 1987) clearly establish a link between differentiation and superiority attributes of product advantage and the commercial success of new products.

In further attempts to isolate specific product advantage characteristics, Cooper and Kleinschmidt (1993) examine the role of product superiority as a component of product advantage and establish superiority in quality, value, uniqueness, and need fulfilment as the strongest predictors of new product success. The importance of having a product advantage was also examined by Cooper (1994:61), in which it was recognised that “Delivering unique benefits and product value to users – separates winners from losers more often than any other single factor”. This led Cooper (1994:64) to determine that “the development of a new product with real advantages and customer benefits becomes paramount. Simply being equal to the competition or having good product/market fit is not enough: the goal must be superiority and advantage”.

32
In a meta-analysis of new product performance, Montoya-Weiss and Calantone (1994) identified 18 determinants of new product performance from existing literature (Cooper and Kleinschmidt, 1987; Utterback et al., 1976; Rothwell et al., 1974). Montoya-Weiss and Calantone, (1994:41) defined product advantage as “the customer’s perception of product superiority with respect to quality, cost-benefit ratio, or function relative to competitors” and as a new product strategy, creating product advantage was the most important strategic factors that influences new product performance. The inclusion of customer perceptions in the definition of product advantage highlights the importance of the customer viewpoint to new product performance.

In the period ranging from the late 1970s’ to the mid-1990s’ several advancements were made in conceptualising product advantage. Product advantage was recognised as the single strongest predictor of new product success. Additionally, the aforementioned studies (Montoya-Weiss and Calantone, 1994; Cooper, 1994, Cooper and Kleinschmidt, 1993) clearly attest to product advantage being synonymous with differentiation and superiority relative to competitors’ offerings. Innovativeness was noted to lead to increased differentiation and quality, value, uniqueness, and need fulfilment, which were identified as the most important superiority characteristics.

Subsequently, Cooper (2001) found that, the most important single success factor was having a superior new product that delivered significant and unique benefits to the end user. The odds of success with a unique, superior product were over 80% in contrast the ‘me too’ or run-of-the-mill products achieved a success rate of only 28%. Superior products were three times more likely to succeed than ‘me-too’ products. A superior product is a product that offers unique features; provides good value-for-money; meets customer needs better; has higher relative product quality; boasts superior
price/performance characteristics; has benefits perceived as useful and whose benefits are highly visible (Cooper 2001) thus reaffirming a distinct superiority dimension to product advantage. These core large firm studies identify that product advantage is important on two fronts; the benefits to the consumer, and superiority relative to competitors. Consumer benefit is achieved by being closely able to match needs, and superiority in the form of quality, cost and uniqueness relative to competitors correspond to product advantage. Additionally the impact of firm size on product advantage was noted.

Further studies conducted during the 1990s’ and 2000s’ examined product advantage in different situations and identified that the nature and impact on success of product advantage can change depending on firm size, strategic orientation, industry and sector. In a study of the determinants of success in small entrepreneurial high-technology firms, Yap and Souder (1994) highlighted that individual product characteristics allow for the creation of product advantage in products and identified product characteristics as the antecedent category affecting new product success in SMEs. Yap and Souder (1994) identified the product characteristics which may allow for product advantage in SMEs as performance superiority, unique features, compatibility, cost effectiveness and support/service.

Yap and Souder (1994) found that the advantages of a cost-effective product and a product with good customer support/service were correlated with success in small firms under conditions of low market uncertainty while under conditions of high market uncertainty, small firms should offer products that are compatible with the adopting firm’s existing products, processes and technologies and be cautious about trying to tailor products to particular individual customers. Market uncertainty refers to the rate
of change in the composition of customers and their preferences (Hanvanich et al., 2006). According to Harris (1998), an unclear view of the customer, contentment with the status quo, ignorance of market orientation, lack of competitive differentiation, limited resources, perceived inappropriateness and a short-term mentality are several key factors impinge on the ability to focus on market trends and needs and as such may direct product advantage activities in firms of different sizes.

Similarly, in an international study of small and large high technology electronics firms, Souder and Song (1997) examined the effect of product design as a contributing factor to new product performance. Souder and Song (1997) used four parameters; performance superiority, technical superiority, radicalness and compatibility to measure the effect of product design on new product performance and highlighted distinct differences in the effect of product design on new product performance in small and large firms. Confirming the findings of Yap and Souder (1994), Souder and Song (1997) found that designing performance superiority, technical superiority and radicalness into new products is negatively correlated with commercial success for small firms. Souder and Song (1997) identified that, compatibility is correlated with success for small electronic firms and that technical and performance superior designs do not relate to success.

These findings by Yap and Souder (1994) and Souder and Song (1997) are consistent with previous literature (Link, 1987; Souder. 1987; 1988; 1989; Wind, 1982; Souder and Chakrabarti, 1978; Pessemier, 1975), in that cost effectiveness, customer service and compatibility are correlated with successful new product performance in SMEs. Performance superiority and unique features were not correlated with successful new product performance in SMEs.
Similarly, a subsequently study by Song et al. (1997) which sought to develop and test a casual model of the relationships among the key variables leading to new product performance, clarified that product quality influences most strongly and positively new product performance in large firms. A notable distinction in this study (Song et al. 1997) is that the product advantage characteristics that foster success in large firms; innovativeness, problem-solving, benefits, relative to competitors’ offerings and matching customer needs were not found to influence success in SMEs. In a study of non-service large firms Song and Parry (1997b:66) identified a “significant positive relationship between the level of new product success and measures of product competitive advantage, such as the presence of unique features, relatively high product quality, and the ability to reduce consumer costs or enable the consumer to perform a unique task” again highlighting the difference in the composition of product advantage in small and large firms.

Atuahene-Gima (1995) in a cross-sectional study of both service based and manufacturing firms introduced radicalness and a differentiation characteristic into the product advantage mix by identifying product advantage as encompassing unique benefits to customers, high quality, problem-solving, innovativeness and radically different from competitors. Mishra et al. (1996) sought to identify a global set of factors that contribute to product success and found that, although there seemed to be some global relationships between new product development factors and product success, no universal pattern exists. Mishra et al. (1996) identified the general characteristics of the new product venture (the product’s innovativeness to the market and its technical complexity) are closely related to new product outcomes and found that in relation to the product offering that a reduction of customers’ costs, better satisfaction of
customer’s needs and unique features of the product are all related to successful new products.

Li and Calantone (1998), in a study of small and large software firms, looked at the impact of market knowledge on new product advantage and established that new product advantage exerted a significant influence on new product performance. Product advantage was defined in terms of new product attributes; such as new product quality, reliability, newness and uniqueness, which provide a more concrete picture of a firm’s ability to meet customer needs and confirm that “differences between alternatives on the important attributes provide direct evidence of advantage” (Day and Wensley, 1988:14). Li and Calantone (1998) support the critical nature of superiority in product advantage, and highlight the importance of the creation of superior new products that meets customers’ needs, superiority being important to product advantage.

Further compounding the importance of uniqueness and newness to product advantage, Bastic (2004), in a study of manufacturing firms with over 50 employees, used eight items to measure product superiority. The eight items were; benefit to cost ratio, meeting the customer’s needs, reducing the customers cost, technical performance, unique features for the customers, higher quality, environmental responsibility, and permitting the customers to carry out new jobs. Bastic (2004) found that product advantage is associated with permitting customers to perform new tasks, meeting customer needs, and providing unique features for the customer and that the level of new product success is positively correlated with the level of product advantage. Although Bastic (2004) examined product advantage in a manufacturing context, no study has examined whether the type of manufacturing (business-to-business or business-to-consumer) has an impact.
Gatignon and Xuereb (1997) in a cross sectional study on a firms strategic orientation and its relationship with new product performance, looked at the impact of innovation characteristics on product advantage. Innovation characteristics were analysed according to Rogers (1983) scheme, which proposed that the innovation’s relative advantage, compatibility, trialability and observability are positively related to adoption and that innovation complexity and perceived risk are negatively related to adoption. Gatignon and Xuereb (1997) found that, the performance of an innovation is directly related to the innovation characteristics, and that the greater the product radicalness the smaller the product similarity with its competitors, and also the greater the product advantage and the lower the product costs, the better the perceived performance of the innovation. Thus showing that the more dissimilar an innovation is from its competitors, the greater the product advantage, clearly identifying a distinct linkage between high levels of product innovativeness, differentiation relative to competitors’ offerings and product advantage and confirming previous findings by Cooper (1983).

Hultink and Hart (1998) (in an empirical investigation into the launch strategies associated with high and low levels of product advantage) using Cooper’s (1979) definition of product advantage, confirmed the associations of high and low levels of product advantage with launch decisions except for one. No significant difference was found among the two categories of product advantage with respect to the price of the new product compared to competitors. Hultink and Hart (1998) divided product advantage along the lines of high, medium and low product advantage and omitted medium product advantage from the associated investigations. Although Hultink and Hart (1998) were the first to demonstrate the association between high and low levels of product advantage and its associated effects on NPD variables, they did not examine the
association between high and low levels of product advantage and new product performance.

Langerak et al. (2004) in a study focusing on product advantage (because product benefits typically form the compelling reasons for customers to buy the new product) and on product launch proficiency (as the launch stage represents the most costly and risky part of the NPD process), highlight activities that crystallize into a superior product indicating that superiority is the key characteristic of product advantage. In a study not directly associated with product advantage, Song and Noh (2006) investigated the critical factors affecting the likelihood of new product success and effective new product development (NPD) models for high-technology firms. Song and Noh (2006) suggest that, successful projects differ from unsuccessful projects in project environment, skills and resources, project leadership, strategic fit, efficient NPD process and effective product-positioning strategies. Product positioning strategy was defined as having an emphasis on quality, features, compatibility, cost and service. The product positioning strategies with the highest correlations with success were products versatility, products compatibility, unique features and price although, compatibility/versatility and performance/superiority had higher correlations with new product success while product feature/service has lower correlations thus highlighting a positive relationship between innovativeness and superiority and product success and providing support for earlier findings of Gatignon and Xuereb (1997).

Hua and Wemmerlov (2006), in an investigation of the intensively competitive personal computer (PC) industry looked at the relationship between product change intensity and product advantage and market share. The analysis concluded that a PC firms’ product rate of change is positively associated with its product advantage and that’s its product
advantage, in turn, is positively associated with its market share and growth performance. In Hua and Wemmerlov’s (2006) study, product advantage was used as a performance measure and focused on product price, quality, performance and customer service (Cooper and Kleinschmidt, 1996; Robinson, 1990; Maidique and Zirger, 1983; Corey, 1983) along with a product feature-related item to reflect product characteristics resulting from frequent product changes. Product advantage was defined as the perceived level of product design, attributes and quality relative to competition (Song and Parry, 1999; Cooper and Kleinschmidt, 1996; Robinson, 1990; Maidique and Zirger, 1983; Corey, 1983), and reflected the relative market position as a result of multiple product successes and failures over time. Hua and Wemmerlov (2006) establish that the more frequently a firm redesigns and improves its products, the more likely it is that its products have higher levels of product advantage thereby highlighting positive associations between product changes intensity, product advantage and market success. It is also noted that Hua and Wemmerlov (2006) found that firm size and product life did not help explain any variance in product advantage. In relation to competitive uncertainty, Appiah-Adu and Singh, (1998) highlighted that strong competition will drive an SME to seek new products that enable them to survive and in such a situation it is important to subscribe to a strong competitor focus.

Hsieh et al. (2008:02) establish that many high-tech firms pursue an “innovative and product advantage” strategy when launching their new products. These firms aim to introduce products with high innovativeness and compete with rivals by producing above average products, supporting Gatignon and Xuereb (1997) concepts that the greater the product radicalness, the smaller the product similarity with competitors and the greater the product advantage but identified that product advantage does not always promise new product performance (Hsieh et al., 2008). These studies highlight that
large firms tend to operate in more technologically sophisticated environs, than small firms’ whose products tend to be developed on a single core technology for a niche market. The larger resource base of larger firms enables them to employ both customer and competitor knowledge acquiring processes in their NPD processes indicating that large firm pursue innovative technologies while smaller firms do not. Empirical research has shown that small firms can introduce radical product innovations but that their innovative behaviour is different from large firms because their resources are different (Galende and de la Fuente, 2003). As a result of the limited resources (Freel, 2000; Carson et al. 1995) SMEs develop relationships with customers because customers are a valuable source for new product ideas (von Hippel, 1988) and they provide the necessary resources (Foster, 1986; Cooper and Schendel, 1976; Pfeffer and Salancik, 1978).

The review of literature reveals variations in the characteristics that constitute product advantage. Several studies support superiority and/or differentiation of the product over competitive offerings as the key characteristic of product advantage (Heish et al., 2008; Calantone et al., 2006; Nakata et al., 2006; Henard and Szymanski, 2001; Song and Montoya-Weiss, 2001). Other studies, Bastic (2004) and Blankson et al (2006) identified that product advantage is associated with permitting customers to perform new tasks, meeting customer needs and providing unique features for the customer. Whereas, Mishra et al. (1996) identified product advantage as relating to characteristics of the product offering such as innovativeness, technology, per unit price and mechanical/technical complexity.

Furthermore, a synopsis of literature reveals 14 product advantage characteristics that have been satisfactorily linked to success in different studies, further compounding the
uncertainties surrounding product advantage conceptualisation and measurement. These product advantage characteristics are: 1) be better relative to competitive offerings, 2) be superior, 3) be unique, 4) be of better quality, 5) solve-problems, 6) be innovative, 7) enable better technical performance, 8) meet customers’ needs, 9) enable differentiation, 10) provide benefits, 11) have better product design, 12) have better individual attributes/features, 13) match customer perceptions and 14) be cost effective. Table 2.2 identifies each of the 14 characteristics and its representative literature.

Table 2.2: Identified Product Advantage Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Representative Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be better relative to competitive offerings</td>
<td>Montoya-Weiss and Calantone (1994); Atuahene-Gima (1995); Song and Parry (1997b); Song and Montoya-Weiss (2001); Henard and Szymanski (2001); Nakata et al. (2006); Calantone et al. (2006); Hua and Wemmerlov (2006); Heish et al. (2007); Ledwith and O’ Dwyer (2008)</td>
</tr>
<tr>
<td>2. Be superior</td>
<td>Cooper (1994); Montoya-Weiss and Calantone (1994); Atuahene-Gima (1995); Song and Montoya-Weiss (2001); Henard and Szymanski (2001); Nakata et al. (2006); Calantone et al. (2006); Heish et al. (2007); Ledwith and O’ Dwyer (2008)</td>
</tr>
<tr>
<td>4. Be of better quality</td>
<td>Montoya-Weiss and Calantone (1994); Atuahene-Gima (1995); Song and Parry (1997b); Hua and Wemmerlov (2006); Heish et al. (2007); Ledwith and O’ Dwyer (2008)</td>
</tr>
<tr>
<td>5. Solve problems</td>
<td>Atuahene-Gima (1995); Song and Parry (1997b)</td>
</tr>
<tr>
<td>6. Be innovative</td>
<td>Atuahene-Gima (1995); Song and Parry (1997b)</td>
</tr>
<tr>
<td>7. Enable better technical performance</td>
<td>Song and Parry (1997a); Heish et al. (2007)</td>
</tr>
<tr>
<td>8. Meet customers’ needs</td>
<td>Calantone and di Benedetto (1988); Cooper (1994); Montoya-Weiss and Calantone (1994); Atuahene-Gima (1995); Song and Parry (1997b); Bastic, (2004); Heish et al. (2007); Ledwith and O’ Dwyer (2008)</td>
</tr>
<tr>
<td>9. Enable differentiation</td>
<td>Cooper (1994); Atuahene-Gima (1995); Henard and Szymanski (2001)</td>
</tr>
<tr>
<td>11. Have better product design</td>
<td>Hua and Wemmerlov (2006)</td>
</tr>
<tr>
<td>12. Have better individual attributes/features</td>
<td>Bastic (2004); Hua and Wemmerlov (2006); Heish et al. (2007)</td>
</tr>
<tr>
<td>13. Match</td>
<td>Montoya-Weiss and Calantone (1994); Song and Montoya-Weiss</td>
</tr>
</tbody>
</table>
The extant literature on product advantage has revealed that product advantage has been a key concept in many empirical studies, as an independent variable, dependent variable or moderator. Indeed the literature review reveals 14 characteristics (see Table 2.2) that have been found indicative of product advantage in different situations. However, the literature review reveals that the extant literature is over reliant on large firm studies. In addition the review has highlighted several factors that may impact product advantage in firms namely; firm size, firm type and product strategy. Studies have shown that large firms indicate the importance of innovativeness, differentiation and superiority while small firms indicate that the customer viewpoint and satisfying customers' needs is most important. Similarly, product strategy - whether the product is a new product, product extension or product improvement - has been found to influence the choice of advantage to present in new products. Furthermore, in identifying the factors that have been found to impact product advantage in previous studies this review has highlighted a gap in the literature in that studies have not considered the impact of firm type (business-to-business or business-to-customer) on product advantage in firms.

As noted in Section 2.3 the focus of product advantage research has evolved from looking at a holistic single-dimensional construct (for example, Bastic, 2004; Henard and Szymanski, 2001) to more recent studies recognising a delineated multi-dimensional construct (for example, Rijsdijk et al., 2011; McNally et al., 2010;
Szymanski et al., 2007; Calantone et al., 2006). The following section details the advancements in the multi-dimensional conceptualisation of product advantage.

**2.3.2 Studies that have identified a multi-dimensional product advantage construct**

In a significant move away from previous holistic conceptualisations, four recent studies (Rijsdijk et al., 2011; McNally et al., 2010; Szymanski et al., 2007; Calantone et al., 2006) have decomposed product advantage and profiled different components that constitute its structure. Calantone et al. (2006) noted that previous research failed to clearly distinguish product advantage from product innovativeness and suggested that a distinction be made between product innovativeness, product advantage and customer familiarity. Additionally Calantone et al. (2006) suggested that the ambiguity in the findings in relation to the relationship between product innovativeness and product success was due to an overly holistic conceptualisation of product innovativeness that has included the concepts of product advantage and customer familiarity and that this was inaccurate.

Further supporting the decomposition of the product advantage construct Szymanski et al. (2007) also suggest that researchers sometimes inaccurately conceptualised product innovativeness as including a ‘meaningfulness’ component, which is more related to product advantage than to innovativeness (meaningfulness is defined as the degree to which any new product has functional relevance to its potential user group). Szymanski et al. (2007) conducted a meta-analysis of 95 correlations on product innovativeness and new product performance that were recorded in 32 studies. The study found that the relationship between innovativeness and performance was small to moderate in size but
that this increased when innovativeness measures that included a meaningfulness dimension were integrated. The findings also revealed that innovativeness today may not represent the same competitive advantage as it did in previous years, unless the focus is on products and specifically new-to-the-market rather than new-to-the-firm products. Thus innovativeness is only partially relevant to new product success and only in certain circumstances.

McNally et al. (2010) in an examination of the relationship between product advantage (classified as superior to competitors), product innovativeness (classified as marketing, technical and customer discontinuities) and product financial performance found that product advantage was not correlated with firm based product innovativeness (technological and marketing discontinuity) but was moderately correlated with customer discontinuity. Additionally the positive relationship between product advantage and financial performance was supported. McNally et al. (2010) further highlights the contentious relationship between product superiority and product innovativeness and product meaningfulness and the need to distinguish between them.

Similarly, Rijsdijk et al. (2011) identified a need to distinguish between the constructs of product meaningfulness, product superiority and product innovativeness as the innovativeness of a new product does not by definition imply that a product is meaningful to customers or superior to competing offerings. Rijsdijk et al. (2011) note that capturing a product’s innovativeness, meaningfulness and superiority within a one-dimensional product advantage construct as done in previous studies (see Table 2.1) does not effectively capture the unique role that each plays in enhancing new product performance. Using measures based on Atuahene-Gima (1995) and Cooper and Kleinschmidt (1987), Rijsdijk et al. (2011) deconstruct product advantage to comprise
of two components product meaningfulness and product superiority. Product meaningfulness concerns the extent to which the new product’s attributes and functionalities are beneficial to (potential) customers (Im et al., 2008). The second component is product superiority which refers to the extent to which a new product outperforms competing offerings along with existing attributes and functionalities (Day and Wensley, 1988). While previous studies (McNally et al., 2010; Szymanski et al., 2007; Calantone et al., 2006) focused on the separation of product innovativeness, and its’ theoretical distinction from product advantage, Rijsdijk et al. (2011) concentrate on product advantage and using the component-wise approach outline the distinction between meaningfulness and superiority as separate components of product advantage.

Additionally Rijsdijk et al. (2011) examined the effect of market turbulence on product meaningfulness and product superiority and highlighted that under conditions of high market turbulence, product meaningfulness is more important for NPP and its importance decreases as markets stabilize. After markets have stabilized product superiority contributes more strongly to new product performance. This suggests that micro and small firms are operating in more turbulent market environments than the larger firms in the study.

This evolutionary process highlights that viewing product advantage as a monolithic construct is restrictive and that a multi-dimensional product advantage provides a platform for the effective capturing of the important role that product advantage plays in enhancing product development. Such a categorisation moves product advantage research beyond the traditional holistic conceptualisation to a multi-component product advantage construct comprising of three entities; product innovativeness, product superiority and product meaningfulness. In doing so, a deconstructed conceptualisation
of product advantage is advanced which may be more appropriate, as it provides distinct ideas on the understanding of product advantage and how new products deliver advantage to customers. Additionally, such a categorisation benefits prediction, in that the specific product characteristics that impacts on core performance measures can specifically be identified. The situation being investigated is simplified, and the impact the different dimensions have on specific performance measures can be identified, thus enabling SMEs to specifically target product development actions towards areas upon which they wish to improve performance.

However, the importance that firms attribute to each element has not been adequately discussed in literature nor has it been investigated sufficiently within SMEs. Furthermore no study has previously examined the three components in a single study nor has a deconstruct product advantage been empirically tested. As a result it is still not sufficiently clear how new product characteristics are related to the components of product advantage and how these components can be measured.

This study thus contends that a precondition of the investigation on the nature of product advantage (Research Objective 1) is the development of an explicit definition and measurement scale for product advantage. Developing a disaggregated product advantage construct and measurement scale prior to further analysis would go a long way in advancing the conceptualisation and measurement of product advantage. This study will thus conduct analysis the 14 product advantage characteristics that have been found to constitute product advantage (see Table 2.2) for the purpose of identifying the underlying structure of product advantage. Additionally, to conduct a comprehensive investigation of the nature of product advantage in SMEs it is necessary that this study
considers the impact of previously noted factors such as firms size, firm type and product strategy on product advantage in SMEs (see Figure 2.3).

**Figure 2.3: Product Advantage**

In summation, the path depicting the evolutionary development from a holistic to multi-dimensional product advantage has been presented and reveals that it may be most appropriate to view as a multi-dimensional construct. Additionally, three factors that may influence product advantage in SMEs have been found. However the review of literature points out that prior to further analysis on the nature of product advantage in SMEs it is necessary to explore the factor structure of product advantage and make its measurement explicit.

The following section examines the literature on new product performance so as to underpin the investigation of Research Objective 2.
2.4 New product performance

The success rate of new products worldwide has been low (Bogue and Delahunty, 1999), with research showing that on average only one in four new products succeed in the marketplace (Cooper, 2001). Therefore, increasing understanding on the dimensions of, and what, drives new product performance is critical if firms are to continue to successfully innovate. New product performance (NPP) is the performance of the new product against certain pre-defined organisational measures and “describes the degree to which a new product is perceived to have achieved its market share, sales growth, customer growth and profit objectives” (Atuahene-Gima and Ko, 2001:58). However, NPD research has often measured NPP opportunistically (Huang et al., 2004) which has resulted in a large number of measures being used (Cooper and Kleinschmidt, 1993). For example performance measures have been classified using financial and non-financial measures (Hart, 1993); internal (project) and external (market) measures (Garcia et al., 2008; Blindenbach-Driessen et al., 2005) and efficacy and efficiency (Alegre et al., 2006). Also the new products impact on the organisation can be multi-level and multi-dimensional (Cooper and Kleinschmidt, 1987), complex and dynamic (Hart, 1993), subtle and only perceivable in the long term (Maidique and Ziger, 1984). The interpretation of success is also affected by the various interested groups involved in the new product development process such as research and development, marketing and production (Huang et al., 2004). Thus measuring new product success has remained elusive (Huang et al., 2004) with little consensus within the literature as to how new product performance should be measured.

In relation to new product performance measurement activities several studies (Ledwith and O’ Dwyer, 2008; Langerak et al., 2004, Huang et al., 2004; Atuahene-Gima, 1995; Montoya-Weiss and Calantone, 1994; Cooper, 1994; Griffin and Page, 1993, 1996)
have tried to measure new product performance in different situations. A task force set up by the Product Development Management Association (PDMA) examined 77 articles and identified sixteen measures considered to be the core new product success measures for new products (Griffin and Page, 1993). These measures were categorised into four distinct performance areas 1) customer acceptance measures; 2) financial performance measures; 3) product-level measures and 4) firm-level measures. In addition, Montoya-Weiss and Calantone, (1994) in a meta-analysis of the determinants of new product performance identified three broad categories that capture the measures of new product performance used in studies 1) financial objectives (profit, sales, payback period, costs), 2) market share objectives and 3) technical objectives. Likewise, Cooper (1994), measured new product performance in terms of financial performance, market share, the impact on the firm, meeting objectives, and timeliness. In a large firm study and using the measures created by Griffin and Page (1993; 1996), Hultink et al. (2000) carried out a series of studies involving managers who were responsible for launching new products and revealed that the two most adopted measures of new product performance were market and financial outcomes. Langerak et al. (2004) in a study which touched on the relationship between product advantage and new product performance adapted the measures developed by Griffin and Page (1993; 1996) and developed a seventeen item NPP measurement scale across five dimensions. Nakata et al. (2006) looked at new product performance in relation to the products relative performance and devised a five-item measure adapted from Cooper and Kleinschmidt (1995) and Song and Parry (1997b) to assess relative market share, relative sales, and relative profitability of new products.

In a study on small firms Huang et al. (2004) reported that the most commonly used new product performance measures were non-financial measures; customer acceptance,
customer satisfaction, achieving product performance goal, and meeting quality goals. These findings suggest that SMEs consider product-level measures and subjective market acceptance to be primary measures of new product success, while financial measures seem to be a secondary concern (Huang et al., 2004) and highlight differences in NPP activities between small and large firms. Similarly, Ledwith and O’Dwyer (2008) found that SME’s are more successful on customer acceptance measures than on financial performance measures.

Confirming the findings of Huang et al. (2004), Ledwith and O’Dwyer (2008) suggest that SMEs’ consider the quality and performance of a new product and its market acceptance to be primary measures of new product success (Huang et al., 2004), while financial measures seem to be a secondary concern. Ledwith and O’Dwyer (2008) found new product performance to be a strong predictor of organisational performance in SMEs, but of the five new product performance measures only market-level measures and financial measures were significant contributors to organisational performance (neither product-level nor customer-acceptance performance measures are linked with organisational performance). This is interesting in that the same study found that SME’s rate their performance in terms of product-level and customer acceptance measures above market-level and financial-level measures. The findings by Huang et al. (2004) and Ledwith and O’Dwyer (2008) are supported by earlier research that identified customer acceptance and customer satisfaction as the most commonly used measures of new product success (Lipovestsky et al., 1997; Griffin and Page, 1996) but also identifies the new product performance activities are different in small and large firms.

Furthermore, Griffin and Page (1996) identified that the set of measures for assessing project-level success depends on the product strategy. For example the objectives and
success criteria for a new product that creates an entirely new market will differ from those of a project that extends an existing product line. Griffin and Page (1996) highlight that the no single NPP measure suffices for gauging the success of every product development project and detailed the most appropriate set of measures for each project strategy; new-to-the-company; product extensions and product improvements.

In summation, although much research on the classification of new product performance exists (Garcia et al., 2008; Alegre et al., 2006; Blindenbach-Driessen et al., 2005; Hart, 1993), research on the composition of the NPP dimension in SMEs is scant. In their study Huang et al. (2004) conducted a factor analysis on Griffin and Page’s (1993, 1996) seventeen measures of new product performance and identified a four factor solution for NPP measurement in SMEs. Huang et al. (2004) identified that financial performance, objective market performance, subjective market performance, and product-level measures underline product success at an individual project level in SMEs.

Additionally a review of literature reveals that although there is little consensus in literature as to how new product performance should be measured there is consensus that new product performance should be measured using multiple criteria (Huang et al., 2004). The literature review also reveals that new product performance activities and the measures indicative of product success differ in small and large firms, and that product strategy is an antecedent to new product performance measurement behaviours. In reviewing literature it was also noted that studies have not consider the impact of firm type (business-to-business or business-to-consumer) on the measurement activities of firms.
Literature thus highlights that the classification of new product performance in SMEs is under-explored. This study contends that such an under exploration is a barrier to the efficient investigation of Research Objective 2; to investigate the nature of new product performance measurement in SMEs, and highlights the appropriateness of new product performance for factor structure identification.

To facilitate the identification of the factor structure of new product performance this study will conduct a factor analysis on 17 new product performance measures adapted from Griffin and Page (1993, 1996) and used successfully by Langerak et al. (2004) and Ledwith and O’Dwyer (2008):

- market-level performance (unit volume goals; met revenue goals; met sales growth goals; met market share goals),
- financial performance (return on investment or internal rate of return; met profitability goals; met contribution marginal goals; development costs),
- customer acceptance (customer acceptance; customer satisfaction; number of customers; customers competitive advantage),
- product-level performance (met performance specifications; met quality specifications) and
- timing (launch on time; time to market; break-even time).

Additionally, to conduct a comprehensive investigation of the nature of new product performance in SMEs it is necessary that this study considers the impact of firms size, firm type and product strategy on new product performance in SMEs (see Figure 2.4).
This section has highlighted that the structure of the new product performance dimension in SMEs is unclear. Additionally, several factors that may influence new product performance measurement activities in SMEs have been identified. The following section 2.5, details literature on the causal relationship between product advantage and new product performance in SMEs, pursuant to Research Objective 3.

2.5 Product Advantage and New Product Performance

It is widely accepted in the literature that there is a relationship between product advantage and new product performance in firms (Langerak et al., 2004; Bastic, 2004; Henard and Szymanski, 2001; Song and Montoya-Weiss, 2001; Cooper, 2001, 1994, 1979; Li and Calantone, 1998; Song and Parry, 1997a,b; Gatignon and Xuereb, 1997).
Evidence of the relationship between product advantage and new product performance has been found in the US, Canada, Europe, Korea, Australia and Japan (Ledwith and O’Dwyer, 2008; Nakata et al., 2006; Langerak et al., 2004; Huang et al., 2004; Bastic, 2004; Mishra et al., 1996; Parry and Song, 1994; Cooper and Kleinschmidt, 1987; 1993; Cooper, 1979, 1994). However, although the relationship between product advantage and new product performance has in many studies been identified as positive, the nature of the relationship is unclear.

A meta-analysis by Henard and Szymanski (2001) and an empirical investigation by Cooper (1979) both demonstrated that advantage is an important determinant of new product success. A study of 260 new product managers (Nakata et al., 2006) found that new product advantage corresponds with higher new product performance in firms. Similarly, Li and Calantone (1998) determined that product advantage is significantly linked to new product performance for software firms and Japanese manufacturers also indicate that product advantage correlates positively with new product performance (Song and Parry, 1997a; Song and Montoya-Weiss, 2001). These studies demonstrate that product advantage is linked to the market and financial performance of a new product.

Cooper and Kleinschmidt (1987) identified product advantage as one of nine drivers of new product success among firms. The dominance of product advantage was also addressed by Henard and Szymanski (2001) in which it was found that product advantage is a prevailing driver of new product performance. This is supported by Langerak et al. (2004) who also reported a positive significant relationship between new product advantage and new product performance. Langerak et al. (2004) found that the higher the product advantage the better the new product performance. Similarly Nakata
et al. (2006) found that the degree to which a new product is perceived as superior to those of competitors mainly determines whether or not it is a marketplace winner. It was also found by Nakata et al. (2006) that a positional advantage held by a firm should be rewarded with market share and/or profitability exceeding competitors. Therefore, in relation to innovation efforts, when advantages are built into new products, the products should be better received in the marketplace, or have higher NPP.

However, Yap and Souder (1994) found that product advantage is not always associated with success in small firms, concluding that small firms should develop compatible products, adopt one core technology and avoid diversification. Likewise, Souder and Song (1997) indicate that SMEs’ should avoid many of the NPD strategies that are associated with success in large firms. Compatibility was found to be correlated with success. In some industrial markets compatibility is also the key issue and products that are incompatible or different from the market norm are more difficult to sell. Consistent with this finding, Ledwith (2000) found that, the initial cost of the product and the level and support offered was positively linked with success in large firms, while product compatibility was the only product characteristic linked with success in small firms. Similarly, Calantone et al. (2006) found that a high level of product innovativeness (product innovativeness an attribute of product advantage) reduces customer familiarity, indicating that product innovativeness can be detrimental to new product success if customers are not sufficiently familiar with the nature of the new product and if innovativeness fails to improve product advantage.

Hsieh et al. (2008:09) found that while product advantage positively impacts new product performance in total, it does not impact each part equally; concluding that “product advantage has a positive impact on market performance but has a slightly
weaker influence on financial performance”. Ledwith and O’Dwyer (2008) found that new product performance and product advantage are different in small and large firms and reported that product advantage has no impact on new product performance in either small or large firms. This empirical evidence does not reflect previous studies which noted the positive relationship between product advantage and new product performance. Much of this is attributed by Ledwith and O’Dwyer (2008) to the lack of influence of small firms in persuading customers to adopt new and different products.

Whereas a positive relationship is widely documented in large firms, small firm studies such as those by Yap and Souder (1994), Souder and Song (1997), Calantone et al. (2006) and Ledwith and O’Dwyer (2008) have indicated that product advantage is not always associated with new product performance in SMEs. Many of the aforementioned product advantage characteristics (innovativeness, uniqueness, technical performance and cost) negatively affect product success in SMEs. Previous research would indicate that an effective strategy for SMEs would be to concentrate on the production of compatible products as compatibility is correlated with success under both low and high uncertainty. Also, it is suggested that product advantage has a high impact on market related performance measures and a weak impact on financial measures of performance (Hsieh et al., 2008). However, many previous studies of the relationship were limited in their holistic definition and measurement of product advantage.

Recent studies by Calantone et al. (2006), Szymanski et al. (2007), McNally et al. (2010) and Rijsdijk et al. (2011) have examined the relationship between deconstructed elements of product advantage and new product performance. However, the aforementioned literature examined the relationship between the components of product advantage and new product financial and market performance only. Calantone et al.

Calantone et al. (2006) found that a high level of innovativeness reduces customer familiarity, indicating that product innovativeness can be detrimental to new product success if customers are not sufficiently familiar with the nature of the new product and if innovativeness fails to improve product advantage. The study showed that after controlling for product advantage and customer familiarity, product innovativeness has no direct effect on new product profitability. Szymanski et al. (2007) found that the relationship between innovativeness and performance was small to moderate in size but that this increased when innovativeness measures that included a meaningfulness dimension were included. McNally et al. (2010) found that product advantage (classified as superior to competitors), was not correlated positively with financial performance. Rijsdijk et al. (2011) examined the relationship between product superiority and product meaningfulness and new product performance and found that interaction between product superiority and product meaningfulness on performance needs to be considered jointly.

A review of literature highlights that the relationship between product advantage and new product performance in SMEs is ambiguous and much is still not known about the relationship between product advantage and new product performance. Additionally advancements in the conceptualization of product advantage have resulted in large gaps in the literature on the relationship (see Table 2.3).
Table 2.3: Identified relationships between product advantage and new product performance

<table>
<thead>
<tr>
<th></th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market-level</td>
<td>Not Known</td>
<td>Rijsdijk et al. (2011);</td>
<td>Rijsdijk et al. (2011);</td>
</tr>
<tr>
<td>Financial-level</td>
<td>Szymanski et al. (2007);</td>
<td>Rijsdijk et al. (2011);</td>
<td>McNally et al. (2010).</td>
</tr>
<tr>
<td>Customer acceptance-</td>
<td>Not Known</td>
<td>Not Known</td>
<td>Not Known</td>
</tr>
<tr>
<td>level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product-level</td>
<td>Not Known</td>
<td>Not Known</td>
<td>Not Known</td>
</tr>
<tr>
<td>Timing-level</td>
<td>Not Known</td>
<td>Not Known</td>
<td>Not Known</td>
</tr>
</tbody>
</table>

In summation, product advantage has been linked to new product success and not surprisingly has obtained a central role in NPD literature (Rijkski, 2011). However after reviewing the literature it is unclear if SME managers should focus efforts on developing innovative and technical superior products or develop compatible product focusing on a cost and quality advantages as a key to marketplace success. Additionally, it is not immediately clear whether a strategy of developing products with high levels of product advantage does indeed hold a key to increased new product performance. For example, equivocal arguments can be advanced for the presence of a positive relationship between product advantage and new product performance or a negative relationship between product advantage and new product performance in SMEs. Also, the relationship between; product innovativeness, product superiority and product meaningfulness, and customer, product and timing-level measures of NPP have not been examined.

Nevertheless, product advantage can, and should, be part of the SMEs competitive NPD strategy because as suggested by Ledwith (2000) product advantage is the most important success factor for SMEs involved in NPD. The smaller size and flexibility of SMEs allow them to seek out markets, where product advantage is valued by customers.
over other factors such as price (Murphy and Ledwith, 2007). Cooper (1979) suggests that product advantage is the core or critical strategy in industrial product innovation because the largest correlations relate to the benefits of the product offering. The following section depicts the research model developed to facilitate the investigation of the Research Aim.

### 2.6 Research Model

The field of product innovation has expanded rapidly and clear insights regarding the composition of the product advantage and new product performance constructs, and the relationship between product advantage and new product performance have become more difficult to determine from reviews of literature. It is not clear which product advantage characteristics are related positively to new product performance, especially in the SME domain, but it is clear that there is a need to address the nature of the product advantage construct and its distinction from other new product constructs and it is a factor deserving of individual study. Product advantage is the most important determinant of product success and is positively related to increased new product performance but it is not a standalone construct and is best explored multi-dimensionally.

However, as noted throughout this chapter little research has been undertaken on the nature of product advantage and its causal relationships with new product performance in SMEs. Similarly, the structure of product advantage and new product performance in SMEs is ill-defined. The overall aim of this thesis is to identify the nature of product advantage and new product performance measurement in SMEs and then detail the interactions between them. This has been broken into 3 research objectives;
Research Objective 1: To investigate the nature of product advantage in SMEs.

To achieve this research objective, 5 research questions derived from the review of literature and which will be addressed through empirical research have been established;

a) What are the main component factors of Product Advantage?
b) What is the impact of Product Advantage on product outcome (success/failure)?
c) Does firm size (micro, small or medium-size) impact Product Advantage?
d) Does firm type (business-to-business or business-to-consumer) impact Product Advantage?
e) Does product type (new product, product extension or product improvement) impact Product Advantage?

Research Objective 2: To investigate the nature of new product performance measurement in SMEs.

To satisfy the investigation into Research Objective 2, 5 research questions have also been derived;

a) What are the main component factors of New Product Performance?
b) Does New Product Performance measurement activities impact product outcome (success/failure)?
c) Does firm size (micro, small or medium-size) impact New Product Performance?
d) Does firm type (business-to-business or business-to-consumer) impact New Product Performance?
e) Does product type (new product, product extension or product improvement) impact New Product Performance?

Research Objective 3: To determine the relationship between product advantage and new product performance in SMEs.

To satisfy the investigation of Research Objective 3, it will be necessary to develop a series of research hypothesis. However it is not possible to develop the research hypothesis of the relationship prior to the identification of the factor structure of product advantage (Research Objective 1a) and new product performance (Research Objective 2a) in Chapter 4.

To satisfy these research objectives a research model of the impact of product advantage on new product performance is developed so as to operationalize the research aim and provide a platform for further investigation in this study (see Figure 2.5). Figure 2.5 suggests that there is a relationship between product advantage and new product performance in SMEs, it depicts a 14 item product advantage measurement scale, a 17 item new product performance measurement scale and illustrates 3 factors derived from literature that may impact on the core constructs.
**Figure 2.5: Research Model**

**FIRM SIZE**

- **FIRM TYPE**

- **PRODUCT STRATEGY**

- **NEW PRODUCT PERFORMANCE**
  - Unit volume goals
  - Met revenue goals
  - Met sales growth goals
  - Met market share goals
  - ROI or IRR
  - Met profitability goals
  - Met contribution marginal goals
  - Development costs
  - Customer acceptance
  - Customer satisfaction
  - Number of customers
  - Customers competitive advantage
  - Met performance specifications
  - Met quality specifications
  - Launch on time
  - Time to market
  - Break even time

- **PRODUCT ADVANTAGE**
  - Be better relative to competitors’ offerings
  - Be superior
  - Be unique
  - Be of better quality
  - Solve problems
  - Be innovative
  - Enable better technical performance
  - Meet customers’ needs
  - Enable differentiation
  - Provide benefits
  - Have better product design
  - Have better individual attributes/features
  - Match customer perceptions
  - Be cost effective

63
The research model will be advanced in Chapter 4 by identifying the structure of product advantage and new product performance and facilitate the subsequent exploration of the relationship between them.

2.7 Conclusion

The field of product innovation has expanded rapidly and clear insights regarding the composition of the product advantage construct and the relationship between product advantage and new product performance have become more elusive to discern from reviews of the literature. It is not clear which product advantage characteristics are related positively to new product performance, especially in the SME domain, but it is clear that there is a need to address the nature of the product advantage construct and its distinction from other new product constructs and that it is a factor deserving of individual study.

This chapter has presented a review of literature on product advantage and new product performance and the relationship between them. A series of research objectives and research questions to aid in the satisfaction of the research aim have been developed and a research model depicted. A strong relationship between product advantage and new product performance has been shown to exist in large firm literature however; much about this relationship is unknown and less clear in SMEs. In exploring the literature on product advantage 14 product characteristics, which influence the level of advantage present in a product, were identified. Additionally literature reveals that a multi-dimensional approach to the study of product advantage would product clear benefits in prediction and understanding of how SMEs should deliver advantage.
Similarly, the review of literature reveals that there is little consensus in literature as to how new product performance should be measured but that it should be measured using multiple criteria. This chapter also reveals that the structure of the new product performance dimension in SMEs is under-explored and thus unclear. Seventeen seminal measures have been identified as core new product performance measures.

The next chapter describes the research method that will be used to describe and explain the nature of the relationship between product advantage and performance in SMEs.
Chapter 3 Research Methodology
3.1 Introduction

This chapter charts the methodological approach adopted for the empirical element of this study. The chapter outlines the fundamental concepts and theories underpinning the relevant research methods, and subsequent to this informs on the choice of methodology used in this research.

Research is a process, a set of activities that unfold over time, with distinct stages that entail different tasks (Ghauri and Gronhaug, 2010). A research methodology refers to the procedural framework within which research is conducted (Remenyi et al., 1998). Carson et al. (2001) describe the purpose of research as, a way of underpinning the choices and decisions involved in staking a research position, thus providing a clearer purpose to specific research projects within the wider context. This chapter thus gives an explanation of the mixed method research approach adopted for this study. Mixed methods research is defined as “the class of research where the researcher mixes or combines quantitative and qualitative techniques, methods, approaches, concepts or language into a single study” (Johnson and Onwuegbuzie, 2004:17). Mixed-method research is seen as an expansive and creative form of research, not a limiting form – being inclusive, pluralistic, and complementary and includes the use of induction (or discovery of patterns) and deduction (testing of theories and hypothesis) (Johnson and Onwuegbuzie, 2004). Indeed mixed methods research helps bridge the split between quantitative and qualitative research (Onwuegbuzie and Leech, 2004). This thesis thus rejects the incompatibilist, either/or approach and follows a more pluralist/ pragmatist approach to draw from the strengths and minimise the weaknesses of quantitative and qualitative approaches in single research study. Quantitative designs are suited to establishing relationships between variables, but are weak in establishing the reasons for
them whereas; qualitative methods help in developing explanations for the relationships. The use of this complementary mixed-method methodology provides stronger evidence for conclusions through convergence and enables a more complete, holistic and contextual portrait of product advantage and new product performance in SMEs. Doing so adds insights and understanding above which could have been achieved from a single method.

This complementary mixed-method methodology employed a structured questionnaire as the quantitative research instrument to advance the research model and develop the descriptive model, and in-depth case studies as the qualitative research instrument to inform on and further explore the exploratory elements of this research. Figure 3.1 details the layout of this chapter.

![Figure 3.1: Outline of Chapter 3](image)

This chapter is structured as follows: Section 3.2 identifies the research aims of this study. An introduction to the research philosophy underpinning this investigation is
contained in section 3.3. Section 3.4 presents the research strategy adopted for this study. The methods used and the rationale behind the selection of these methods are described. Section 3.5 describes the quantitative method used in this research and the qualitative method used is explored in section 3.6. Section 3.7 details the evaluation of the research methods in terms of reliability and validity and the chapter is concluded in section 3.8.

3.2 Research Aim and objectives

The aims and objectives of any research project are largely determined by how much is already known about the selected topic. The extent to which existing knowledge and understanding can be used to develop research questions and hypotheses which can be confirmed or refuted must be considered (Easterby-Smith et al., 1991; Patton, 1987) when deciding on a research issue. The objective of this research is to explore the nature of product advantage and new product performance measurement in SMEs’ and investigate the causal relationship between them.

This research issue has been operationalized graphically through the development of an initial research model in Chapter 2 section 2.6 (see Figure 2.5). The research model for this study is derived from the literature presented in Chapter 2 and the empirical findings relative to the structure of product advantage and new product performance that will be presented in Chapter 4 Section 4.2, and represents all the factors necessary to satisfy the investigations the research aim. The purpose of developing a research model in this study lies in its ability to predict/forecast based on past behaviour and guide future actions. The research model was developed as a visual mechanism to aid in the
investigation of three research objectives, which consequently facilitated the
development of the research plan;

1. To investigate the nature of product advantage in SMEs.
2. To investigate the nature of new product performance measurement in SMEs.
3. To determine the relationship between product advantage and new product
   performance in SMEs.

3.3 Research Philosophy

A research paradigm/philosophy can be described as a human and world science that
represents people’s viewpoints, ideologies, perspectives, and theories (Hill et al., 1999).
Guba and Lincoln (1994:35) define such as a “basic set of beliefs that guide action.
Paradigms represent a worldview that defines the nature of the world, the individual’s
place in it and the range of possible relationships to that world and its parts”.
Philosophers of science have long debated about how it is best to conduct research and
the debate has primarily been centred on two main paradigms, positivist and
interpretivist, with quantitative and qualitative methods underlying each paradigm
respectively.

The positivist paradigm highlights that all phenomena can be reduced to empirical
indicators which represent the truth (Sale et al, 2002). The major characteristics of
positivist research are a focus on deduction, confirmation, theory/ hypothesis testing,
explanation, prediction, standardised data collection and statistical analysis. The
interpretivist paradigm sees the explanation of events as a central theme in research and
places an emphasis on process and meanings. The major characteristics of interpretivist
research are induction, discovery, exploration, theory/hypothesis generation, the researcher as primary ‘instrument’ of data collection and qualitative analysis.

For more than a century advocates of each paradigm have engaged in ardent disputes with purists on both sides advocating their paradigm as the ideal for research and advocating the *incompatibility thesis* (Howe, 1988). The *incompatibility thesis* posits that quantitative and qualitative research paradigms cannot and should not be mixed. However, in recent years evaluators of educational and social programs have expanded their methodological repertoire with designs that include the use of both qualitative and quantitative methods. Indeed Howe, (1988) highlights that no incompatibility between quantitative and qualitative methods exist at either the level of practice or epistemology and that there are thus no good reasons for researchers not to use mixed methods. Methodological work on mixed methods research paradigm can be seem in Johnson and Christensen, (2004), Creswell, (2003), Tashakkori and Teddlie, (1998; 2003), and Reichardt and Rallis, (1994).

Philosophically, mixed methods research is the “third wave”, a movement that moves past the paradigm wars by offering a logical and practical approach and makes use of the pragmatic method and system of philosophy. Pragmatism helps to shed light on how research approaches can be mixed in ways that offer the best opportunities for answering important research questions (Hoshmand, 2003). Pragmatism rejects traditional dualisms (e.g., rationalism vs. empiricism, realism vs. antirealism, free will vs. determinism, platonic appearance vs. reality, facts vs. values, subjectivism vs. objectivism) and generally prefers more moderate and common sense versions of philosophical dualisms based on how well they work in solving problems (Sale et al. 2002). Its logic of inquiry includes the use of both induction and deduction (Johnson
and Onwuegbuzie, 2004). It is an expansive and creative form of research, inclusive, pluralistic and complementary (Sale et al. 2002).

In order to mix in an effective manner, researchers first need to consider all the relevant characteristics of quantitative and qualitative research (Johnson and Onwuegbuzie, 2004). Such an understanding puts a researcher in a position to mix or combine strategies and to use what Johnson and Turner, (2003) call the fundamental principle of mixed research. Indeed effective use of this principle is a major source of justification for mixed methods research because the product will be superior to mono-method research (Johnson and Turner, 2003). Consequently a brief description each of the research paradigm (positivism and interpretivism) follows, highlighting the characteristics of each and the pros and cons of combining them in a pragmatist research philosophy.

3.3.1 Positivism/ Quantitative

Positivism is a scientific approach to developing knowledge, methods and strategies and interpreting results (Hines, 2000). Researchers focus on facts and figures mostly, and use quantitative methods to find the cause and effect of the hypothesis (Hines, 2000). Positivism uses quantitative and experimental methods to test hypothetical-deductive generalisations (Amaratunga et al., 2002), searches for causal explanations and fundamental laws, and generally reduces the whole to the simplest possible elements in order to facilitate analysis (Remenyi et al., 1998; Easterby-Smith et al., 1991). The rationale for using such an approach was best described by Nau (1995:121) in which it was found that quantitative investigations look for “distinguishing characteristics, elemental properties and empirical boundaries” and tend to measure “how much or
**Table 3.1: Strengths and Weaknesses of positivist research**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provides precise, quantitative, numerical data.</td>
<td>• Knowledge produced may be too abstract and general for direct application to specific local situations, contexts, and individuals.</td>
</tr>
<tr>
<td>• Useful for obtaining data that allow quantitative predictions to be made.</td>
<td>• The researcher may miss out on phenomena occurring because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation (called the confirmation bias).</td>
</tr>
<tr>
<td>• Testing hypotheses that are constructed before the data are collected. Can generalise research findings when the data are based on random samples of sufficient size.</td>
<td>• The researcher’s theories that are used may not reflect local constituencies’ understandings.</td>
</tr>
<tr>
<td>• The researcher may construct a situation that eliminates the confounding influence of many variables, allowing one to more credibly assess cause-and-effect relationships.</td>
<td></td>
</tr>
<tr>
<td>• Data collection using some quantitative methods is relatively quick (e.g., telephone interviews).</td>
<td></td>
</tr>
<tr>
<td>• Data analysis is relatively less time consuming (using statistical software).</td>
<td></td>
</tr>
<tr>
<td>• The research results are relatively independent of the researcher (e.g., effect size, statistical significance).</td>
<td></td>
</tr>
<tr>
<td>• It is useful for studying large numbers of people.</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Johnson and Onwuegbuzie, 2004)

### 3.3.2 Interpretivism / Qualitative

Interpretivism is the process that recognises the world as socially constructed, and it takes a subjective rather than a general approach to research, using qualitative methods in order to find the true meaning of hypotheses, and attempts to understand the complexity of the subject (Goulding, 2005; Hines, 2000). Interpretivists’ recognize the need to find out the specifics behind a given situation (Saunders et al., 2007) which is suited for the investigation of product advantage and new product performance in this study. Interpretivist inquiry uses qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings. Interpretivism endeavours to understand and explain a phenomenon rather than search
for external causes or fundamental laws (Remenyi et al., 1998; Easterby-Smith et al., 1991) which was essential in this study. The goal is the development of theory through explanatory methods rather than through the creation of generalisations. As an inquiry method interpretivism was needed in this study to inductively and holistically view SMEs in their entirety (Shaw, 1999). This approach facilitated in-depth understanding of the reality of the SME and allowed for the interpretation of SMEs’ perspectives (Hill and Wright, 2001; Grant et al., 2001; Carson et al., 2001; Gilmore and Coviello, 1999) and facilitated a deeper investigation of the research objectives. Table 3.2 explores some of the strengths and weaknesses of interpretivist/quantitative research.

Table 3.2: Strengths and weaknesses of Interpretivist research

<table>
<thead>
<tr>
<th>Strengths</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The data are based on the participants’ own categories of meaning.</td>
<td></td>
</tr>
<tr>
<td>It is useful for studying a limited number of cases in depth.</td>
<td></td>
</tr>
<tr>
<td>It is useful for describing complex phenomena.</td>
<td></td>
</tr>
<tr>
<td>Provides individual case information.</td>
<td></td>
</tr>
<tr>
<td>Can conduct cross-case comparisons and analysis.</td>
<td></td>
</tr>
<tr>
<td>Provides understanding and description of people’s personal experiences of phenomena (insider’s viewpoint).</td>
<td></td>
</tr>
<tr>
<td>The researcher identifies contextual and setting factors as they relate to the phenomenon of interest.</td>
<td></td>
</tr>
<tr>
<td>The researcher can use the primarily qualitative method of “grounded theory” to generate inductively a tentative but explanatory theory about a phenomenon.</td>
<td></td>
</tr>
<tr>
<td>Can determine how participants interpret “constructs”.</td>
<td></td>
</tr>
<tr>
<td>Data are usually collected in naturalistic settings in qualitative research.</td>
<td></td>
</tr>
<tr>
<td>Qualitative approaches are responsive to local situations and conditions.</td>
<td></td>
</tr>
<tr>
<td>Qualitative data in the words and categories of participants lend themselves to exploring how and why phenomena occur.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge produced may not generalise to other people or other settings (i.e., findings may be unique to the relatively few people included in the research study).</td>
<td></td>
</tr>
<tr>
<td>It is difficult to make quantitative predictions.</td>
<td></td>
</tr>
<tr>
<td>It is more difficult to test hypotheses and theories.</td>
<td></td>
</tr>
<tr>
<td>It generally takes more time to collect the data when compared to quantitative research.</td>
<td></td>
</tr>
<tr>
<td>Data analysis is often time consuming.</td>
<td></td>
</tr>
<tr>
<td>The results are more easily influenced by the researcher’s personal biases and idiosyncrasies.</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Johnson and Onwuegbuzie, 2004)
3.3.3 Pragmatism / Mixed research

Johnson and Onwuegbuzie (2004) identify mixed-method research as an attempt to legitimise the use of multiple approaches in answering research questions, rather than restricting or constraining choices by using one method. Several arguments have been presented for mixed method research (see Sale et al. 2002) and indeed a key highlighted feature of mixed methods research is its methodological pluralism which frequently results in superior research (compared to mono-method research).

Many researchers have argued that pragmatism should be the key factor in determining the methodology (Collins and Hussey, 2009) and that pragmatism offers an attractive philosophical partner for mixed methods research. Rather than be constrained by a single paradigm, pragmatists advocate that researchers should be ‘free’ to mix methods from different paradigms. The pragmatist approach is an attempt to “cross the divide between the quantitative and qualitative and the positivist and the non-positivist” (Curran and Blackburn, 2001:123). Reichardt and Cook (1979) argue that paradigm attributes are logically independent and therefore can be mixed and matched, in conjunction with methods choices, to achieve the combination most appropriate for a given inquiry problem. The practical demands of the problem are primary; inquirer flexibility and adaptiveness are needed to determine what will work best for a given problem (Greene et al., 1989).

As noted by Sechrest and Sidana (1995) growth in the in the mixed methods (i.e., pragmatist) movement has the potential to reduce some of the problems associated with singular methods. By utilising quantitative and qualitative techniques within the same framework, mixed methods research can incorporate the strengths of both methodologies. Most importantly, investigators who conduct mixed methods research are more likely to select methods and approaches with respect to their underlying...
research questions, rather than with regard to some preconceived biases about which research paradigm should have hegemony in social science research. Table 3.3 details some of the strengths and weaknesses associated with the mixed method research approach.

Table 3.3: Strengths and weaknesses of mixed-method research

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Words, pictures, and narrative can be used to add meaning to numbers.</td>
<td>· Can be difficult for a single researcher to carry out both qualitative and quantitative research.</td>
</tr>
<tr>
<td>· Numbers can be used to add precision to words, pictures, and narrative.</td>
<td>· Researcher has to learn about multiple methods and approaches and understand how to mix them appropriately.</td>
</tr>
<tr>
<td>· Can provide quantitative and qualitative research strengths.</td>
<td>· Methodological purists contend that one should always work within either a qualitative or a quantitative paradigm.</td>
</tr>
<tr>
<td>· Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach.</td>
<td>· More expensive.</td>
</tr>
<tr>
<td>· A researcher can use the strengths of an additional method to overcome the weaknesses in another method by using both in a research study.</td>
<td>· More time consuming.</td>
</tr>
<tr>
<td>· Can provide stronger evidence for a conclusion through convergence and corroboration of findings.</td>
<td></td>
</tr>
<tr>
<td>· Can add insights and understanding that might be missed when only a single method is used</td>
<td></td>
</tr>
<tr>
<td>· Qualitative and quantitative research used together produce more complete knowledge necessary to inform theory and practice.</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Johnson and Onwuegbuzie, 2004)

In summation, positivism uses quantitative and experimental methods to test hypothetical-deductive generalisations (Amaratunga et al., 2002) and relies on an objective view of knowledge. Data is collected in a value-free manner and analysed statistically to develop universal causal theories and laws. Interpretivist inquiry uses qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings. Quantitative methodologies consist of methods that gain logic from a series of numbers and tables that are retrieved from multiple questionnaires and large amounts of data (Horna, 1994). However, the physiological, motivational and influencing factors were is also important in this research to add
meaning to the numbers. Although quantitative methods can be used to measure such factors, their appropriateness in explaining them in depth is more limited (Amaratunga et al., 2002), thus a complementary interpretivist methodology was also deemed necessary. The attributes of each paradigm are logically independent and are used in conjunction to produce the most appropriate investigation of the research issue. Thus in a complementarily mixed-method study, qualitative and quantitative methods are used to measure overlapping but also different facts about a phenomenon, yielding an enriched, elaborated understanding of that phenomenon. This differs from the triangulation intent in that the logic of convergence requires that the different methods assess the same conceptual phenomenon. Sale et al. (2002) argue that quantitative and qualitative methods cannot be combined for cross-validation or triangulation but that they can however be combined for complementary purposes, which is the case in this research.

The following section examines the research approach deemed necessary for this study.

3.4 Research Approach

In keeping with a pragmatist mixed method research philosophy both inductive (theory building) and deductive research (theory testing) approaches were used in this study. It is possible to combine approaches within the same piece of research, a method which is often quite advantageous (Saunders et al., 2007).

Induction as a research approach is exploratory in nature, involves theory building and understanding what is happening, so as to better comprehend the nature of the problem. A deductive approach is appropriate where the focus is on researching distinct concepts
and relationships which were stated before collecting data (Hyde, 2000), which is the situation in this study. As a research approach deduction is explanatory in nature, involves the development of a theory that is subjected to a rigorous test (Robson, 2002). Saunders et al. (2007) identified several important characteristics of a deductive approach. First, the search to explain casual relationships between variables, second, concepts need to be operationalized in a way that enables facts to be measured quantitatively and finally, generalisation, to be able to generalise statistically about regularities in human social behaviour it is necessary to select samples of sufficient numerical size.

An inductive approach relying on the examination and re-examination of interview notes and summaries, using coding methods to structure and aid analysis, gives meaning to data (Shaw, 1999), which then compared with the concepts suggested by literature (Glaser and Strauss, 1967) was also used in this research. Such an approach is appropriate for this research as it sought to view SMEs’ in their entirety, to penetrate their realities and interpret their perceptions (Shaw, 1999) enabling deeper investigation (O’ Donnell, 2004) and to understand the properties of the phenomena so as to facilitate theory building required in this study. Research using an inductive approach is likely to be particularly concerned with the context in which such events are taking place. Therefore, the study of a small sample is more appropriate (Saunders et al., 2007).

In this thesis, quantitative methods are first used to test theory and advance the research model of the research aim. The purpose of conducting the quantitative analysis (exploratory factor analysis) first was to identify the underlying structure of product advantage and new product performance (research questions 1a and 2a) and define the constructs to be used in the research model. Second, quantitative analysis (between
group’s tests) is conducted to explore the remaining research questions on the impact of firm size, firm type, product types and product success on both verified product advantage and new product performance structures. Third, the causal relationship between product advantage and new product performance (Research Objective 3), as depicted by the advanced research model, is tested and a descriptive model presented. Finally, qualitative research methods are used to increase understanding and inform on the exploratory element of this thesis (research objectives 1 and 2) in the SME domain. This research process is illustrated in Figure 3.1.
Research Question

Research Aims and Objectives

Quantitative Data collection and analysis

STAGE 1: Descriptive Survey used to advance the research model, explore RObj1, RObj2 and test the causal relationship (RObj3).

STAGE 2: Exploratory case studies to increase understanding on RObj1 and RObj2

Exploatory Element (RObj1 and RObj2)

Causal Element (RObj3)

Quantitative Data collection and analysis

Quantitative Findings regarding RObj1 and RObj2

Advancement of Research Model

Quantitative Findings regarding RObj3

Literature Review and Research Model development

Qualitative Data collection and analysis

Qualitative Data collection and analysis

Discussion and Conclusion

Figure 3.2: Research Process Chart
Having identified the research approach to be used in this study, the next section describes the application of this approach in the selection of an appropriate research method.

### 3.4.1 Research Strategy

In keeping with the adoption of a pragmatist research philosophy, a research strategy that is suitable for achieving the Research Objectives (section 3.2) must be selected. Accordingly a research strategy which was exploratory in approach and interpretivist in nature, utilising questionnaires and multiple case studies to maximise the contextual richness and complexities of SMEs, was deemed necessary to gain an understanding of SME product advantage and new product performance activities. The aim of which is to blend quantitative and qualitative methods of research to produce a final product which highlights the significant contributions of both (Nau, 1995:1), where “qualitative data supports explicitly the meaning of quantitative research” (Jayaratne, 1993:117). In this research study qualitative research methods were used to develop the results of a quantitative method and to facilitate interpretation of the variables depicted in the research model. The main advantage of adopting complementary mixed-methods for this study is that it enables a more complete, holistic and contextual portrait of product advantage and new product performance in SMEs.

The following sections 3.4.2 and 3.4.3 explains in greater detail and provides a step by step account of the quantitative and qualitative methodological methods adopted for this study.
3.4.2 Quantitative Research Methodology

Quantitative research designs are characterised by the assumption that human behaviour can be explained by what may be termed ‘social facts’ which can be investigated by methodologies that utilise “the deductive logic of the natural sciences” (Horna, 1994:121). The quantitative approach emerges out of a tradition that places trust in numbers that represent facts of action (Amaratunga et al., 2002). This research design is robust in measuring variables such as a quantitative assumption regarding construction process capability in that “processes can be reduced to a set of variables which are somehow equivalent across construction projects, persons involved and across situations” (Amaratunga et al., 2002). The quantitative instrument used in this study is a structured questionnaire (See Appendix A) administered to SME’s within a defined geographical area. The questionnaire is an effective tool to elicit opinions and descriptions as well as capturing cause and effect relationships and is a popular data collection method in business studies (Ghauri and Gronhaug, 2010).

3.4.2.1 Design of the Quantitative Research Instrument

Oppenheim (1992) defines a survey as a form of planned collection of data for the purpose of description or prediction as a guide to action on for the purpose of analysing the relationship between certain variables. Surveys can be either descriptive or analytic depending on the aim of the research. Oppenheim (1992) describes the descriptive survey as fact finding and actuarial, endeavouring to identify trends over time. The descriptive survey explores ‘how many’ or ‘what proportion’ of a population has certain characteristics and how often events occur, they are not designed to explain anything or to show casual relationships between variables. Oppenheim (1992) identifies that the analytical survey is set up to explore the associations between variables, to explore
specific hypotheses and is orientated towards finding associations and explanations. To this end the structured questionnaire instrument took an analytical survey form, which sought to explain the associations between the variables of the conceptual model was necessary. The structured analytical questionnaire was developed based on existing research measures derived where possible from previous studies.

The review of literature on product advantage (Chapter 2, Section 2.3) and new product performance (Chapter 2, Section 2.4) was used as the basis for the questionnaire design. The questionnaire for this study was divided in 5 sections (A-E), some with subsections (See Appendix A, for a copy of the research instrument). Section A (CB1-CB7) concerned the company background and sought information on business type, area of activity, product type, personnel employed, owner/management run, turnover, number of new products developed and strategic orientation. Section B titled ‘Organisational Performance’ asked respondents to indicate performance on each of six organizational performance measures (OP1-OP6) adopted from Langerak et al. (2004). Section C (NPD1-NPD3) was titled ‘New Product Development’ and based on Booz et al. (1982) product strategy types and asked respondents to indicate the type of most recently introduced product and how it performed. The questions in sections D and E were posed using a 7 point Likert scale ranging from [1- very poorly, 2-poorly, 3-somewhat poor, 4-undecided, 5-somewhat good, 6-good, 7-excellent]. Section D (NPP1-NPP17) presented respondents with the 17 measures of new product performance adapted from Griffin and Page (1993, 1996) by Langerak et al. (2004), and asked firms to indicate performance on each based on the aforementioned Likert scale. Section E (PA1-PA14) ‘product advantage’ asked respondents to indicate agreement on how the 14 product characteristics identified in literature as indicative of product advantage (see Section 2.3.1, Table 2.2) provided an accurate description of their most recently introduced new
product. At the end of the questionnaire respondents were thanked for their support and participation.

3.4.2.2 Pilot survey

A pilot survey is a small-scale replica of the main study and is an essential requirement when undertaking quantitative research. Sarantakos (1993) suggests that the purpose of a pilot study is to discover possible weaknesses, inadequacies, ambiguities and problems in all aspects of the research. The benefits of a pilot study are in testing scale reliability, establishing face validity and identifying poorly worded or formatted questions as well as validating the overall conceptual model and hypothesis to be used in the study (Creswell, 1994).

The questionnaire was pilot tested in October 2008 to a sample of 8 SMEs, operating in the proximity of the University of Limerick. Based on the feedback received from the pilot study minor modifications were made to the questionnaire, such as re-wording, changing ambiguous questions and formatting. No changes to the section formats were necessary and upon completion of the alterations emanating from the pilot study, the questionnaire was formalised (see Appendix A) and ready for administration.

3.4.2.3 Questionnaire Administration

Ethics approval was sought from and granted by the Kemmy Business School Research Ethics Committee, University of Limerick in November 2008 prior to research instrument administration. Subsequently, the research instrument was administered over a period of eight weeks. Prior to administration a database of approximately 800 firms was compiled from various government and small firm representative associations.
Geographic cluster sampling was used as the sampling technique. In this technique clusters were defined by their geographical area and product manufacturing SMEs within the geographical area surveyed. Within this sampling method, probability proportionate to size sampling was used - geographic areas with larger numbers of product manufacturing SMEs were selected. Although spatial autocorrelation (duplication in data because of firm commonalities due to a relative closeness in geographic space) may arise from geographic cluster sampling, reducing the costs associated with data collection was the primary motivating factor in this choice.

Questionnaire administration was concluded at the end of March 2009, upon which time a sufficient sample size had been accrued as was necessary for statistical analysis. Data were received from 123 product manufacturing SMEs operating in various sectors in the Irish economy.

Firm size was classified in terms of employment levels and annual turnover, in-line with the definition of SMEs adopted by The European Commission’s recommendation 2003/361/EC and as published in Article 2 Official Journal of the European Union. Table 3.4 details a brief summary of the survey respondents.

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>Industrial based products</th>
<th>Consumer based products</th>
<th>Industrial and Consumer based</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro (&lt;10)</td>
<td>37 (56%)</td>
<td>18 (27.3%)</td>
<td>11 (16.7%)</td>
<td>66</td>
</tr>
<tr>
<td>Small (11-50)</td>
<td>22 (59.5%)</td>
<td>5 (13.5%)</td>
<td>10 (27%)</td>
<td>37</td>
</tr>
<tr>
<td>Medium (51-250)</td>
<td>5 (25%)</td>
<td>3 (15%)</td>
<td>12 (60%)</td>
<td>20</td>
</tr>
<tr>
<td><strong>All SMEs</strong></td>
<td><strong>64</strong></td>
<td><strong>26</strong></td>
<td><strong>33</strong></td>
<td><strong>123</strong></td>
</tr>
</tbody>
</table>
3.4.2.4 Quantitative data analysis

The questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS 16), a software package for analysing quantitative data. Once a questionnaire was received it was coded and entered into a pre-constructed SPSS data editor. Preliminary data analysis was conducted by examining the frequencies and descriptives of the dataset to ensure adequacy for further statistical analysis. Following the preliminary data analysis two types of statistical tests were used to; 1) compare groups (firm size, product type and product strategy) and 2) explore the relationships between variables, (See Table 3.5). Non-parametric tests were used to compare groups as the data was continuous in nature.

Table 3.5: Summary of Statistical Tests Used

<table>
<thead>
<tr>
<th>Research Objective</th>
<th>Statistical techniques used to compare groups</th>
<th>Statistical techniques used to explore relationships among variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Objective 1</td>
<td>Comparison of Means, Mann-Whitney U-Test, Kruskal-Wallis-Test</td>
<td>Exploratory Factor Analysis</td>
</tr>
<tr>
<td>Research Objective 2</td>
<td>Comparison of Means, Mann-Whitney U-Test, Kruskal-Wallis-Test</td>
<td>Exploratory Factor Analysis</td>
</tr>
<tr>
<td>Research Objective 3</td>
<td>Comparison of Means, Mann-Whitney U-Test</td>
<td>Correlation Analysis, Ordinary Least Squares regression</td>
</tr>
</tbody>
</table>

Prior to the statistical tests detailed in Table 3.5 analysis was carried out for any violations of the assumptions of interdependence of observation, normality, homogeneity of variance, linearity and homoscedasticity. Subsequently, the data was analysed with reference to their ability to satisfy an examination into each of the research objectives.
Research Objective 1 examined the nature of product advantage in SMEs. Exploratory factor analysis (EFA) was used to discover the factor structure of product advantage and to examine its internal reliability. Confirmatory factor analysis was not used in this study because no underlying factor structure could be hypothesised from theory and as such no factor structure could be constructed for verification. There are several core benefits to conducting an EFA, it:

- can used in the identification of a factor structure where it has not previously been confirmed,
- can determine what the factor structure looks like according to participant responses,
- is a variable reduction technique that identifies latent constructs and underlying factor structures,
- estimates factors which influence responses,
- allows the researcher to define, describe and identify the number of latent constructs,
- provides a means of explaining variation among variables using newly created factors thus condensing information.

However there are also some limitations to the use of EFA such as:

- the correlations of the factor analysis describe relationships – no causal inferences can be made,
- it requires complete sets of data,
- it requires a high degree of variation in subjects,
- sample size – EFA requires a minimum of 5 cases for every item measured.

To address the limitations associated with the EFA the questionnaires were administered in person to ensure the necessary completeness of the data, to ensure that a
variety of firms were included in the sample, to satisfy the minimum requirements and
to eliminate potential respondent bias. Consequently it was appropriate and logical to
use EFA in this research. In EFA eigenvalues represent the variance accounted for by
each underlying factor. The Kaiser-Guttman rule for selecting the number of factors
states that the number of factors is equal to the number of factors with eigenvalues
greater than 1.0. Once the number of factors are decided it is important to get the
loadings for each of the factors. For the factor solution to be meaningful the ideal is to
have several variables loading highly on one factor only.

Having satisfied an exploration of the structure of product advantage the mean values
was recorded for each of the fourteen product advantage characteristics to indicate
performance on each. Mann-Whitney U-Tests was used to indicate significant
differences in performance between firms producing consumer-based and industrial
based products. A similar test was conducted to indicate any significant differences
between product advantage performance and product outcome (success/failure).
Kruskal-Wallis Tests was used to compare across firm size and product strategy.

Research Objective 2 examined the nature of new product performance measurement in
SMEs. Similarly exploratory factor analysis (EFA) was also used to discover the factor
structure of new product performance and to examine its internal reliability. Once the
factor structure of new product performance was known, similar tests as were used to
explore Research Objective 1 were conducted to identify the nature of new product
performance across the parameters of firm size, firm type, product strategy and product
outcome.
Research Objective 3 examines the relationship between product advantage and new product performance. Once the preliminary investigation of the underlying structure of both product advantage and new product performance had been conducted and a research model presented, it was then possible to develop research hypotheses of the relationship to aid in the satisfaction of Research Objective 3. Researchers in the social sciences have tended to adopt the use of the alternative hypothesis over the null hypothesis (Creswell, 1994). Evidence of such use is found in Chen et al. (1998) and Markman et al. (2002) and for this reason the hypotheses for this study are stated as alternative hypotheses. The construction of each hypothesis in this study was used to address the casual relationship identified in the research model and aid in the satisfaction of Research Objective 3. The construction of each hypothesis is now considered.

H1: There is a positive relationship between product advantage and objective customer acceptance measures of new product performance in SME’s

H1a: There is a positive relationship between product innovativeness and objective customer acceptance measures of new product performance in SME’s

H1b: There is a positive relationship between product superiority and objective customer acceptance measures of new product performance in SME’s

H1c: There is a positive relationship between product meaningfulness and objective customer acceptance measures of new product performance in SME’s

H2: There is a positive relationship between product advantage and development time measures of new product performance in SME’s

H2a: There is a positive relationship between product innovativeness and development time measures of new product performance in SME’s

H2b: There is a positive relationship between product superiority and development time measures of new product performance in SME’s
H2c: There is a positive relationship between product meaningfulness and development time measures of new product performance in SME’s

H3: There is a positive relationship between product advantage and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3a: There is a positive relationship between product innovativeness and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3b: There is a positive relationship between product superiority and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3c: There is a positive relationship between product meaningfulness and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

Consequently a research matrix (see Table 3.6) to facilitate the investigation of Research Objective 3 is presented and nine hypotheses (H1a-H3c) proposed for further investigation.

Table 3.6: Revised research matrix

<table>
<thead>
<tr>
<th>Objective customer acceptance</th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development time</td>
<td>H1a</td>
<td>H1b</td>
<td>H1c</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H2a</td>
<td>H2b</td>
<td>H2c</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>H3b</td>
<td>H3c</td>
</tr>
</tbody>
</table>

In testing the above hypotheses ordinary least squares and stepwise regression was used to determine the product advantage characteristics that influence new product performance measurement in SMEs.
3.4.2.5 Evaluation of the Quantitative Research Design

Any method of research has an inherent set of strengths and weaknesses (Gill & Johnson, 1997). There are two important characteristics that can be used to evaluate a research method, validity and reliability.

3.4.2.5.1 Reliability

Reliability is concerned with the consistency of the results obtained. In order to satisfy the need for reliability it must be possible for another researcher to obtain the same results by repeating the original research with the same respondent and conditions. Reliability refers to the degree to which results are consistent across repeated measurements (Bryman and Bell, 2003).

The statistical method used in measuring reliability or internal consistency is the ‘Cronbach Alpha’. The value of the Cronbach Alpha is determined by the number of measurement items used in defining the constructs and the average correlations of each item with each other – the higher the Alpha the more reliable it is. Bryman and Bell indicate that an Alpha of 0.80 is typically denotes an acceptable level of internal reliability although Howitt and Cramer (2001) accept a slightly lower figure of 0.70 or above as acceptable.

Table 3.7: Reliability of Scale Coefficients

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. of items</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. New Product Performance</td>
<td>17</td>
<td>.911</td>
</tr>
<tr>
<td>2. Product Advantage</td>
<td>14</td>
<td>.893</td>
</tr>
<tr>
<td>3. Product Innovativeness</td>
<td>7</td>
<td>.859</td>
</tr>
<tr>
<td>4. Product Superiority</td>
<td>4</td>
<td>.803</td>
</tr>
<tr>
<td>5. Product meaningfulness</td>
<td>3</td>
<td>.730</td>
</tr>
<tr>
<td>6. Objective customer acceptance measures</td>
<td>9</td>
<td>.927</td>
</tr>
<tr>
<td>7. Development time measures</td>
<td>3</td>
<td>.788</td>
</tr>
</tbody>
</table>
Table 3.7 above illustrates that the guidelines for reliability were met in this study. In addition to inter-item reliability the design of the questionnaire went through several revisions and a pilot test thereby contributing to the reliability of the empirical data.

3.4.2.5.2 Validity

Validity is concerned with the fact that the research measures only what it is supposed to measure. In order to satisfy the criterion of validity, research must not be subject to other extraneous factors which can bias results in one direction or another.

Content validity or face validity is a subjective assessment of the appropriateness of measurement items as judged by knowledgeable reviewers (Bryman and Bell, 2003). This research followed the three guidelines provided by Bohrnstedt (1983) for enhancing content validity. First, extant literature was searched to determine how other authors have used the concept. Based on this review, the constructs were defined. Second, the domain of the construct was separated into its major features and several previously used measurement items were researched and adopted to reflect, whenever possible, the meanings of the different features. Third, the measurement items were pre-tested with persons similar to those persons to whom the questionnaires were targeted.

Criterion-related validity has been used mainly in education and psychology for analysing various selection processes and tests (Carmines and Zeller, 1979). Its use in survey research has been less because there is lack of empirical criteria against which the validity can be assessed (Bohrnstedt, 1983). That is the case with the present
research since the measures are mainly related to theory-based, abstract constructs instead of other empirical variables. Broad firm performance categories are often preferred to accurate and detailed performance data, because executives are unwilling to disclose this information (Chandler and Hanks, 1993). Criterion-related validity could be used to assess the validity of firm performance measures in the present research if correlations between self-reported and objective performance data were available from previous studies.

Construct validity is concerned with how well a measure reflects a theory-based construct and whether a measure relates to other observed variables in a way that is consistent with theoretically derived predictions (Bagozzi, et al., 1991; Bollen, 1989). In the present study, construct validity was strengthened and checked by carefully defining constructs and using previously validated measurement items whenever possible, and examining correlations between variables (Bollen, 1989; Boernstedt, 1989; Carmines and Zeller, 1979).

Convergent validity is supported by significant correlations between different constructs reflecting a common broader concept. Internal validity is concerned about the quality of hypothesized relationships between the constructs. Science is ultimately interested in findings answers to why questions, finding causal relationships among constructs. Usually, three conditions are required for causality:

1. Association between constructs,
2. Temporal difference between the cause and effect, and
3. Exclusion of rival hypotheses.
A correlational study can partially support causality by demonstrating association between variables, but it does not reveal the direction of causality. When multivariate techniques, like multiple regression analyses and structural equation modelling, empirically support the hypotheses, then internal validity receives support.

In summation questionnaires allow a great depth of information to be generated and allow inferences from the sample to the wider population to be made and are according Gill and Johnson (1991) high on validity and reliability. The careful random selection of samples ensures that results can be generalised to wider populations with a high degree of confidence. Additionally, the use of highly structured questionnaires is usually regarded as easily replicable and therefore reliable.

### 3.4.3 Qualitative Research Design

Qualitative research is used to understand a circumstance in terms of how and why it occurs (Cassell and Symon, 2004). Qualitative research deals with ordinary everyday life situations, such as experiences of individuals, groups/organisations (Amaratunga et al., 2002) and as such was invaluable in developing explanations for the nature of the variables and their relationships. Qualitative data, with its emphasis on people’s ‘lived experience’, are fundamentally well suited for locating the meanings people place on events, processes and structures of lives: their “the interpretative approach seeks to analyse and clarify meanings, perceptions, assumptions, prejudgements, presuppositions” (Van Maanen, 1977:214), and for connecting these meanings to the social world around them. The underlying goal of qualitative methods is to understand the true meaning of the research being conducted (Hannibuss, 1996) and thus satisfied the exploratory aspect of this study. Strauss and Corbin (1990:19) identify the tasks of
qualitative research as “to uncover and understand what lies behind any phenomenon about which little is yet known or to gain novel and fresh slants on things about which quite a bit is already known”. Qualitative research analyses the way in which people think and why they think it about a particular area under discussion, and it does not rely on a number of people saying the same thing (De Ruyter and Scholl, 1998). The aim of qualitative methodology is to describe and analyse the culture and behaviour of humans and their groups from the point of view of those being studied and to collect and analyse data, which is ‘uncountable’ (Cassell and Symon, 2004).

3.4.3.1 Case study sample selection

There are no precise guides to the number of cases to be included (Carson et al. 2001; Perry, 1998) and the decision is left to the researcher. However, Eisenhardt (1989) recommends that cases should be added until ‘theoretical saturation’ is reached or as detailed by Lincoln and Guba (1985:36) “to the point of redundancy”. Additionally, as highlighted by Yin (1994) replication logic and not sampling logic should be used for the selection of multiple case-studies. That is, representativeness is not the criteria for case selection but that the guarded choice of each case should be made such that it either:

- predicts similar results for predictable reasons (literal replication); or
- produces divergent results for predictable reasons (theoretical replication).

(Yin, 1994)

Theoretical replication sampling was chosen as the method of selection of the case study companies in this study – the cases were selected on the assumption that they would produce contradictory results. Thus an appropriate population was selected to ensure variation in firm size (micro, small and medium) and firm type (B2B and B2C). Additionally, the cases were chosen to fill theoretical categories and provide examples.
Indeed Pettigrew (1988) notes that it makes sense to choose cases, such in which the process of interest is “transparently observable”. It was thus deemed appropriate to select cases who had previously participated in the quantitative questionnaire because of their apparent process of interest. Furthermore, a pre-determined set of criteria was compiled enabling the researcher to make decisions regarding the purposive selection of the case companies which were rich in information in the research area (Shaw, 1999). The case companies were selected on the basis that:

- case-firms satisfied the grounded definition of smallness (Shaw, 1999),
- case-firms had been trading for a minimum of three years (Shaw, 1999),
- the quantitative data contained approximately one small firm and one medium sized firm for every two micro firms; this ratio was applied in the selection of the four case study firms,
- the four cases were selected to have different types of products and to operate in different markets. This will facilitate a deeper understanding of the impact of different variables,
- all four firms completed the original questionnaire,
- proximity, case-firms were located within daily travelling distance of the researcher (Shaw, 2009).

In accordance with Eisenhardt, (1998) case study companies were recruited until no new data was found from the participation of additional cases and when it was deemed that the additional value of a new case was negligible. The qualitative process thus involved in-depth case studies with four companies. Table 3.8 details a brief summary of the companies that participated in the study.

**Table 3.8: Summary of Case Study Companies**

<table>
<thead>
<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
</tr>
</thead>
</table>

97
The qualitative element of this thesis was advanced to enable a deeper exploratory investigation of research objective 1 and research objective 2.

### 3.4.3.2 Data collection

One of the primary strengths of case study research in its application to SMEs is its use of multiple methods such as interviews, direct observation, documentation, archival records and physical artefacts, all of which combine to enable converging lines of inquiry on historical, attitudinal or behavioural issues (Yin, 1994). In-depth interviews, historical company documentation and observation were used in the analysis of each case study company.

#### 3.4.3.2.1 Interviews

In an exploratory interpretivist study like this one, in-depth interviews can be very helpful and appropriate to *find out what is happening and to seek new insights* (Robson, 2002:59). Grant et al. (2001), and Curran and Blackburn (1994) found that semi-structured or unstructured interviews were highly effective in researching SMEs, and that such interviews are most successful where empathy and trust have been achieved through utilisation of the language and terminology of the respondent rather than of the researcher (Carson et al., 1998).
In-depth interviews with the owner/manager of each of four case study companies were chosen as the appropriate qualitative method for this study. The in-depth interview is used in qualitative research, whether positivist, interpretative or critical (Myers and Newman, 2006). Rubin and Rubin (2005:07) identify the qualitative interview as “permitting us to see that which is not ordinarily on view and to examine that which is looked at but seldom seen”. The advantages of this method fall into three broad categories:

1. circumstances of unique applicability, especially those involving sensitive or personal topics can be explored (Robson and Foster, 1989),
2. sampling advantages including greater control over respondent selection, and hence, more depth, context and flexibility in the process of inquiry (Cassell and Symon, 2004),
3. preferential outcome, in terms of the depth and comprehensiveness of information that they can yield (Hedges, 1985).

In-depth interviews generally fall into the categories of structured, semi-structured or unstructured. Unstructured interviews are informal and are useful to explore in depth a general area and can provide greater breath than do the other types given its qualitative nature (Fontana and Frey in Denzin and Lincoln, 2000:705). Where it is necessary to understand the reasons for the decisions that the research participants have taken, or to understand the reasons for their attitudes and opinions, it is advisable to conduct a qualitative interview. Semi-structured and in-depth interviews provide opportunities to ‘probe’ answers, where it is needed for interviewees to explain, or build on their responses. A number of data quality issues can be identified in relation to the use of semi-structured and in-depth interviews, reliability, forms of bias and validity and
generalisability, all of which were noted by the researcher and measures taken to alleviate the possibility of such.

Personal interviews were selected as the main data collection method in order to gain a deeper insight into the companies used in the case studies. Personal interviewing is a very suitable method for doing research and has proved to be one of the most popular methods used for collecting information (Amaratunga et al., 2002). This is because it allows information to flow freely, is guided by the interviewee (McDaniel and Gates, 2010) and the questions can be adjusted to enable the interviewee to give in-depth answers (Hannibuss 1996; Das, 1983).

In-depth interviews can be adapted to the personality of the interviewee (Hannibuss 1996). Ericsson and Simon (1984:27) stated that the “accuracy of verbal reports depends on the procedures used to elicit them and the relation between the requested information and the actual sequence of heeded information”. Therefore, because of these technicalities the interviewer must make sure that a good relationship is developed with the interviewee so that the interviewee feels relaxed and comfortable to talk openly (Jarratt, 1996). The interviewee must be assured that the interview is confidential, that practical matters such as time and place of the interview are also considered carefully and that the questions to be asked also have been considered cautiously, so as not to sway the opinion of the interviewee (Hannibuss, 1996). It is a highly flexible method, it can be used almost anywhere, and is capable of producing data of great depth (King, 1994). Kvale (1983:174) defines the qualitative research interview as “an interview, whose purpose is to gather descriptions of the life-world of the interviewee with respect to the interpretation of the meaning of the described phenomena”.

100
In this study a semi-structured interview was selected in order to provide fuller picture of NPD process and specifically product advantage and NPP. Thus a topic list (see Appendix B) was designed to explore the results of the quantitative study. Two semi-structured in-depth interviews were conducted with each case study company. In accordance with Perry (1999), an interview protocol was designed and the interviews were carried out in 2009 and 2010 at the premises of the interviewee (See Table 3.9).

**Table 3.9: Interview Protocol**

<table>
<thead>
<tr>
<th>Interview Number</th>
<th>Interview Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 1</td>
<td>• Familiarisation with the company&lt;br&gt;• Introduction to new products and NPD processes&lt;br&gt;• Explore the nature of Product Advantage and New Product Performance measurement activities</td>
</tr>
<tr>
<td>Interview 2</td>
<td>• Further explore the nature of product advantage and factors influencing choices&lt;br&gt;• Further explore issues in relation to NPP measurement activities</td>
</tr>
</tbody>
</table>

Each interview lasted approximately 1.5-2 hours and was recorded. In addressing whether to record the interviews, the researcher was guided by Yin (1994), who asserts that the decision is a matter of preference for the researcher, and Carson et al. (2001), who state that “*some respondents simply do not like any kind of recorder to be used*”. A transcript of the interviews is included in Appendix C. All interviews commenced with open-ended questions, designed to establish a comfortable interview atmosphere. In optimising the interview responses, it was critical that the researcher adhered to certain guidelines to maximise the value of in-depth interviews, thus exploring emergent key issues and immersing the researcher in areas of interest. Thus, the guidelines focused on:
- using non-academic, non-jargon language - where the respondent used such jargon, it was replaced with non-jargon language (Carson et al., 2001),
- the respondent was allowed to dictate the order of topic discussion, even when they digressed to irrelevant issues (Carson et al., 2001; Gilmore and Coviello, 1999),
- ensuring that the respondent’s perspective was noted by facilitating interview flows from the general to the particular (Carson et al., 2001),
- allowing the respondent uninterrupted dialogue (Carson et al., 2001),
- guiding the researcher in remaining detached, but receptive, while maintaining eye contact (Carson et al., 2001; Gilmore and Coviello, 1999; Hills and Muzyka, 1993), while remaining as silent as possible, accepting ‘silences’ during interviews (Carson et al., 2001), and
- directing the researcher not to use leading questions, but to ask for clarification if unclear on the response (Carson et al., 2001; Gilmore and Coviello, 1999), and not to evaluate answers in the interview (Carson et al., 2001).

The decision to use himself as the “instrument” for collecting data was influenced by the qualitative research approach adopted, the exploratory nature of the research and the researchers own qualifications and experience in this research method, having previously completed qualitative studies.

3.4.3.2.2 Observation

“When one’s concern is the experience of people, the way that they think, feel and act, the most truthful, reliable, complete and simple way of getting that information is to share their experience” (Douglas, 1976:112). This is precisely the outlook subscribed to
by proponents and practitioners of participant observation (Waddington, 1994). According to Waddington (1994), participant observation is best suited to research projects:

1. which emphasise the importance of human meanings, interpretations and interactions,
2. where the phenomenon under investigation is generally obscured from public view,
3. where it is controversial,
4. where it is little understood and may therefore be assumed that an “insider” perspective would enhance the existing knowledge.

Additionally, non-participant observation was undertaken by the researcher. Participant observation means that the researcher attempts to observe the lives and activities of the subjects without actually participating in their work activities. The present researcher used non participant observation to further an understanding of the NPD culture of the SMEs. In this regard non participant observation did not generate data which was subsequently used as evidence of product advantage preferences or new product performance activities but merely served to develop the researchers understanding of the nature of the NPD in the SMEs and to consequently have a greater appreciation of descriptions outlined by the SME owner/ managers. The non-participant observation, therefore, did not require content analysis. However, non-participant observation could lead to bias, but as the researcher did not use this form of data generation to confirm or disconfirm hypotheses, the potential for bias by the researcher recalling events which correspond with the actual results was limited. The researcher tried to make sure that non-participant observation was used solely as means of developing understanding rather than drawing firm conclusions thereby reducing researcher bias by selective presentation of data.
3.4.3.3 Qualitative Analytical Procedure

The analysis and interpretation of research data form a major part of this research. The definition of what is the ‘analytical method’ is of paramount importance to any analytical strategy (Amaratunga et al., 2002). Miles and Huberman (1994) define qualitative data analysis as consisting of three concurrent flows of activity: data reduction, data display and conclusion drawing and verification. Data reduction refers to the process of selecting, focusing, simplifying, abstracting and transforming the data that appears in transcripts. Data display is the organised compressed assembly of information that permits conclusion drawing. This method for analysing the data was chosen once the data had been collected. In the ‘data reduction’ stage the resulting volumes of data were condensed using QSR Nvivo (a statistical programme for analysing qualitative information). In analysing the case interviews, it is customary to commence by focusing on a case-by-case breakdown before engaging in cross-case analysis (Carson et al., 2001; Miles and Huberman, 1994). Thus, the researcher progressed through a succession of steps, starting with open codes which were derived from the data, following with more abstract codes, and finally, forming the foundations of theory with a final set of conceptual and theoretical codes (Goulding, 1998). As such,
coding was crucial in identifying emerging concepts from the data that were employed in the analysis of the phenomenon, and in theory building, in this research (Catterall, 1996). Once condensed by ‘Nvivo, the data were displayed in a series of extended texts which facilitated the process of analysis. The results of the analyses were compared with the extant literature to verify consistencies and note discrepancies, thereby enhancing internal validity and generalisability in the theoretical level of theory building (Lindgreen, 2000).

In summation, the combination of these techniques such as in-depth interviews, non-participant observation, archival methods (including newspaper articles, company websites and FAME where present), and field log enabled the collection of data from verbal communications, observation, reports and documentation, and researcher experience within a specific context. In addition, the case SMEs websites were included in this exploration of their NPD activities and practise. Such data were compiled to form a case study on each company, (presented in the Chapter 5) thereby enabling process questions of “how” and “why” format to be posed, which facilitated an investigation of “a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (Yin, 1994: 3). Such an integrated approach (Gilmore and Carson, 1996) allowed the researcher to combine appropriate research methodologies and aids at specific points in the research process, thereby eliminating the deficiencies of any one research technique (Carson and Coviello, 1996) and increasing credibility of findings (O’Donnell and Cummins, 1999).
3.4.3.4 Evaluation of the case study research design

To establish variability and reliability in case study research, Riege (2003) proposed four criteria for judging the soundness of case study research; internal validity, external validity, reliability and construct validity.

3.4.3.4.1 Internal validity

Internal validity in case study research refers to how the research process established results in a credible way. Internal validity involves establishing that the results of research are credible or believable from the perspective of the participant in the research. Since the purpose of this element of research was to describe or understand the phenomena (product advantage and new product performance) from the participant's eyes, the participants are the only ones who can legitimately judge the credibility of the results. To establish in this research, prolonged engagement, observation and the use of multiple sources of data were used. Additionally an initial case by case analysis was conducted followed by a cross-case analysis which highlighted internal coherence of findings and concepts.

3.4.3.4.2 External validity

External validity is concerned with the degree to which the results from the case study research can be transferred to other contexts or settings. The purpose of the case study in this thesis was to increase understanding and not generalisability. However, external validity was enhanced by doing a thorough job of describing the research context and the assumptions that were central to the research. The person who wishes to “transfer” the results to a different context is then responsible for making the judgment of how sensible the transfer is.
3.4.3.4.3 Reliability

Reliability refers to the demonstration that the procedures of the research inquiry can be repeated by other researchers. In this research several techniques were used to enhance reliability such as giving full account of theories and ideas, developing research protocol and topic lists, recording and transcribing interviews, using Nvivo to code the text and highlight parallels in extended texts and recording observations. The idea of reliability emphasises the need for the researcher to account for the ever-changing context within which research occurs. Thus a constant effort was made to document changes that occurred in the setting and how these changes affected the way the research.

3.4.3.4.4 Construct validity

Construct validity refers to the establishment of appropriate operational measures for the theoretical concepts being researched. There were a number of strategies used in this research for enhancing construct validity; multiple sources of data were used, a clear chain of evidence was established and documented, the procedures for checking and rechecking the data throughout the study was also documented. Additionally, the researcher actively searched for and described instances that contradict prior observations and after the study, a data audit was conducted to examine the data collection and analysis procedures.

3.5. Evaluation of the Multi-method research design

The convergent findings of a multi method approach are accepted with greater confidence in terms of validity and reliability. The multi method approach is considered to be high in both validity and reliability. The approach tests the validity of measures
and theories by means of cross method comparisons. Validity can be inferred from agreement between different data sets and invalidity from disagreement. However, generally researchers (Taber, 1991; Gill and Johnson 1991; Brewster and Hunter 1989) believe that multi-method ensures higher validity and reliability of results. Brewster and Hunter (1989:17) note

“For if our various methods have weaknesses that are truly different then their convergent findings may be accepted with far greater confidence than any single methods findings would warrant”

3.6 Conclusion

This chapter has provided an overview of the research plan used in this thesis – a multi method approach using both quantitative and qualitative research instruments. The objectives of the research strategy were discussed and the research philosophy detailed. The research study seeks an explanation of the relationship between product advantage and organisational performance. The ontological stance of the researcher – pragmatism – is identified and explained. The epistemology adopted for this study is that of both positivist and phenomenological due to its appropriateness and applicability to the research project at hand. The methodological basis of this study is multi-methodology due to complementarity being the method adopted. By adopting such an approach, this study intends to make a significant contribution to both the wider arena of NPD as well as helping in the formulation of a stronger empirical framework for the further study product advantage business context. The following chapter, Chapter 4, presents the primary research findings relating to the research objectives.
Chapter 4 Quantitative Findings
4.1 Introduction

This chapter begins the process of extracting meaning from the data received from the quantitative research undertaken as part of this thesis, represents stage one of the research process (see Figure 4.1), and presents findings relative to research objectives 1-3, which were posed in Chapter 2. As previously detailed in chapter 2 it is necessary to identify the underlying structure of the research components; product advantage and new product performance, prior to the investigation of the research objectives. The purpose of this chapter is thus to a) advance the research model (by identifying the underlying structure of product advantage (Research Question 1a) and new product performance (Research Question 2a) and (b) to conduct analysis relative to research objectives 1-3.

**Figure 4.1: Stage One of the research Process**

This chapter is arranged as follows first, the results are arranged by presenting the preliminary statistics in relation to firm size (micro, small or medium-sized), firm type
(B2C or B2B), new product strategy (new product, product extension or product improvement) and product outcome (success/failure) of the survey sample.

Second, in satisfaction of research questions 1a and 2a, exploratory factor analysis (EFA) was used to discover the factor structure of product advantage and new product performance. EFA is based on the *Common Factor Model* that proposes that each observed response is influenced partially by underlying common and unique factors. EFA is used to discover the nature of the constructs influencing a set of responses without imposing a preconceived structure on the outcome and is generally recommended when researchers have no hypotheses about the nature of the underlying factor structure of their measure. Consequently, the research model of the relationship between product advantage and new product performance is developed and research hypotheses to test the relationship (Research Objective 3) are presented.

Third, descriptive statistics (mean and median) are presented and non-parametric Mann-Whitney U-Tests and Kruskal Wallis H-Tests are conducted to satisfy the investigation of remaining research questions 1b-e and 2b-e. Mann Whitney U-Test and Kruskal Wallis H-Test are used when assessing whether two or more samples of independent observations tends to have larger values than the other. It is one of the most well-known non-parametric significance tests. Mann Whitney U-Test and Kruskal Wallis H-Tests are used when the observations from both groups are independent of each other and when the responses are ordinal or continuous measurements as was the case in this thesis. Such an exploration completes the quantitative exploration into the nature of product advantage (Research Objective 1) and new product performance (Research Objective 2) in SMEs.
Finally, facilitated by the advanced research model, regression analysis is used to test the causal relationships between product advantage and new product performance (Research Objective 3). Regression analysis is a statistical tool that allows the prediction of the value of one continuous dependent (DVs) variable from one or more other independent variables (IVs). Each IV is associated with specific coefficients that summarises the relationship between that IV and the DV. Once the coefficients are estimated hypothesis tests and confidence intervals are used to make inferences about the corresponding parameters of the population. Regression analysis was used in this thesis to explain the variability in the dependent variables (NPP measurement dimensions) using several independent variables (PA components).

Figure 4.2 illustrates the outline of this chapter.

![Figure 4.2: Outline of Chapter 4](image)

This chapter is structured as follows; section 4.2 presents the survey data and the preliminary descriptive findings. Section 4.3 presents the investigation of Research Question 1a and Research Question 2a and advances the research model. Section 4.4 presents the remainder of the analysis on Research Objective 1, Section 4.5 presents the
remainder of the analysis on Research Objective 2 and Section 4.6 presents the analysis of Research Objective 3. Section 4.7 details the key issues emerging from the quantitative analysis and the chapter is concluded in Section 4.8.

4.2 Preliminary Statistics

The following section details the descriptive data in relation to firm size (micro, small or medium-sized), firm type (business-to-consumer or business-to-business), product strategy (new product, product extension or product improvement) and product outcome (success/failure) of the survey sample. Table 4.1 details firm types; business-to-consumer (B2C) and business-to-business (B2B) product manufacturers reduced by firm size.

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>B2C</th>
<th>B2B</th>
<th>Both</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro (&lt;10 employees)</td>
<td>37 (56%)</td>
<td>18 (27%)</td>
<td>11 (17%)</td>
<td>N=66 (54%)</td>
</tr>
<tr>
<td>Small (11-50 employees)</td>
<td>22 (59%)</td>
<td>5 (14%)</td>
<td>10 (27%)</td>
<td>N=37 (30%)</td>
</tr>
<tr>
<td>Medium (51-250 employees)</td>
<td>5 (25%)</td>
<td>3 (15%)</td>
<td>12 (60%)</td>
<td>N=20 (16%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>64 (52%)</strong></td>
<td><strong>26 (21%)</strong></td>
<td><strong>33 (27%)</strong></td>
<td><strong>N=123 (100%)</strong></td>
</tr>
</tbody>
</table>

Within the sample of 123 firms approximately 54% were micro firms, 30% were small firms and 16% were medium sized firms, indicating that the sample consisted of one medium sized firm for every two small and three micro sized firms. Data shows that across firm types the majority of the sample, approximately 52% of firms, was producing consumer based products compared to 21% producing industrial based products. Thirty-three firms, 27% of the sample identified that they are producing both consumer and industrial products. Furthermore, approximately 58% of firms producing
B2C products are micro firms, compared to 34% and 8% for small and medium sized firms respectively. Similarly, the majority of the firms who are producing B2B products are micro firms at 69% followed by small and medium at 19% and 12% respectively (See Table 4.1). A Chi-square test for independence was conducted to indicate if there is an association between firm size and firm type. The chi-square test for independence indicated a significant strong association between firm size and firm type (p=.002, Cramer’s V = .261**).

In relation to new product strategy, classified according to Booz et al. (1982) product strategy types, Table 4.2 identifies that across firm size SMEs are predominantly producing product extensions, representing approximately 45%, followed by product improvements and new products at 29% and 26% respectively. New products are products that are new to the company and do not refer to new-to-the-world products. The categories the respondents could choose from were; 1) a new product line, 2) an addition to an existing product line and 2) a product improvement. These categories account for approximately 77% of all new products introduced in the marketplace (Griffin, 1997). The chi-square test for independence indicated no significant association between firm size and product type (p=.604, Cramer’s V = .137).

Table 4.2: Product strategy by Firm Size (N=116)

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>New Products</th>
<th>Product Extensions</th>
<th>Product Improvements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro (&lt;10 employees)</td>
<td>17 (28%)</td>
<td>27 (44%)</td>
<td>17 (28%)</td>
<td>N=61</td>
</tr>
<tr>
<td>Small (11-50 employees)</td>
<td>7 (20%)</td>
<td>17 (49%)</td>
<td>11 (31%)</td>
<td>N=35</td>
</tr>
<tr>
<td>Medium (51-250 employees)</td>
<td>6 (30%)</td>
<td>8 (40%)</td>
<td>6 (30%)</td>
<td>N=20</td>
</tr>
<tr>
<td></td>
<td>30 (26%)</td>
<td>52 (45%)</td>
<td>34(29%)</td>
<td>N=116</td>
</tr>
</tbody>
</table>

Furthermore, firms identified if their most recently introduced product had been successful or unsuccessful by indicating on a five point scale whether their new product
had met, exceeded or failed to meet expectations. Successful products are products that met or exceeded expectations and unsuccessful products are products that fell below expectations. Table 4.3 shows the breakdown of the data in terms of project success and firm size.

Table 4.3: The rate of product success versus failure (N=118)

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>New Product Performance</th>
<th>Far above expectations</th>
<th>Slightly above expectations</th>
<th>Met expectations</th>
<th>Slightly below expectations</th>
<th>Far below expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success</td>
<td>Fail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro (&lt;10)</td>
<td>13 (19.7%)</td>
<td>6 (9.1%)</td>
<td>1 (1.5%)</td>
<td>N=66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small (11-50)</td>
<td>6 (17.6%)</td>
<td>9 (26.5%)</td>
<td>16 (47.1%)</td>
<td>1 (2.9%)</td>
<td>2 (5.9%)</td>
<td>N=34</td>
</tr>
<tr>
<td>Medium (51-250)</td>
<td>1 (5.6%)</td>
<td>6 (33.3%)</td>
<td>9 (50%)</td>
<td>2 (11.1%)</td>
<td>0 (0%)</td>
<td>N=18</td>
</tr>
<tr>
<td>All SMEs</td>
<td>20</td>
<td>31</td>
<td>55</td>
<td>9</td>
<td>3</td>
<td>N=118</td>
</tr>
</tbody>
</table>

The majority of new products introduced by the SMEs’ surveyed recorded successful outcomes (See Table 4.3) with 106 product successes compared to 12 unsuccessful products. In relation to successful products only, the following breakdown exists; 55 products or 52% of companies surveyed highlighted that there most recently introduced product fell into the ‘met expectations’ category compared to 31 products (26%) recording performance ‘slightly above expectations’ and 20 products (17%) recording an outcome ‘far above expectations’. Small firms (between 11-50 employees), recorded the highest level of success in product development with 91.2% success conversion rate followed 89.4% of micro firms (<10 employees) and 88.9% of medium-sized (between 51-250 employees). A chi-square test for independence could not be conducted as the ‘minimum expected cell frequency’ assumption was violated.

Firms also identified their performance on six organisational performance measures derived from literature. A comparison is drawn between successful and unsuccessful
products by examining the mean values of the measures used. Figure 4.3 illustrates that firms who recorded successful product development outcomes (N=106) performed better on all six organisational performance measures (see Table 4.13) compared to those firms whose product development was unsuccessful (N=12), further supporting the relationship between product development success and organisational performance in SMEs.

![Bar chart showing organisational performance comparison of successful versus unsuccessful products](chart.png)

**Figure 4.3: Organisational Performance comparison of successful versus unsuccessful products**

To further test for reliability a series of Mann-Whitney U-tests also revealed a significant difference between all six organisational performance measures for successful products compared to unsuccessful products (see Table 4.4) identifying a distinct and positive relationship between successful new product development and increased organisational performance in SMEs. Mann-Whitney Tests were deemed appropriate as the data was ordinal and continuous in nature. There is a distinct positive relationship between successful product development and increased organisational performance in SMEs and thus support for the notion of developing new products as a means of increasing organisational performance is advanced.
Table 4.4: Impact of product outcome on Organisational Performance

<table>
<thead>
<tr>
<th>Organisational Performance measures</th>
<th>Mean Success</th>
<th>Mean Failure</th>
<th>Median Success</th>
<th>Median Failure</th>
<th>Mann-Whitney U-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>5.25</td>
<td>4.09</td>
<td>6.00</td>
<td>4.00</td>
<td>.004**</td>
</tr>
<tr>
<td>Profitability</td>
<td>5.12</td>
<td>3.73</td>
<td>5.00</td>
<td>4.00</td>
<td>.000**</td>
</tr>
<tr>
<td>New product success</td>
<td>5.20</td>
<td>3.64</td>
<td>5.00</td>
<td>4.00</td>
<td>.000**</td>
</tr>
<tr>
<td>Sales share new products</td>
<td>5.04</td>
<td>3.90</td>
<td>5.00</td>
<td>4.00</td>
<td>.019*</td>
</tr>
<tr>
<td>Market share</td>
<td>5.21</td>
<td>4.18</td>
<td>5.00</td>
<td>5.00</td>
<td>.034*</td>
</tr>
<tr>
<td>ROI/IRR</td>
<td>5.35</td>
<td>3.45</td>
<td>5.00</td>
<td>3.00</td>
<td>.000**</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

In summation, this section has detailed the preliminary data in relation to the composition of the sample for this study and advanced support for the notion of developing new products as a means to achieve organisational growth in SMEs. The following section begins the process of extracting meaning from the data specific to the advancement of the research model of the Research Aim: “How does Product Advantage influence new product performance in Small and Medium-sized Enterprises?”

4.3 Research Model Development

Chapter 2, Section 2.6 noted that due to the ambiguity in literature on the composition of product advantage and new product performance the relationship between them could not be hypothesised prior to analysis aimed at identifying the structure of both constructs. Instead chapter 2, Section 2.6 proposed a non-descript model (see Figure 2.5 re-produced below) that only suggested that there is a relationship between product advantage and new product performance in SMEs. Additionally, chapter 2 detailed the 14 scale items indicative of product advantage and the 17 scale items indicative of new product performance to be subjected to exploratory factor analysis.
This section details the statistical techniques used to identify the underlying structure of both product advantage and new product performance. This process adheres to Mulaik (1993) who suggest that the factor structures based on theory should be set up prior to conducting a factor analysis which would prove or disprove that theory. Consequently, the survey questions were designed to incorporate the characteristics of product advantage and the measures of new product performance theory (Section 2.3 and 2.4 respectively). Additionally, the nature of research objectives 1 and 2 is exploratory, so it is appropriate that the data ultimately suggests the factor structure.

### 4.3.1 Product advantage structure identification in SMEs.

Chapter 2, Section 2.3 proposed 14 characteristics that were satisfactorily identified in literature as indicative of product advantage. Exploratory factor analysis (EFA) was used to discover the factor structure of product advantage and to examine its internal
reliability. Additionally, by identifying empirically, any underlying dimensions within the construct, the deficiencies associated with previous product advantage conceptualisation and measurement scales are addressed.

Subsequently, the 14 item product advantage scale was subjected to EFA using SPSS. Prior to performing EFA the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above, (See Table 4.5) indicating that many of the scale items seem to be measuring the same phenomenon and supporting the appropriateness of the construct for EFA.
Table 4.5: Correlation analysis between Product Advantage characteristics and Product Success (N=123)

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
<th>11.</th>
<th>12.</th>
<th>13.</th>
<th>14.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be better relative to competitors offerings</td>
<td>-</td>
<td>.522**</td>
<td>.234**</td>
<td>.475**</td>
<td>.268**</td>
<td>.117</td>
<td>.270**</td>
<td>.502**</td>
<td>.177</td>
<td>.356**</td>
<td>.388**</td>
<td>.268**</td>
<td>.251**</td>
<td>.417**</td>
</tr>
<tr>
<td>Be superior</td>
<td>-</td>
<td>.457**</td>
<td>.596**</td>
<td>.374**</td>
<td>.229**</td>
<td>.393**</td>
<td>.414**</td>
<td>.335**</td>
<td>.457**</td>
<td>.509**</td>
<td>.394**</td>
<td>.293**</td>
<td>.289**</td>
<td></td>
</tr>
<tr>
<td>Be unique</td>
<td>-</td>
<td>.465**</td>
<td>.478**</td>
<td>.421**</td>
<td>.353**</td>
<td>.373**</td>
<td>.522**</td>
<td>.341**</td>
<td>.361**</td>
<td>.461**</td>
<td>.266**</td>
<td>.270**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be of better quality</td>
<td>-</td>
<td>.351**</td>
<td>.327**</td>
<td>.403**</td>
<td>.559**</td>
<td>.344**</td>
<td>.386**</td>
<td>.584**</td>
<td>.636**</td>
<td>.397**</td>
<td>.231**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve problems</td>
<td>-</td>
<td>.550**</td>
<td>.615**</td>
<td>.314**</td>
<td>.552**</td>
<td>.535**</td>
<td>.399**</td>
<td>.384**</td>
<td>.290**</td>
<td>.209**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be innovative</td>
<td>-</td>
<td>.468**</td>
<td>.344**</td>
<td>.525**</td>
<td>.363**</td>
<td>.340**</td>
<td>.436**</td>
<td>.407**</td>
<td>.151</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable better technical performance</td>
<td>-</td>
<td>.318**</td>
<td>.444**</td>
<td>.499**</td>
<td>.368**</td>
<td>.359**</td>
<td>.322**</td>
<td>.207**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet customer's needs</td>
<td>-</td>
<td>.422**</td>
<td>.491**</td>
<td>.390**</td>
<td>.540**</td>
<td>.540**</td>
<td>.451**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable differentiation</td>
<td>-</td>
<td>.600**</td>
<td>.415**</td>
<td>.540**</td>
<td>.515**</td>
<td>.149</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide benefits</td>
<td>-</td>
<td>.550**</td>
<td>.501**</td>
<td>.482**</td>
<td>.188**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have better product design</td>
<td>-</td>
<td>.644**</td>
<td>.426**</td>
<td>.262**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have better individual attributes/features</td>
<td>-</td>
<td>.536**</td>
<td>.218**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Match customer perceptions</td>
<td>-</td>
<td>.450**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be cost effective</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at p < 0.05; ** Significant at p < 0.01
The Kaiser-Meyer-Oklin value, which measures the adequacy of the sample for factor analysis, was .866, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and the Bartlett’s Test of Sphericity (Bartlett, 1954), which considers the appropriateness for factor analysis, reached statistical significance (P=.000), supporting the factorability of the correlation matrix (Vogt, 2005). Tabachnick and Fidell (2007) suggest that for the factor structure to be reliable the ratio of subjects to items should not be lower than five cases for every item; the ratio in this study was approximately nine cases for every item again supporting the suitability of the scale for factor analysis. Subsequent principal component analysis revealed the presence of three components; Component 1 contributing 44.7%, Component 2 contributing 10.7% and Component 3 contributing 7.5%. To aid in the interpretation of these three components, Direct Oblimin rotation was performed (see Table 4.6).
In identifying the variables to retain in the factor analysis the following minimum criteria was used:

1. items had communality values above .30 (Pallant, 2007),

2. items had primary loadings above .4 (Hair et al. 1998) on specific factor and no cross-loadings of .32 or above (Tabachnick and Fidell, 2001),

3. the reliability of the scale was increased by the deletion of any items (Pallant, 2007),

4. each factor contained a minimum of three items (Pallant, 2007).

As detailed in Table 4.6 all items had communality loadings above .30 and all items had primary loadings over .40. However, the items ‘have better individual attributes/features'
attributes/features’ and ‘have better product design’ had factor loadings above .32 on Factors 1 and 3 and Factors 1 and 2 respectively. In this situation two options are available 1) variable deletion or 2) decreasing/increasing the number of factors to be retained. As a result these items were considered for deletion. An inspection of the coefficient alphas however revealed that deletion of ‘have better individual attributes/features’ and ‘have better product design’ from their respective factors reduced the scale reliability coefficients (Cronbach’s Alpha) from .859 to .845 and .803 to .769 respectively. It was decided to remove the weak loadings from further analysis as it was deemed to not compromise the integrity of the data (Costello and Osbourne, 2005). Finally, all three factors contained a minimum of three items.

The rotation solution reveals the presence of a simple structure, with all components showing a number of strong loadings and all variables loading on only one component. The results of the exploratory factor analysis provide clear support for the delineation of product into three components. The product advantage delineated components advanced by Rijsdijk et al., 2011; McNally et al., 2010; Szymanski et al., 2007; and Calantone et al., 2006 and reviewed in Chapter 2 Section 2.3.3 suited the extracted factors and as a result these labels are retained in the study.

- Component 1 is a seven item component (solve problems, enable differentiation, be innovative, enable better technical performance, provide benefits, be unique, have better individual attributes/features) labelled ‘product innovativeness’ and is related to the ability of the product to solve problems and add value through its physical features and level of innovativeness and technical performance.

- Component 2 is a four item component (be superior, be better relative to competitors’ offerings, of better quality, have better product design) labelled
‘product superiority’ and is related to the products superiority over competitors in key areas of product design and quality.

- Component 3 is a three item component (match customers’ perceptions, be cost effective, meet customers’ needs) labelled ‘product meaningfulness’ and is related the ability of the product to be meaningful in that it matches perceptions, satisfies needs and is cost effective.

Internal consistency for each factor, examined using Cronbach’s alpha, was high; .859 for product innovativeness (7 items), .803 for product superiority (4 items) and .730 for product meaningfulness (3 items), supporting the adequacy of the factor solutions.

As previously suggested, for the factor structure to be reliable the ratio of subjects to items should not be lower than five cases for every item. As a result, whether a different factor structure exists for consumer based products and industrial based products; for micro, small or medium sized firms; or product strategy; could not be investigated and a comparison between groups could not be conducted, however such an investigation could be an avenue for future research.

In summation, empirical support for the delineation of the product advantage construct into three alternative entities has been provided thereby addressing the deficiencies in conceptualisation and measurement associated with previous studies. However, as noted in chapter 2 similar conceptual weaknesses exist around the structure and measurement of new product performance in SMEs. The following Section 4.3.2 thus presents the empirical results of the new product performance structure identification process.
4.3.2 New Product Performance structure identification

Although much research on the classification of new product performance exists (Garcia et al., 2008; Alegre et al., 2006; Blindenbach-Driessen et al., 2005; Hart, 1993), research on the composition of the NPP dimension is scant. Huang et al. (2004) in a study of firms with less than 200 employees used principal component analysis to identify a four factor structure for NPP relating to; financial performance, objective customer acceptance, technical measures and subjective customer acceptance. However, in identifying the four factor structure, Huang et al. (2004) used the Varimax method to rotate and interpret the factor loadings. Varimax is an orthogonal approach to factor solution rotation and requires the researcher to assume that the underlying constructs are independent (Tabachnick and Fidell, 2007), which this study proposes was a flawed approach. It is for this reason that this study replicates Huang et al. (2004) approach but uses an oblique rotation approach (Direct Oblimin) to interpret the factor solution as oblique approaches allow for the factors to be correlated.

Subsequently, the 17 item measurement new product performance scale was subjected to EFA using SPSS. The Kaiser-Meyer-Oklin value, which measures the adequacy of the sample for factor analysis, was .872, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and the Bartlett’s Test of Sphericity (Bartlett, 1954), which considers the appropriateness for factor analysis, reached statistical significance (P=.000), supporting the factorability of the correlation matrix. Principal component analysis revealed the presence of four factors with eigenvalues greater than one that explained 71.9% of the variance in the data. Factor 1 contributing 47.3%, Factor 2 contributing 11.6%, Factor 3 contributing 7.0% and Component 4 contributing 6.0%. The rotation solution is presented in Table 4.7.
Table 4.7: Pattern Matrix for PCA with Oblimin Rotation of Four Factor Solution for New Product Performance Scale for all SMEs (N=123)

<table>
<thead>
<tr>
<th>Item</th>
<th>Pattern Coefficients</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factor 1</td>
<td>Factor 2</td>
</tr>
<tr>
<td>Met revenue sales</td>
<td>.935</td>
<td>.030</td>
</tr>
<tr>
<td>Met sales growth goals</td>
<td>.889</td>
<td>.058</td>
</tr>
<tr>
<td>Met market share goals</td>
<td>.823</td>
<td>.107</td>
</tr>
<tr>
<td>Unit volume goals</td>
<td>.817</td>
<td>.047</td>
</tr>
<tr>
<td>Met profitability goals</td>
<td>.780</td>
<td>-.048</td>
</tr>
<tr>
<td>Met contribution marginal goals</td>
<td>.733</td>
<td>-.064</td>
</tr>
<tr>
<td>Number of customers</td>
<td>.721</td>
<td>-.134</td>
</tr>
<tr>
<td>ROI or IRR</td>
<td>.700</td>
<td>.018</td>
</tr>
<tr>
<td>Break-even time</td>
<td>.561</td>
<td>.229</td>
</tr>
<tr>
<td>Launch on time</td>
<td>.025</td>
<td>.918</td>
</tr>
<tr>
<td>Time to market</td>
<td>-.003</td>
<td>.902</td>
</tr>
<tr>
<td>Development costs</td>
<td>-.001</td>
<td>.483</td>
</tr>
<tr>
<td>Met quality specifications</td>
<td>-.098</td>
<td>-.020</td>
</tr>
<tr>
<td>Met performance specifications</td>
<td>.154</td>
<td>-.018</td>
</tr>
<tr>
<td>Customer competitive advantage</td>
<td>.044</td>
<td>.112</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>.134</td>
<td>.078</td>
</tr>
<tr>
<td>Customer acceptance</td>
<td>.363</td>
<td>.078</td>
</tr>
</tbody>
</table>

In identifying the variables to retain in the factor analysis similar criteria was adhered to as was used in the previous section. As detailed in Table 4.7 all items had communality loadings above .30 and all items had primary loadings over .40. However, as highlighted in Table 4.7, three NPP measures cross loaded; development costs cross-loading on Factors 2 and 3, customer satisfaction cross-loading on Factors 3 and 4 and customer acceptance also cross-loading of Factors 3 and 4. Also only one measure, customer acceptance loaded significantly on Factor 4. In this situation two options are available 1) variable deletion or 2) decreasing/increasing the number of factors to be
retained. Given the importance and contribution to product success attributed to these variables in previous NPD literature it was chosen to ‘force’ a three factor solution in this study.

The subsequent ‘forced’ three factor solution (see Table 4.8) reveals the presence of a simple structure, accounting for 65.9% of the variance in the data with communalities above .5, with all components showing a number of strong loadings and all variables loading substantially on one component. Factor 1 contributing 47.3%, Factor 2 contributing 11.6% and Factor 3 contributing 7%.

<table>
<thead>
<tr>
<th>Item</th>
<th>Pattern Coefficients</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factor 1</td>
<td>Factor 2</td>
</tr>
<tr>
<td>Met revenue sales</td>
<td>.953</td>
<td>.011</td>
</tr>
<tr>
<td>Met sales growth goals</td>
<td>.907</td>
<td>.028</td>
</tr>
<tr>
<td>Met market share goals</td>
<td>.842</td>
<td>.072</td>
</tr>
<tr>
<td>Unit volume goals</td>
<td>.837</td>
<td>-.005</td>
</tr>
<tr>
<td>Met profitability goals</td>
<td>.781</td>
<td>-.031</td>
</tr>
<tr>
<td>Met contribution marginal goals</td>
<td>.731</td>
<td>-.028</td>
</tr>
<tr>
<td>Number of customers</td>
<td>.729</td>
<td>-.173</td>
</tr>
<tr>
<td>ROI or IRR</td>
<td>.699</td>
<td>.060</td>
</tr>
<tr>
<td>Break-even time</td>
<td>.568</td>
<td>.300</td>
</tr>
<tr>
<td>Launch on time</td>
<td>.039</td>
<td>.921</td>
</tr>
<tr>
<td>Time to market</td>
<td>.012</td>
<td>.879</td>
</tr>
<tr>
<td>Development costs</td>
<td>-.012</td>
<td>.519</td>
</tr>
<tr>
<td>Met quality specifications</td>
<td>-.127</td>
<td>-.011</td>
</tr>
<tr>
<td>Met performance specifications</td>
<td>.131</td>
<td>-.004</td>
</tr>
<tr>
<td>Customer competitive advantage</td>
<td>.025</td>
<td>.119</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>.127</td>
<td>.011</td>
</tr>
<tr>
<td>Customer acceptance</td>
<td>.367</td>
<td>-.007</td>
</tr>
</tbody>
</table>

Table 4.8: Pattern Matrix for PCA with Oblimin Rotation of Three Factor Solution for New Product Performance Scale for all SMEs (N=123)

However, as detailed in Table 4.8 two items had cross-loadings above .32; development time and customer acceptance. An inspection of the coefficient alphas however revealed that deletion of these items from their respective factors reduced the scale reliability.
coefficients (Cronbach’s Alpha). It was decided to remove the weak loadings from further analysis as it was deemed to not compromise the integrity of the data (Costello and Osbourne, 2005). Finally, all three factors contained a minimum of three items. The results of the EFA demonstrate that new product performance is comprised of three dimensions:

- Factor 1 is a nine item dimension (met revenue sales, met sales growth goals, met market share goals, unit volume goals, met profitability goals, met contribution marginal goals, number of customers, ROI or IRR and break-even-time) and is related to external objective market success, internal objective financial success and external objective customer numbers. Factor 1 reflects the degree of financial and non-financial success of the new product and is labelled ‘objective customer acceptance measures’.

- Factor 2 is a three item dimension (launch on time, time to market and development costs) and is an internal factor related to development costs/acceleration speed. Factor 2 reflects the efforts carried out to achieve success and is consequently labelled ‘development time measures’.

- Factor 3 is a five item dimension (met quality specifications, met performance specifications, customers’ competitive advantage, customer satisfaction and customer acceptance) and is related to internal non-financial technical performance and non-financial external customer acceptance. As identified in Table 4.8 all five items negatively load on factor 3. Negative loadings are caused by items that are negatively oriented to that factor. Factor 3 therefore reflects the performance of the product in reducing levels of customer dissatisfaction. Factor 3 is labelled ‘measures aimed at reducing subjective customer dissatisfaction’.
The Cronbach’s alpha for each dimension scale was high: .93 for objective customer acceptance (9 items), .79 for development time (3 items) and .83 for measures aimed at reducing subjective customer dissatisfaction (5 items).

In summation, empirical support has been provided for the re-structuring of NPP into three dimensions of measurement. The interpretation of the three measurement dimensions of NPP is not in line with previous literature however, no other study has sought to explore the structure of the construct in this way. The altered NPP conceptualisation is presented in Table 4.9.

### Table 4.9: NPP structure with scale items

<table>
<thead>
<tr>
<th>Objective customer acceptance measures (OCAM)</th>
<th>Development time measures (DTM)</th>
<th>Measures aimed at reducing subjective customer dissatisfaction (SCDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met revenue sales</td>
<td>Launch on time</td>
<td>Met quality specifications</td>
</tr>
<tr>
<td>Met sales growth goals</td>
<td>Time to market</td>
<td>Met performance specifications</td>
</tr>
<tr>
<td>Met market share goals</td>
<td>Development costs</td>
<td>Customers’ competitive advantage</td>
</tr>
<tr>
<td>Unit volume goals</td>
<td></td>
<td>Customer satisfaction</td>
</tr>
<tr>
<td>Met profitability goals</td>
<td></td>
<td>Customer acceptance</td>
</tr>
<tr>
<td>Met contribution marginal goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of customers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROI or IRR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break-even-time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following section presents the altered research model which will be used to determine the causal relationship between product advantage and new product performance (Research Objective 3) in SMEs. Additionally the new structure of product advantage and new product performance will be used in the exploration of research objectives 1 and 2.

### 4.3.3 Finalised Research Model

Based on the empirical findings regarding the composition of product advantage (Section 4.2.1) and new product performance (Section 4.2.2), the relationship between
product advantage and new product performance can be hypothesised and research model of this relationship developed (see Figure 4.4).
Figure 4.4: Research model of the research aim
The research model above highlights that there is 3 components to product advantage; product innovativeness, product superiority and product meaningfulness and that new product performance is measured on 3 dimensions; objective customer acceptance, development time and measures aimed at reducing subjective customer dissatisfaction. A research matrix is presented (see Table 4.10) and nine hypotheses (H1a-H3c) are proposed to facilitate the investigation of Research Objective 3.

**Table 4.10: Revised research matrix**

<table>
<thead>
<tr>
<th></th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance</td>
<td>H1a</td>
<td>H1b</td>
<td>H1c</td>
</tr>
<tr>
<td>Development time</td>
<td>H2a</td>
<td>H2b</td>
<td>H2c</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H3a</td>
<td>H3b</td>
<td>H3c</td>
</tr>
</tbody>
</table>

H1: There is a positive relationship between product advantage and objective customer acceptance measures of new product performance in SME’s

   H1a: There is a positive relationship between product innovativeness and objective customer acceptance measures of new product performance in SME’s

   H1b: There is a positive relationship between product superiority and objective customer acceptance measures of new product performance in SME’s

   H1c: There is a positive relationship between product meaningfulness and objective customer acceptance measures of new product performance in SME’s

H2: There is a positive relationship between product advantage and development time measures of new product performance in SME’s

   H2a: There is a positive relationship between product innovativeness and development time measures of new product performance in SME’s
H2b: There is a positive relationship between product superiority and development time measures of new product performance in SME’s

H2c: There is a positive relationship between product meaningfulness and development time measures of new product performance in SME’s

H3: There is a positive relationship between product advantage and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3a: There is a positive relationship between product innovativeness and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3b: There is a positive relationship between product superiority and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

H3c: There is a positive relationship between product meaningfulness and a reduction in subjective customer dissatisfaction measures of new product performance in SME’s

The advanced research model and the aforementioned hypothesis form the basis for the investigation of the causal element (Research Objective 3) of this thesis.

This remainder of this chapter extracts meaning from the data relative to the satisfaction of Research Objectives 1-3. Section 4.4 explores the nature of product advantage in SMEs (Research Objective 1). Section 4.5 explores the nature of new product performance measurement in SMEs (Research Objective 2). Section 4.5 facilitated by the research model (Fig 4.4 above) tests the causal relationship between product advantage and new product performance in SMEs (Research Objective 3).
4.4 Empirical Findings regarding the nature of Product Advantage in SMEs

The review of the literature on product advantage presented in chapter 2 presented four additional questions aimed at satisfying Research Objective 1: To investigate the nature of product advantage in SMEs.

b) What is the impact of Product Advantage on product outcome (success/failure)?

c) Does firm size (micro, small or medium-size) impact Product Advantage?

d) Does firm type (business-to-business or business-to-consumer) impact Product Advantage?

e) Does product type (new product, product extension or product improvement) impact Product Advantage?

To develop a comprehensive understanding of SME product advantage activities, this section thus provides a comparison of product advantage across the 4 parameters of; product outcome, firm size, firm type and product strategy. Mean and median values for each product advantage characteristic will be presented and non-parametric between groups’ tests (Kruskal-Wallis H-Test or Mann-Whitney U-Test) detailed. For non-parametric data it is appropriate to report the median values, however mean values provide for greater analysis and are generally the accepted standard.

Respondents indicated on a continuous ordinal scale of 1-7 (1 being the lowest, 7 being the highest), how each of the 14 product advantage characteristics provided an accurate description of their most recently introduced new product. Firms were also asked to identify along with the product advantage characteristics present in their new product.
whether the product had ‘fell below’, ‘met’ or ‘exceeded expectations’. Success was
deemed inclusive of products that ‘met’ or ‘exceeded expectations’ and failure was
products that ‘fell below expectations’. Table 4.11 presents the list, mean and median
(in parenthesis) values categorised by product outcome and illustrates that firms who
recorded successful product development outcomes (N=106) had higher levels on all
but two product advantage characteristics ‘have better product design’ and ‘be
innovative’ compared to those firms whose product development was unsuccessful
(N=12).

<table>
<thead>
<tr>
<th>Product Advantage Characteristics</th>
<th>Mean Success</th>
<th>Mean Failure</th>
<th>Mann-Whitney U-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet customer's needs</td>
<td>6.26 (6.00)</td>
<td>6.17 (7.00)</td>
<td>.918</td>
</tr>
<tr>
<td>Be of better quality</td>
<td>6.15 (6.00)</td>
<td>5.75 (6.00)</td>
<td>.062</td>
</tr>
<tr>
<td>Be cost effective</td>
<td>6.06 (6.00)</td>
<td>5.08 (5.00)</td>
<td>.009**</td>
</tr>
<tr>
<td>Match customer perceptions</td>
<td>6.04 (6.00)</td>
<td>5.64 (6.00)</td>
<td>.418</td>
</tr>
<tr>
<td>Be better relative to competitors</td>
<td>5.89 (6.00)</td>
<td>5.33 (6.00)</td>
<td>.233</td>
</tr>
<tr>
<td>offerin gs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be superior</td>
<td>5.78 (6.00)</td>
<td>5.25 (6.00)</td>
<td>.080</td>
</tr>
<tr>
<td>Provide benefits</td>
<td>5.69 (6.00)</td>
<td>5.36 (6.00)</td>
<td>.311</td>
</tr>
<tr>
<td>Have better individual</td>
<td>5.61 (6.00)</td>
<td>5.45 (6.00)</td>
<td>.578</td>
</tr>
<tr>
<td>attributes/features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enable differentiation</td>
<td>5.55 (6.00)</td>
<td>5.36 (6.00)</td>
<td>.601</td>
</tr>
<tr>
<td>Have better product design</td>
<td>5.54 (6.00)</td>
<td>5.56 (6.00)</td>
<td>.858</td>
</tr>
<tr>
<td>Be innovative</td>
<td>5.54 (6.00)</td>
<td>5.55 (6.00)</td>
<td>.952</td>
</tr>
<tr>
<td>Enable better technical</td>
<td>5.41 (6.00)</td>
<td>5.00 (5.00)</td>
<td>.298</td>
</tr>
<tr>
<td>performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve problems</td>
<td>5.40 (6.00)</td>
<td>5.09 (5.00)</td>
<td>.444</td>
</tr>
<tr>
<td>Be unique</td>
<td>5.39 (6.00)</td>
<td>4.83 (5.00)</td>
<td>.123</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Mann-Whitney U-tests identified only one statistically significant difference in ‘be cost
effective’ (p=.009**) product advantage characteristic between successful and
unsuccessful products. A subsequent bi-variate correlation further echoed the
importance of cost as an impacting factor on product success by indicating a significant
linear relationship between ‘be cost effective’ and success (r=.243, p-value <.01),
Additional analysis conducted by way of an ordinary least squares (OLS) regression identified that 7.9% ($R^2 = .079$, $p=.002$) of the variance in product success is solely explained by the ‘be cost effective’ variable.

Composite scores were created based on the mean values of the items which had their primary loadings on each of the three product advantage components identified in Section 4.3.1; product innovativeness, product superiority and product meaningfulness (see Table 4.12). Table 4.12 indicates that firms who recorded successful product development outcomes had higher levels on all three product components compared to those firms whose product development was unsuccessful. However, no statistically significant difference was found for the composite components between the groups.

**Table 4.12: Product components categorised by Product Outcome**

<table>
<thead>
<tr>
<th>Product Advantage Characteristics</th>
<th>Mean Success</th>
<th>Mean Failure</th>
<th>Mann-Whitney U-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Innovativeness</td>
<td>5.49</td>
<td>5.13</td>
<td>.154</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>5.84</td>
<td>5.55</td>
<td>.242</td>
</tr>
<tr>
<td>Product meaningfulness</td>
<td>6.12</td>
<td>5.70</td>
<td>.349</td>
</tr>
</tbody>
</table>

* Significant at $p < 0.05$; ** Significant at $p < 0.01$

Table 4.13 illustrates the list, mean and median (in parenthesis) values categorised by product size; micro firms (n=66), small firms (n=37) and medium-sized firms (n=20), of the 14 product advantage scale items in descending order of importance.

**Table 4.13: SME Product Advantage values categorised by Firm Size (N=123)**

<table>
<thead>
<tr>
<th>Product Advantage characteristics</th>
<th>Mean micro firm</th>
<th>Mean small firm</th>
<th>Mean medium-sized firm</th>
<th>Kruskal-Wallis H Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet customer’s needs</td>
<td>6.52 (7.00)</td>
<td>6.08 (6.00)</td>
<td>5.65 (6.00)</td>
<td>.002**</td>
</tr>
<tr>
<td>Be of better quality</td>
<td>6.26 (6.00)</td>
<td>5.95 (6.00)</td>
<td>6.00 (6.00)</td>
<td>.354</td>
</tr>
<tr>
<td>Product Advantage</td>
<td>Micro (x̄=6.08)</td>
<td>Small (x̄=6.52)</td>
<td>Medium (x̄=6.00)</td>
<td>p-value</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Be cost effective</td>
<td>5.97</td>
<td>5.15</td>
<td>5.97</td>
<td>.048</td>
</tr>
<tr>
<td>Match customer perceptions</td>
<td>6.06</td>
<td>6.00</td>
<td>5.60</td>
<td>.299</td>
</tr>
<tr>
<td>Be better relative to competitors’ offerings</td>
<td>5.81</td>
<td>5.75</td>
<td>5.75</td>
<td>.959</td>
</tr>
<tr>
<td>Be superior</td>
<td>5.54</td>
<td>5.15</td>
<td>4.65</td>
<td>.791</td>
</tr>
<tr>
<td>Provide benefits</td>
<td>5.49</td>
<td>5.55</td>
<td>5.55</td>
<td>.434</td>
</tr>
<tr>
<td>Have better individual attributes/features</td>
<td>5.53</td>
<td>5.20</td>
<td>5.20</td>
<td>.215</td>
</tr>
<tr>
<td>Have better product design</td>
<td>5.44</td>
<td>5.25</td>
<td>5.25</td>
<td>.132</td>
</tr>
<tr>
<td>Enable differentiation</td>
<td>5.53</td>
<td>5.05</td>
<td>5.05</td>
<td>.322</td>
</tr>
<tr>
<td>Be innovative</td>
<td>5.46</td>
<td>5.10</td>
<td>5.10</td>
<td>.352</td>
</tr>
<tr>
<td>Solve problems</td>
<td>5.17</td>
<td>5.00</td>
<td>5.00</td>
<td>.122</td>
</tr>
<tr>
<td>Enable better technical performance</td>
<td>5.00</td>
<td>5.45</td>
<td>5.45</td>
<td>.153</td>
</tr>
<tr>
<td>Be unique</td>
<td>5.30</td>
<td>4.65</td>
<td>4.65</td>
<td>.133</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Inspection of the mean values (x̄) in Table 4.13 highlights that for micro and small firms the ability of the product to ‘meet customer’s needs’ (x̄=6.52) and (x̄=6.08) respectively, is the product advantage that most accurately describes their new product. Both firm sizes; micro and small also indicate that the ability to be ‘of better quality’, ‘be cost effective’, ‘match customer perceptions’, and ‘be better relative to competitors’ offerings’ also encapsulates their products advantage. However, small firms indicate that the ability to ‘match customer perceptions’ (x̄=6.06) and ‘to be cost effective’ (x̄=5.97) is more important than the ‘be of better quality’ (x̄=5.95) characteristic. Medium-sized SMEs indicate that customer related product advantage characteristics such as ‘meet customer needs’ (x̄=5.65) and ‘match customer perceptions’ (x̄=5.60) are not as important to present in their product offering as the ability to ‘be of better quality’ (x̄=6.00) and ‘be better relative to competitors’ offerings’ (x̄=5.75). Also to ‘be cost effective’ (x̄=5.15) in the product offering does not rank as a top five indicator of product advantage for medium-sized firms.

Non-parametric Kruskal Wallis ‘between groups’ H Tests were conducted to identify if; in fact there is a significant difference in the median scores for the individual items.
across firm size. The Kruskal Wallis H Tests revealed two statistically significant differences in the ‘meet customer needs’ ($p=.002$) and ‘be cost effective’ ($p=.048$), across firm size. Table 4.13 indicates that there are statistically significant differences across micro, small and medium sized firms in abilities to ‘meet customers’ needs’ and ‘be cost effective’ in new product development.

Table 4.14 illustrates that both micro and small firms indicate that product meaningfulness best describes their product advantage followed by product superiority and product innovativeness. However, medium-sized firms identify product superiority as the product advantage component that best describes product advantage followed by product meaningfulness and product innovativeness.

### Table 4.14: Product component values categorised by Firm Size (N=123)

<table>
<thead>
<tr>
<th>Product Advantage components</th>
<th>Mean micro firm</th>
<th>Mean small firm</th>
<th>Mean medium-sized firm</th>
<th>Kruskal-Wallis H Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Innovativeness</td>
<td>5.65</td>
<td>5.32</td>
<td>5.14</td>
<td>.440</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>5.96</td>
<td>5.72</td>
<td>5.69</td>
<td>.646</td>
</tr>
<tr>
<td>Product meaningfulness</td>
<td>6.24</td>
<td>6.06</td>
<td>5.47</td>
<td>.024*</td>
</tr>
</tbody>
</table>

* Significant at $p < 0.05$; ** Significant at $p < 0.01$

A Kruskal Wallis H Test revealed a statistically significant difference in product meaningfulness between micro, small and medium-sized firms ($p=.024^*$. Table 4.14 indicates that for micro and small firm’s product meaningfulness more accurately describes product advantage above that of medium-sized firms.

In relation to product advantage characteristics considered across firm type; Table 4.15 illustrates the list, mean and median scores categorised by firm type; consumer market (n=64) and industrial market (n=26), of the 14 product advantage scale items in descending order of mean importance.
### Table 4.15: SME Product Advantage Values categorised by Firm Type (N=90)

<table>
<thead>
<tr>
<th>Product Advantage characteristics</th>
<th>Mean B2C</th>
<th>Mean B2B</th>
<th>Mann-Whitney U Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet customer's needs</td>
<td>6.28 (7.00)</td>
<td>6.32 (7.00)</td>
<td>.988</td>
</tr>
<tr>
<td>Match customer perceptions</td>
<td>6.10 (6.00)</td>
<td>6.08 (6.00)</td>
<td>.947</td>
</tr>
<tr>
<td>Be of better quality</td>
<td>6.09 (6.00)</td>
<td>6.28 (6.00)</td>
<td>.616</td>
</tr>
<tr>
<td>Be cost effective</td>
<td>5.86 (6.00)</td>
<td>6.20 (6.00)</td>
<td>.112</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
<td>5.81 (6.00)</td>
<td>5.80 (6.00)</td>
<td>.852</td>
</tr>
<tr>
<td>Enable differentiation</td>
<td>5.67 (6.00)</td>
<td>5.48 (6.00)</td>
<td>.454</td>
</tr>
<tr>
<td>Be superior</td>
<td>5.63 (6.00)</td>
<td>5.92 (6.00)</td>
<td>.406</td>
</tr>
<tr>
<td>Be innovative</td>
<td>5.63 (6.00)</td>
<td>5.56 (6.00)</td>
<td>.948</td>
</tr>
<tr>
<td>Provide benefits</td>
<td>5.56 (6.00)</td>
<td>5.84 (6.00)</td>
<td>.350</td>
</tr>
<tr>
<td>Have better individual attributes/features</td>
<td>5.52 (6.00)</td>
<td>5.84 (6.00)</td>
<td>.334</td>
</tr>
<tr>
<td>Have better product design</td>
<td>5.47 (6.00)</td>
<td>5.71 (6.00)</td>
<td>.464</td>
</tr>
<tr>
<td>Be unique</td>
<td>5.42 (6.00)</td>
<td>5.60 (6.00)</td>
<td>.310</td>
</tr>
<tr>
<td>Solve problems</td>
<td>5.24 (6.00)</td>
<td>5.56 (6.00)</td>
<td>.235</td>
</tr>
<tr>
<td>Enable better technical performance</td>
<td>5.11 (6.00)</td>
<td>5.60 (6.00)</td>
<td>.092</td>
</tr>
</tbody>
</table>

* Significant at $p < 0.05$; ** Significant at $p < 0.01$

Inspection of the mean values ($\bar{x}$) in Table 4.15 for the top five indicators of product advantage reveals a minor variation in the product advantage characteristics that are being presented in B2C and B2B SMEs. Both firm types identify that to ‘meet customers’ needs’, ‘match customer perceptions’, ‘be of better quality’, ‘be cost effective’, and ‘be superior’ is indicative of product advantage. However, B2B based firms indicate that the ability to ‘be of better quality’ ($\bar{x}=6.28$) and ‘be cost effective’ ($\bar{x}=6.20$) is a more accurate description of their product offering than ‘match customer perceptions’ ($\bar{x}=6.08$) and ‘be better relative to competitors offerings’ ($\bar{x}=5.80$). It is noted that B2B products recorded higher levels in 10 product advantage characteristics above that of B2C products but the difference in mean values is marginal. Mann-Whitney U-Tests conducted to identify if there is a significant difference in the individual items for either SMEs type revealed no significant differences.

The composite mean values in Table 4.16 illustrate that, across all firm types SMEs describe their new products as having higher product meaningfulness characteristics.
above product superiority and product innovativeness. Mann-Whitney U-Tests revealed no significant difference in the product advantage components between SMEs producing consumer products or SMEs producing industrial products.

Table 4.16: Product component values categorised by firm type (N=90)

<table>
<thead>
<tr>
<th>Product Advantage components</th>
<th>Mean B2C</th>
<th>Mean B2B</th>
<th>Mann-Whitney U Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Innovativeness</td>
<td>5.39</td>
<td>5.64</td>
<td>.272</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>5.75</td>
<td>5.97</td>
<td>.587</td>
</tr>
<tr>
<td>Product meaningfulness</td>
<td>6.09</td>
<td>6.10</td>
<td>554</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Table 4.17 considers the product advantage characteristics across product strategy; new product (n=30), product extension (n=52) and product improvement (n=34), of the 14 product advantage scale items in descending order of mean importance.

Table 4.17: SME Product Advantage Values categorised by product strategy (N=116)

<table>
<thead>
<tr>
<th>Product Advantage characteristics</th>
<th>Mean new product</th>
<th>Mean product extension</th>
<th>Mean product improvement</th>
<th>Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet customer's needs</td>
<td>6.31 (7.00)</td>
<td>6.12 (6.00)</td>
<td>6.26 (6.50)</td>
<td>.845</td>
</tr>
<tr>
<td>Match customer perceptions</td>
<td>6.14 (6.00)</td>
<td>5.94 (6.00)</td>
<td>5.94 (6.00)</td>
<td>.894</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
<td>6.14 (6.00)</td>
<td>5.69 (6.00)</td>
<td>5.85 (6.00)</td>
<td>.378</td>
</tr>
<tr>
<td>Be of better quality</td>
<td>6.03 (6.00)</td>
<td>6.12 (6.00)</td>
<td>6.18 (6.00)</td>
<td>.660</td>
</tr>
<tr>
<td>Be cost effective</td>
<td>5.93 (6.00)</td>
<td>5.90 (6.00)</td>
<td>5.85 (6.00)</td>
<td>.980</td>
</tr>
<tr>
<td>Provide benefits</td>
<td>5.93 (6.00)</td>
<td>5.38 (6.00)</td>
<td>5.88 (6.00)</td>
<td>.079</td>
</tr>
<tr>
<td>Have better product design</td>
<td>5.70 (6.00)</td>
<td>5.46 (6.00)</td>
<td>5.52 (6.00)</td>
<td>.636</td>
</tr>
<tr>
<td>Be superior</td>
<td>5.69 (6.00)</td>
<td>5.69 (6.00)</td>
<td>5.91 (6.00)</td>
<td>.402</td>
</tr>
<tr>
<td>Enable differentiation</td>
<td>5.69 (6.00)</td>
<td>5.50 (6.00)</td>
<td>5.45 (6.00)</td>
<td>.935</td>
</tr>
<tr>
<td>Have better individual attributes/features</td>
<td>5.69 (6.00)</td>
<td>5.43 (6.00)</td>
<td>5.73 (6.00)</td>
<td>.224</td>
</tr>
<tr>
<td>Be innovative</td>
<td>5.62 (6.00)</td>
<td>5.53 (6.00)</td>
<td>5.55 (6.00)</td>
<td>.910</td>
</tr>
<tr>
<td>Enable better technical performance</td>
<td>5.50 (6.00)</td>
<td>5.04 (5.00)</td>
<td>5.75 (6.00)</td>
<td>.034*</td>
</tr>
<tr>
<td>Solve problems</td>
<td>5.43 (6.00)</td>
<td>5.22 (6.00)</td>
<td>5.63 (6.00)</td>
<td>.301</td>
</tr>
<tr>
<td>Be unique</td>
<td>5.41 (5.00)</td>
<td>5.29 (6.00)</td>
<td>5.32 (5.50)</td>
<td>.975</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01
Inspection of the mean values ($\bar{x}$) in Table 4.17 reveals that for all product types; new products, product extensions, and product improvements, the ability to ‘meet customers’ needs’ ($\bar{x}=6.31, 6.12$ and $6.26$) is the most important indicator of product advantage. For new products and product extensions; ‘match customer perceptions’, ‘be better relative to competitors’ offerings’, ‘be of better quality’ and ‘be cost effective’ are also characteristics that are indicative of product advantage. Additionally, ‘be of better quality’ and ‘be cost effective’ have increased position for product extensions. It is also noted that for product improvements the ability to ‘be better relative to competitors offerings’ and ‘be cost effective’ is less indicative of advantage, instead the ability to ‘be superior’ ($\bar{x}=5.91$) and ‘provide benefits’ ($\bar{x}=5.88$) is. Non-parametric Kruskal Wallis H-Tests revealed one statistically significant differences in the ‘enable better technical performance’ ($p=.034$) across the three product types.

Table 4.18 illustrates that product meaningfulness is the dominant product dimension across product type, followed by product superiority with product innovativeness the least important dimension. The Kruskal Wallis H-Tests revealed no statistically significant differences between the product type groups.

<table>
<thead>
<tr>
<th>Product Advantage characteristics</th>
<th>Mean new product</th>
<th>Mean product extension</th>
<th>Mean product improvement</th>
<th>Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Innovativeness</td>
<td>5.55</td>
<td>5.30</td>
<td>5.62</td>
<td>.382</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>5.92</td>
<td>5.73</td>
<td>5.90</td>
<td>.780</td>
</tr>
<tr>
<td>Product meaningfulness</td>
<td>6.13</td>
<td>5.98</td>
<td>6.05</td>
<td>.952</td>
</tr>
</tbody>
</table>

* Significant at $p < 0.05$; ** Significant at $p < 0.01$

Tables 4.11 to 4.18 illustrates that across the different parameters on average three product meaningfulness characteristics; ‘meeting customers’ needs’, ‘match customer perceptions’ and ‘be cost efficient’ and two product superiority characteristics; ‘of
better quality’, and ‘better relative to competitors offerings’ are indicative of product advantage in SMEs. Product innovativeness characteristics only appear in the bottom 50% of the scale in order of indication and as such it is evident that SMEs in this study do not rate product innovativeness as an important characteristic to present in their new products. Furthermore, to ‘be cost effective’ is statistically the only product advantage characteristic that influences product success.

In relation to Research Objective 1 and the satisfaction of research questions 1b-e, this section has identified several key advancements.

- Although higher levels of product advantage are found in all but two product advantage characteristics for successful products over unsuccessful products the only product characteristic that significantly influences product outcome is to ‘be cost effective’.
- Firm size impacts on two product advantage characteristics; ‘meet customer needs’ and to ‘be cost effective’. Micro firms indicate that both characteristics are more indicative of their product offering than both small and medium-sized firms. Additionally, firm size impacts on product meaningfulness in SMEs.
- Whether the firm is producing consumer market products or industrial market products does not impact on product advantage in SMEs.
- The type of product being introduced (product strategy) does not impact product advantage in SMEs.

Having satisfied the investigation of Research Objective 1 the subsequent section 4.5 details the quantitative findings regarding the investigation into Research Objective 2.
4.5 An exploration of the nature of new product performance in SMEs.

This section explores the nature of new product performance measurement in SMEs. The review of the literature on product advantage presented in chapter 2 presented four questions aimed at satisfying Research Objective 2:

b) How does New Product Performance measurement activities impact product outcome (success/failure)?

c) Does firm size (micro, small or medium-size) impact New Product Performance?

d) Does firm type (business-to-business or business-to-consumer) impact New Product Performance?

e) Does product type (new product, product extension or product improvement) impact New Product Performance?

Similar to the previous section a comparison of activities is conducted across product outcome, firm size, firm type and product strategy. Mean and median values for each new product performance measure will also be presented and non-parametric between groups’ tests detailed.

Respondents indicated the performance of the most recently introduced product on the 17 NPP measures adapted from Griffin and Page, (1993, 1993) by Langerak et al. (2004). Table 4.19 illustrates that firms who recorded successful product development outcomes (N=106) had higher levels on all of the new product performance measures compared to those firms whose product development was unsuccessful (N=12).

**Table 4.19: New product performance values characterised by Product Outcome (N=118)**
**New Product Performance** | **Dimension** | **Mean success** | **Mean failure** | **Mann-Whitney U Test**  
--- | --- | --- | --- | ---  
met quality specifications | *SCDR* | 6.04 (6.00) | 5.72 (6.00) | .363  
customer satisfaction | *SCDR* | 6.02 (6.00) | 4.92 (5.00) | .005**  
customer acceptance | *SCDR* | 5.89 (6.00) | 4.33 (5.00) | .001**  
met performance specifications | *SCDR* | 5.82 (6.00) | 4.45 (5.00) | .001**  
number of customers | *OCAM* | 5.59 (6.00) | 3.82 (4.00) | .000**  
launch on time | *DTM* | 5.51 (6.00) | 4.36 (5.00) | .024*  
met profitability goals | *OCAM* | 5.30 (6.00) | 3.27 (3.00) | .000**  
customers competitive advantage | *SCDR* | 5.32 (6.00) | 4.64 (5.00) | .027*  
ROI or IRR | *OCAM* | 5.24 (6.00) | 3.27 (3.00) | .000**  
break-even time | *OCAM* | 5.26 (5.00) | 4.00 (4.00) | .005**  
met revenue sales | *OCAM* | 5.22 (5.00) | 3.50 (4.00) | .000**  
time to market | *DTM* | 5.24 (5.00) | 4.64 (5.00) | .199  
unit volume goals | *OCAM* | 5.15 (5.00) | 3.37 (4.00) | .000**  
development costs | *DTM* | 5.14 (5.00) | 4.00 (4.00) | .021*  
met contribution marginal goals | *OCAM* | 5.07 (5.00) | 3.70 (4.00) | .001**  
met sales growth goals | *OCAM* | 5.08 (5.00) | 3.17 (4.00) | .000**  
met market share goals | *OCAM* | 5.08 (5.00) | 3.25 (3.50) | .000**  

* Significant at p < 0.05; ** Significant at p < 0.01

Inspection of the mean values (\( \bar{x} \)) in Table 4.19 for the top NPP measures that SMEs perform best on indicates that firms are performing best at reducing subjective customer dissatisfaction above all other measurement dimensions. Additionally, non-parametric Kruskal Wallis H-Tests, revealed 15 statistically significant differences within the NPP measures (see Table 4.25). The Kruskal Wallis Tests reveal a definite difference in NPP measurement levels in SMEs for successful versus unsuccessful products, indicating that firms that perform well in measuring NPP have greater product success.

Comparing NPP dimensions across product outcome, the mean values in Table 4.20 indicates that firms are performing better at reducing subjective customer dissatisfaction than they are in measuring development time and objective customer acceptance. The Kruskal-Wallis H-Tests revealed three statistically significant differences in the groups.
Table 4.20: NPP dimensions categorised by Product Outcome (N=106)

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Mean success</th>
<th>Mean failure</th>
<th>Mann-Whitney U Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance measures</td>
<td>5.22</td>
<td>3.62</td>
<td>.000**</td>
</tr>
<tr>
<td>Development time measures</td>
<td>5.29</td>
<td>4.33</td>
<td>.013*</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>5.81</td>
<td>4.95</td>
<td>.001**</td>
</tr>
</tbody>
</table>

Ordinary Least Squares (OLS) regression was conducted to indicate the relationship between each of the NPP dimensions and product success and found that 21.4% ($R^2 = .214, P = .000$) of the variability in product success is explained by NPP. The model identified only one significant relationship between objective customer acceptance measures ($\beta = .471, p < .05$) and product success (see Table 4.21), indicating that only objective customer acceptance measures significantly influence product success.

Table 4.21: OLS regression of NPP dimensions

<table>
<thead>
<tr>
<th></th>
<th>Beta</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance measures</td>
<td>.471</td>
<td>.000*</td>
</tr>
<tr>
<td>Development time measures</td>
<td>.039</td>
<td>.694</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>.005</td>
<td>.970</td>
</tr>
</tbody>
</table>

Table 4.22 illustrates the list, dimension (objective customer acceptance measures-OCAM, development time measures-DTM, measures aimed at reducing subjective customer dissatisfaction measures-SCDR) mean and median (in parenthesis) scores categorised by firm size; micro (n=66), small (n=37) and medium-sized firms (n=20) in order of decreasing means.

Table 4.22: New Product Performance values categorised by Firm Size (N=123)

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Dimension</th>
<th>Mean Micro</th>
<th>Mean Small</th>
<th>Mean Medium-sized</th>
<th>Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>met quality specifications</td>
<td>SCDR</td>
<td>6.08 (6.00)</td>
<td>5.83 (6.00)</td>
<td>5.95 (6.00)</td>
<td>.257</td>
</tr>
</tbody>
</table>
Inspection of the mean values (\(\bar{x}\)) in Table 4.22 identify ‘meeting quality specifications’ followed by ‘customer satisfaction’, ‘customer acceptance’ and ‘met performance specifications’ as the top four NPP measures that micro, small and medium-sized firms perform well in. One distinction is made in performance on the fifth NPP measure between the firms; small firms indicate that they perform well at measuring the ‘number of customers’ (\(\bar{x}=5.54\)) above that of ‘launch-on-time’ (\(\bar{x}=5.42\)) which is the fifth performance measure identified by micro firms. Medium-sized firms identify ‘break-even time’ (\(\bar{x}=5.32\)) as the next performing measure. Non-parametric Kruskal Wallis H-Tests revealed no statistically significant differences in the median scores for the individual NPP items across firm sizes.

Similar to the process used in the previous section composite scores were created for each of the three NPP dimensions; objective customer acceptance measures, development time measures and measures aimed at reducing subjective customer
dissatisfaction, based on the mean of the items which had their primary loadings on each component (see Table 4.23). Table 4.23 illustrates that irrespective of size all firms identify higher performance in measures aimed reducing subjective customer dissatisfaction (SCDR) above both development time measures (DTM) and objective customer acceptance measures (OCAM). It is noted that small firms indicate greater performance in objective customer acceptance measures than in development time measures of NPP (see Table 4.23). Both micro and medium-sized firms indicate that they are performing worst in measuring objective customer acceptance measures.

Table 4.23: NPP dimensions categorised by firm size (N=123)

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Mean Micro</th>
<th>Mean Small</th>
<th>Mean Medium-sized</th>
<th>Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance measures</td>
<td>4.94</td>
<td>5.26</td>
<td>5.03</td>
<td>.510</td>
</tr>
<tr>
<td>Development time measures</td>
<td>5.21</td>
<td>5.19</td>
<td>5.18</td>
<td>.993</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction measures</td>
<td>5.77</td>
<td>5.66</td>
<td>5.56</td>
<td>.967</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Subsequent, non-parametric Kruskal Wallis H-Tests revealed no statistically significant differences in the median scores for the NPP dimensions across firm sizes.

Table 4.24 illustrates the list, dimension, mean and median (in parenthesis) scores categorised by firm type; consumer market (n=64) and industrial market (n=26), of these seventeen measures in descending order of mean performance.

Table 4.24: New Product Performance categorised by Firm Type (N=90)

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Dimension</th>
<th>Mean B2B</th>
<th>Mean B2C</th>
<th>Mann-Whitney U Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>met quality</td>
<td>SCDR</td>
<td>6.12 (6.00)</td>
<td>6.01 (6.00)</td>
<td>.622</td>
</tr>
</tbody>
</table>
Inspection of the mean values (\( \bar{x} \)) in Table 4.24 for the top five NPP measures that SMEs perform best on indicates little variation in the new product performance across firm type. Both firm types identify that they perform best on ‘meeting quality specifications’, ‘customer satisfaction’, ‘customer acceptance’ and ‘met performance specifications’ as the top four measures of NPP. However, B2C SMEs indicate that they rate performance on ‘launch-on-time’ (\( \bar{x} = 5.47 \)) greater than ‘number of customers’ (\( \bar{x} = 5.36 \)). The Kruskal Wallis H-Tests, revealed no significant differences in the median NPP scores across firm types (see Table 4.24).

Table 4.25 illustrates that across firm type SMEs identified higher performance in measures aimed at reducing subjective customer dissatisfaction above both development time measures and objective customer acceptance measures. Similar to the results revealed above no significant differences in the median NPP scores was found across firm types (see Table 4.25).
Table 4.25: NPP dimension values categorised by firm type

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Mean B2B</th>
<th>Mean B2C</th>
<th>Mann-Whitney U Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance measures</td>
<td>4.84</td>
<td>5.09</td>
<td>.241</td>
</tr>
<tr>
<td>Development time measures</td>
<td>5.20</td>
<td>5.21</td>
<td>.961</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>5.72</td>
<td>5.71</td>
<td>.882</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Table 4.26 illustrates the list, dimension, mean and median scores categorised by product strategy; new products (n=30), product extension (n=52) and product improvements (n=34) in order of decreasing means.

Table 4.26: New Product Performance values categorised by Product Strategy (N=123)

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Dimension</th>
<th>Mean new</th>
<th>Mean extension</th>
<th>Mean improvement</th>
<th>Kruskal-Wallis H-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>customer satisfaction</td>
<td>SCDR</td>
<td>6.03 (6.00)</td>
<td>5.65 (6.00)</td>
<td>6.15 (6.00)</td>
<td>.005**</td>
</tr>
<tr>
<td>met quality specifications</td>
<td>SCDR</td>
<td>5.96 (6.00)</td>
<td>5.87 (6.00)</td>
<td>6.26 (6.00)</td>
<td>.363</td>
</tr>
<tr>
<td>met performance specifications</td>
<td>SCDR</td>
<td>5.86 (6.00)</td>
<td>5.42 (5.50)</td>
<td>5.97 (6.00)</td>
<td>.001**</td>
</tr>
<tr>
<td>customer acceptance</td>
<td>SCDR</td>
<td>5.73 (6.00)</td>
<td>5.56 (6.00)</td>
<td>5.85 (6.00)</td>
<td>.001**</td>
</tr>
<tr>
<td>customers competitive advantage</td>
<td>SCDR</td>
<td>5.43 (6.00)</td>
<td>5.08 (5.00)</td>
<td>5.41 (6.00)</td>
<td>.027*</td>
</tr>
<tr>
<td>number of customers</td>
<td>OCAM</td>
<td>5.32 (5.50)</td>
<td>5.35 (6.00)</td>
<td>5.35 (5.50)</td>
<td>.000**</td>
</tr>
<tr>
<td>ROI or IRR</td>
<td>OCAM</td>
<td>5.18 (5.50)</td>
<td>4.94 (6.00)</td>
<td>5.03 (5.00)</td>
<td>.000**</td>
</tr>
<tr>
<td>break-even time</td>
<td>OCAM</td>
<td>5.15 (5.00)</td>
<td>5.00 (5.00)</td>
<td>5.45 (6.00)</td>
<td>.005**</td>
</tr>
<tr>
<td>launch on time</td>
<td>DTM</td>
<td>5.11 (5.50)</td>
<td>5.33 (5.00)</td>
<td>5.79 (6.00)</td>
<td>.024*</td>
</tr>
<tr>
<td>met profitability goals</td>
<td>OCAM</td>
<td>5.07 (5.00)</td>
<td>5.06 (5.00)</td>
<td>5.12 (5.00)</td>
<td>.000**</td>
</tr>
<tr>
<td>met contribution</td>
<td>OCAM</td>
<td>5.00 (5.00)</td>
<td>4.82 (5.00)</td>
<td>5.15 (5.00)</td>
<td>.001**</td>
</tr>
<tr>
<td>marginal goals</td>
<td>OCAM</td>
<td>4.96 (5.00)</td>
<td>5.08 (6.00)</td>
<td>5.62 (5.00)</td>
<td>.199</td>
</tr>
<tr>
<td>time to market</td>
<td>DTM</td>
<td>4.90 (5.00)</td>
<td>5.00 (5.00)</td>
<td>5.18 (5.00)</td>
<td>.000**</td>
</tr>
<tr>
<td>met revenue sales</td>
<td>OCAM</td>
<td>4.92 (5.00)</td>
<td>4.92 (5.00)</td>
<td>5.34 (5.00)</td>
<td>.021*</td>
</tr>
<tr>
<td>development costs</td>
<td>DTM</td>
<td>4.83 (5.00)</td>
<td>4.81 (5.00)</td>
<td>5.06 (5.00)</td>
<td>.000**</td>
</tr>
<tr>
<td>met sales growth goals</td>
<td>OCAM</td>
<td>4.77 (5.00)</td>
<td>4.92 (5.00)</td>
<td>5.18 (5.00)</td>
<td>.000**</td>
</tr>
<tr>
<td>unit volume goals</td>
<td>OCAM</td>
<td>4.55 (5.00)</td>
<td>4.98 (5.00)</td>
<td>5.03 (5.00)</td>
<td>.000**</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

Inspection of the mean values (x̄) in Table 4.26 for the top NPP measures that SMEs perform best on indicates that across product type SMEs identify that ‘customer satisfaction’, ‘meeting quality specifications’, ‘customer acceptance’ and ‘met
performance specifications’ are the top four measures that they perform best on. For new products ‘customer competitive advantage’ (\(\bar{x}=5.43\)) is the fifth most performing measure with ‘number of customers’ (\(\bar{x}=5.35\)) important for product extensions and for product improvements ‘launch-on-time’ (\(\bar{x}=5.79\)) is the next measure that their new product performed best on. Quite extensively non-parametric Kruskal Wallis H-Tests, revealed fifteen statistically significant differences within the NPP measures (see Table 4.26). The Kruskal Wallis Tests reveal a definite difference in NPP measurement levels in SMEs for new products, product extensions and product improvements, indicating that product type may have a defining influence on NPP measurement in SMEs. This finding will be explored further in chapter five.

Comparing NPP dimensions across product strategy, the mean values in Table 4.27 indicates that firms are performing better at reducing subjective customer dissatisfaction than they are in measuring development time and objective customer acceptance. The Kruskal-Wallis H-Test revealed one statistically significant difference in the groups at a 95% confidence level and one at a 94.9% confidence level in development time measures (\(p=.047\)) and subjective customer dissatisfaction measures (\(p=.051\)) respectively (see Table 4.27).

<table>
<thead>
<tr>
<th>New Product Performance</th>
<th>Mean new</th>
<th>Mean extension</th>
<th>Mean improvement</th>
<th>Kruskal-Wallis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance measures</td>
<td>4.98</td>
<td>4.98</td>
<td>5.23</td>
<td>.511</td>
</tr>
<tr>
<td>Development time measures</td>
<td>5.04</td>
<td>5.09</td>
<td>5.59</td>
<td>.047*</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>5.82</td>
<td>5.52</td>
<td>5.93</td>
<td>.051</td>
</tr>
</tbody>
</table>

* Significant at \(p < 0.05\); ** Significant at \(p < 0.01\)
Tables 4.19 to 4.27, reveal many descriptive findings with regards to the nature of new product performance measurement in SMEs. Across firm size, firm type and product strategy SMEs are performing best at reducing subjective customer dissatisfaction measures in particular ‘customer satisfaction’ followed by ‘met quality specifications’, ‘customer acceptance’ and ‘met performance specifications’ above all other measures. Additionally the findings illustrate that:

- Firms that perform well in measuring NPP report higher levels of product success, there was a significant difference in the measurement of 15 out of the 17 new product performance measures across product outcome.
- SMEs are performing well on measures aimed at reducing subjective customer dissatisfaction but only objective customer acceptance measures of new product performance have been found to significantly influence product success.
- Firm size does not impact on the new product performance in SMEs.
- Similarly firm type does not impact the new product performance in SMEs.
- Product strategy, whether the product being introduced is a new product, product extension or product improvement significantly impacts 15 out of the 17 new product performance measures. Additionally, there is a significant impact across development time measures and measures aimed at reducing subjective customer dissatisfaction.

Having satisfied the investigation of Research Objective 2 the subsequent section 4.6 details the quantitative findings regarding the investigation into Research Objective 3.
4.6 The relationship between Product Advantage and New Product Performance

The purpose of this section is to examine the causal relationship between product advantage and new product performance in SMEs (Research Objective 3). To satisfy the causal element of this thesis, Section 4.3 depicted a research model comprising a 3 component product advantage and a 3 dimensional new product performance measurement scale (see Figure 4.4 re-produced below).

![Research Model Diagram](image)

Figure 4.4 (re-produced): Research model of the research aim

Additionally nine hypotheses (H1a-H3c) were developed to facilitate the investigation of Research Objective 3. The research matrix developed to illustrate the hypothesised relationships is re-produced below.
Table 4.10 (reproduced): Research matrix

<table>
<thead>
<tr>
<th>Objective customer acceptance</th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development time</td>
<td>H1a</td>
<td>H1b</td>
<td>H1c</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H2a</td>
<td>H2b</td>
<td>H2c</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>H3b</td>
<td>H3c</td>
</tr>
</tbody>
</table>

In this section the three product advantage dimensions ‘product innovativeness’, ‘product superiority’ and ‘product meaningfulness’ identified in Section 4.3.1 are used as independent variables to test H1a-H3c. Linear and stepwise regression is used to identify the relationship between the three product advantage components and the three new product performance dimensions, thus advancing the research model (Figure 4.4 in Section 4.2.3). Prior to commencing the regression procedures analysis was conducted to ensure none of the assumptions of sample size, multi-collinearity, singularity, normality, linearity, homoscedasticity and independence of residuals were violated. Section 4.6.1 details the relationship between product advantage and the objective customer acceptance measures; Section 4.6.2 details the relationship with development time measures and Section 4.6.3 details the relationship between product advantage and measures aimed at reducing subjective customer dissatisfaction.

4.6.1 Objective customer acceptance measures

A linear regression revealed than when compared separately no significant relationship between product advantage and objective customer acceptance measures at a 95% confidence level, however product superiority influences objective customer acceptance measures at a 90% confidence level (β=.211, p<.10). The model is statistically significant (p=.002) and the R² value indicates a predictive ability of 13.7% (see Table 4.28).
**Table 4.28: Linear regression modelling objective customer acceptance measures (N=123)**

|                                      | Standardised  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
</tr>
<tr>
<td>R²</td>
<td>.137**</td>
</tr>
<tr>
<td>Product Innovativeness</td>
<td>.067</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>.211</td>
</tr>
<tr>
<td>Customer meaningfulness</td>
<td>.151</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

A subsequent stepwise regression revealed in terms of increasing the prediction equation product superiority explains 11.5% of the variance in objective customer acceptance measures (see Table 4.31). The model is statistically significant at p=.002. The beta coefficient is positive indicating that product superiority has the most significant positive contribution on objective customer acceptance measures of the new product.

Based on the findings of this section the research hypothesis H1a-H1c which sought to determine the relationship between product innovativeness, product superiority and product meaningfulness and the objective customer acceptance measures dimension can now be revisited.

Based on the findings support is found for H1b, and therefore it is possible accept the following hypothesis:

**H1b:** There is a positive relationship between product superiority and objective customer acceptance measures of new product performance in SME’s

Support is not found for the relationship between product innovativeness or product meaningfulness and objective customer acceptance measures of NPP and therefore hypothesis H1a and H1c must be rejected.

**H1a:** There is a positive relationship between product innovativeness and objective customer acceptance measures of new product performance in SME’s
H1c: There is a positive relationship between product meaningfulness and objective customer acceptance measures of new product performance in SME’s.

### 4.6.2 Development time measures

A linear regression revealed that product meaningfulness ($\beta=.279$, $p<.05$) significantly influences development time measures. The model is statistically significant ($p=.003$) and the $R^2$ value indicates a predictive ability of 12% (see Table 4.29).

<table>
<thead>
<tr>
<th></th>
<th>Standardised Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>.120**</td>
</tr>
<tr>
<td>Product Innovativeness</td>
<td>.115</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>.013</td>
</tr>
<tr>
<td>Customer meaningfulness</td>
<td>.279*</td>
</tr>
</tbody>
</table>

* Significant at $p < 0.05$; ** Significant at $p < 0.01$

The stepwise regression supports that product meaningfulness explains 11.2% of the variance in development time measures (see Table 4.31). The model is statistically significant at $p=.000$. The beta coefficient is positive indicating that product meaningfulness has the most significant positive contribution to the development time measures of the new product. Based on the findings support is found for H2c, and therefore it is possible accept the following hypothesis:

H2c: There is a positive relationship between product meaningfulness and development time measures of new product performance in SME’s

Support is not found for the relationship between product innovativeness and product superiority and development time measures of NPP and therefore hypothesis H2a and H2b must be rejected.
H2a: There is a positive relationship between product innovativeness and development time measures of new product performance in SME’s.

H2b: There is a positive relationship between product superiority and development time measures of new product performance in SME’s.

4.6.3 Measures aimed at reducing subjective customer dissatisfaction measures

A linear regression revealed that product meaningfulness ($\beta=.315$, p<.01) significantly influences measures aimed at reducing subjective customer dissatisfaction. The model is statistically significant (p=.000) and the $R^2$ value indicates a predictive ability of 24.7% (see Table 4.30).

Table 4.30: Linear regression modelling measures aimed at reducing subjective customer dissatisfaction (N=123)

<table>
<thead>
<tr>
<th></th>
<th>Standardised Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>.247**</td>
</tr>
<tr>
<td>Product Innovativeness</td>
<td>.206</td>
</tr>
<tr>
<td>Product Superiority</td>
<td>.052</td>
</tr>
<tr>
<td>Customer meaningfulness</td>
<td>.315**</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

The subsequent stepwise regression indicates that product meaningfulness and product innovativeness explains 24.6% of the variance in measures aimed at reducing subjective customer dissatisfaction (see Table 4.31). The relationship is statistically significant (p=.000). Product meaningfulness ($\beta=.333$) has the most significant positive contribution to measures aimed at reducing subjective customer dissatisfaction, followed by product innovativeness ($\beta=.229$). Based on the findings support is found for H3a and H3c, and therefore it is possible accept the following hypotheses:
H3a: There is a positive relationship between product innovativeness and measures aimed at reducing subjective customer dissatisfaction, of new product performance in SME’s.

H3c: There is a positive relationship between product meaningfulness and measures aimed at reducing subjective customer dissatisfaction, of new product performance in SME’s.

Support is not found for the relationship between product superiority and subjective customer satisfaction level measures and therefore hypothesis H3b must be rejected.

H3b: There is a positive relationship between product superiority and measures aimed at reducing subjective customer dissatisfaction, of new product performance in SME’s.

Table 4.31: Stepwise Regression modelling new product performance

<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent Variable</th>
<th>Independent Variables</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Objective customer acceptance measures</td>
<td>Product Superiority</td>
<td>0.115**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.339**</td>
</tr>
<tr>
<td>2</td>
<td>Development time measures</td>
<td>Product meaningfulness</td>
<td>0.112**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.334**</td>
</tr>
<tr>
<td>3</td>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>Product meaningfulness</td>
<td>0.246**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Product Innovativeness</td>
<td>.333**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.229*</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01

The results of this analysis reveals that product advantage have been found to account for between 11.2% to 24.6% of the variance in new product performance in SMEs’ (See Table 4.31) and support is advanced for four hypothesis H1b, H2c, H3a and H3c. The remaining hypotheses were non-significant. The research matrix of the research issue is thus re-visited, highlighting the hypotheses that are supported by this analysis (see Table 4.31).
Table 4.32: Summary of hypotheses testing

<table>
<thead>
<tr>
<th>Objective customer acceptance</th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance</td>
<td>n.s</td>
<td>H1b**</td>
<td>n.s</td>
</tr>
<tr>
<td>Development time</td>
<td>n.s</td>
<td>n.s</td>
<td>H2c**</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H3a*</td>
<td>n.s</td>
<td>H3c**</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01; n.s. = non-significant

Based on the findings illustrated in Tables 4.30 and 4.31 the descriptive model detailing the interactions between product advantage and new product performance in SMEs can be developed (See Figure 4.5). A discussion of the findings relative to the descriptive model will follow in Chapter 6.
OBJECTIVE CUSTOMER ACCEPTANCE MEASURES

DEVELOPMENT TIME MEASURES

MEASURES AIMED AT REDUCING SUBJECTIVE CUSTOMER DISSATISFACTION

**Figure 4.5: Descriptive model of the Relationship between Product Advantage and New Product Performance**
The descriptive model details that:

- Product superiority explains approximately 11.5% of the variance in objective customer acceptance measures of new product performance.
- Product meaningfulness explains approximately 11.2% of the variance in development time measures of new product performance.
- Product innovativeness coupled with product meaningfulness explains approximately 24.6% of the variance in subjective customer dissatisfaction reduction measures of new product performance.

As individual determinants of NPP the three product advantage components explain between 11% and 25% of the variance in NPP approximately. While previous studies acknowledge a positive and dominant relationship between product advantage and NPP, no such study has quantified the extent of the relationship.

The key findings from the causal element of this thesis stem from the satisfaction of Research Objective 3 - the relationship between product advantage and new product performance in SMEs was confirmed. All three product advantage components are found to influence NPP in SMEs but the influence they exert is dimension specific. A positive relationship was found between the dimensions of product innovativeness, product superiority and product meaningfulness and new product performance measurement in SMEs. However, the relationship is complex and intricate; in two cases there is one dominant product advantage dimension, which is the best predictor of the outcome, however, in relation to non-financial measures aimed at reducing subjective customer dissatisfaction, a co-dependent relationship exists between product innovativeness and product meaningfulness. This finding will be discussed further in Chapter 6.
Analysis regarding the relationship in firm types and product types could not be conducted as the sample size was not sufficient to conduct multiple regression analysis and the assumption of sample size was violated. Tabachnick and Fidell (2007:123) indicate that for generalisability ideally the number cases should be N>50+8m (where m = number if independent variables) an assumption that was not supported within this sample. Although it was not possible in this study an investigation that would conduct such a correlation would advance theory further and could be a direction for future research. The following section details the key issues that emerged from the quantitative analysis that will be explored further in Chapter 5 and discussed in Chapter 6.

4.7 Emerging Issues

- Section 4.4 informs that the product advantage advanced is influenced by firm size and not by firm type or product type. Additionally, to ‘be cost effective’ is the only product characteristic and product meaningfulness is the only product advantage component linked to product success. The impact that these factors have on and the identification of other factors that influence product advantage in SMEs needs to be developed further.

- Product meaningfulness emerged as the most important dimension that micro and small firms are striving to present in their new products. However, product superiority is the most important dimension that medium-sized firms are striving to present. Why such a distinction exists is investigated further in the subsequent Chapter 5 and discussion based Chapter 6.

- Additionally, section 4.4 details how SMEs do not consider product innovativeness or its characteristics important to present in their new products. Why SMEs are not operating in this sphere needs to be considered.
Section 4.5 details that new product performance in SMEs is not influenced by firm size or firm type but that it is influenced by product type. The reasoning for such needs to be developed.

Section 4.5 details that SMEs perform best on measures aimed at reducing subjective customer dissatisfaction of NPP above all other dimensions even though objective customer acceptance measures are the only dimension linked to product success. However respondents were not asked which NPP measures that they are using nor were they asked to identify the measures they consider most important. These limitations are identified and addressed in Chapter 5 along with the identification of any influences on the NPP measurement activities of SMEs if a comprehensive review of NPP activities in SMEs is to be achieved.

Section 4.6 presented the relationship between product advantage and new product performance in SMEs. The depiction of these relationships is contained in Figure 4.5. Further discussion of these relationships needs to be presented to enable SMEs to identify key areas for change.

4.8 Conclusion

The aim of this data analysis chapter is to present the quantitative findings relative to research objectives 1-3. However, as previously detailed in chapter 2 it was necessary to identify the underlying structure of the research components; product advantage and new product performance, prior to the investigation of the research objectives. This chapter thus advanced the research model by identifying the underlying structure of both product advantage and new product performance in SMEs. Consequently in satisfying this aim the results of the empirical investigation were presented in-line with the research objectives so as to facilitate interpretation in Chapter 5 and discussion in
Chapter 6. Exploratory statistics presented in section 4.4 and 4.5 provide a contextual description of the nature of product advantage and the new product performance in SMEs. The causal investigation in section 4.6, facilitated by hypotheses H1a-H3c, has identified the relationship between product advantage and new product performance in SMEs.

The results of this chapter have provided some key insights into the nature of product advantage and new product performance in SME, which will be further developed through the qualitative research element of this thesis, in Chapter 5. Chapter 5 presents the information obtained from the qualitative element of this research and points to the key findings therein.
Chapter 5 Case Studies
5.1 Introduction

Chapter 4 provided insights into a) the product advantage concept and its operationalization, and b) the structure of new product performance and current performance levels in SMEs. The quantitative analysis did not explore the product advantage characteristics that SME owner/managers consider important and the factors influencing their decisions nor did it identify the new product performance measurement activities being used by SMEs. Consequently, an additional qualitative analysis was appropriate to add the insights and understanding that was missed in the quantitative analysis and this provide stronger evidence for a conclusion through the convergence and corroboration of findings. The qualitative analysis represents stage 2 of the research process (See Figure 1).

![Figure 5.1: Stage two of the research process](image)

Case studies were thus undertaken with four SMEs actively engaged in product development. The case study analysis takes the form of an explorative study because the purpose, as mentioned, is to gain increased understanding about the nature and the problems related to the particular phenomena by enabling elaboration on and to deepen the initial quantitative analysis by providing more information. The reporting of several
case studies in a single inquiry is possible when the inquiry is to inform rather than to generalise populations. Indeed, data received from several case studies is favourable because it allows cross-case analysis to be used for richer theory building (Perry, 1998) and because of the increased intensity of data collection (Perry et al., 1999; Ghobadian and Gallear, 1997; Yin, 1994).

This chapter is laid out as follows; section 5.2 presents an overview of the NPD activities for each of the four case study companies. Section 5.3 details the issues in relation to the nature of product advantage with section 5.4 detailing the new product performance activities in the case study companies. The chapter is concluded in Section 5.5. Figure 5.2 illustrates the outline of this chapter.

Figure 5.2: Outline of Chapter 5

5.3 New Product Development Overview

The following section presents a brief company background and details the new product development practices of each of the four case study companies. As detailed in Chapter 3 Section 3.4.3.1 the cases were selected on the assumption that they would produce contradictory results - theoretical replication.
The four companies selected were:

- **Company A**: A micro firm with 8 full-time employees (5 in production, 1 in finance and 2 co-owners) who manufactures electric DC servomotors. The company exports 99% of their finished product to businesses in mainland Europe and the UK.

- **Company B**: The small firm formed in 2003 employs 16 full-time staff in its 16,000 square foot facility. The company boasts 24 consumer-based products in their current product range.

- **Company C**: A medium sized firm with approximately 155 employees Company C operates in the capacity of manufacturers of electronic information display systems, specialising in product information systems, parking information systems for local authorities, passenger information systems, public information systems for colleges and universities, display signs for the retail trade and signs for in-flight information on aircrafts. The company operates from its 60,000 square foot manufacturing facility.

- **Company D**: A micro firm with 8 employees currently supplying the Irish market with a range of fruit based drinks. The company was founded in 2000 and production began in its facility in April 2001.

All four case study companies were actively engaged in developing new products in the period 2008-2011. The products manufactured span four sectors; electrical motors, household products, information systems and the drinks sector. Three out of the four companies are owner run, while one company is a 2nd generation family-run business. Table 5.1 presents a brief summary of the case study companies.
Table 5.1: Summary Table of the Case study Companies

<table>
<thead>
<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of employees</strong></td>
<td>8</td>
<td>16</td>
<td>155</td>
<td>8</td>
</tr>
<tr>
<td><strong>Product Range</strong></td>
<td>Electric Motors</td>
<td>Household products</td>
<td>Electronic information display systems</td>
<td>Fruit juices and drinks</td>
</tr>
<tr>
<td><strong>Owner / manager run</strong></td>
<td>Owner</td>
<td>Owner</td>
<td>Family and management team</td>
<td>Owner</td>
</tr>
<tr>
<td><strong>Established</strong></td>
<td>2001</td>
<td>2003</td>
<td>1979</td>
<td>2000</td>
</tr>
</tbody>
</table>

It should be noted that the information contained in this chapter is specific to each case study company and no generalizability to the total population is intended. Additionally, throughout the presentation of the case studies use is made of direct quotations from those interviewed (owner/manager) at the four SMEs.

5.3.1 Company A

Company A is involved in the manufacture of electric DC servomotors. Operations are carried out from leased premises. All raw materials are imported from the UK and US and 99% of their finished product is exported to mainland Europe, US, and the UK. The company is a private limited company jointly owned by two persons; each holding 50% in ownership. The company was founded in November 2001 following an employee buyout. The designs and raw materials for existing products were purchased and put into production. Company A currently employs 8 people, 5 in production, 1 in finance and 2 co-owners. The company is run by the co-owners, who manage all the day-to-day management functions. Relative to the industry in which it operates, Company A is a small firm in a niche market, and at year end December 2008 had a gearing ratio 8.75 and a liquidity ratio of 4.46.

In relation to product development activities, Company A is solutions based and currently producing product extensions and product improvements. All new products
are based on the standard direct current (DC) servomotor product platform but altered for specific customers “who are looking for new applications”. The technology behind the product range is relatively old and has not changed over time “the technology wouldn’t have developed because it’s a very mature technology”, but the price that could once be command has plummeted. In 2001 an appropriate price for a DC servomotor was “€300-€400 now its €100 approx.”. Company A serves various markets in America, China, North Africa and Europe. The biggest of these markets is the control systems for communications antenna and satellite dishes, followed by servomotors for packaging machinery and/or OEMs (original equipment manufacturer/s).

In 2007, the company developed a 63ml servomotor (product extension); which allowed them to enter a new sector in their existing market. More recently, the company has secured two contracts to manufacture specific servomotor components (again product extensions) for non-competitor companies in Israel and the US. Both these contracts involved the improvement of an existing servomotor component to suit the specific client’s product “we manufacture for our motors and we now manufacture for their motors and it is good high volume”. The company are also currently developing three new solutions based products for new customers in the UK, and Sweden and for an existing customer in Switzerland. To minimise risk and aid efficient new product development the company uses a relatively sophisticated five tollgate system when developing new products. The company is aware that they are operating in a niche market and that the market would be considerably larger in terms of “brushless motors” but believe that they do not have the expertise or the resources to compete in the larger more intense and turbulent market.
Company A is aware of the limiting nature of its small size in a large concentrated market “we’d be competitive with our competitors even though they could wipe us off the face of the earth if they really wanted to but we are competitive in terms of price” but are competitive on price for such a highly customisable product. Currently, there is no employee engaged solely in R&D, this function is carried out by the 2 owner/managers in conjunction with their other functions. Admittedly, this can be frustrating and slow, “but it’s all down to cost”. Company A has approached a governmental development agency for financial aid for the purpose of hiring extra staff who would be engaged solely in NPD activities.

The decision to develop new products is very significant, in that, as far as possible, there is a need to ensure that the product will succeed “really if we go after something we need to be sure that its’ going to be a winner”. The company has very limited resources and cannot afford to spend time and resources on a project and not have it come to fruition, “financial constraints are the biggest single obstacle to NPD”. Consequently, Company A is customer oriented in product development as this is envisaged as a lower risk option. Generally, a definite volume of sales would have to be guaranteed prior to product development “a number of companies would be looking for this type of product and we’d talk to them and say if we had this what would you envisage in terms of sales and we might develop it”. In short, Company A will not develop a new product unless there is a definite guaranteed market identified and customer assurances provided.

Product development is thus reactionary in nature as all of its products are customer specific. Customers approach Company A with specifications for a new product/application, and “we quote and may build it – it’s very specialised low volume”.
Customers have driven Company A down this solutions based product development route “customers have driven us towards the more specialised product, so the customer would have a very special application and we would design around that and that’s where we would be strong in that sense we wouldn't be as strong in the whole manufacturing as getting thousands of units out at very low cost. So we are kind of gravitating towards small quantities but highly specialised”, “We let the customer lead us in terms of product development” and all products are specific to individual customers. “You know our focus really is very customer focused”. Company A identified the need for a dedicated international sales team but this is not possible. Currently communication with customers is via agents “we have agents in most countries, many of whom from the previous factory”.

Customer satisfaction is very important to Company A as manufacture is in small volume and to specific customers “we will work with the customer and give them what they want”. Product innovation in the industry is minimal as the product platform is old technology and any innovation is “in-house” and aimed at cost reduction in manufacturing “that is where we would see the major innovations, not in product design or features”. However, sometimes listening too closely to customers can be a disadvantage, so Company A are very prudent in that there would have to be a very reliable chance of continued sales volume from the product.

In relation to the product development process, customers are involved at the initial product concept development and project definition stages of the project “you are still basing it on the basic motor that we have today but you are tailoring the output side the customer might want and you are tailoring the magnetic side of it to suit whatever speeds, currents and power he is looking”. Once these specifications have been
identified the products are tailored and developed and further customer involvement is not required. It is essential that in product development Company A match whatever machine the product is going into so compatibility is important “is a mate mechanically and that joins up the same part that the holes are in the right places, the screws sizes are right, that the shaft is the right diameter and the right length, that it matches the connection is what he wants, that it’s a flying lead or connector or whatever” and as a result the initial project definition stages are very important and occupies much of the product development time.

All product specifications are thus expressed directly by the customer and are met exactly “for us most of ours are one to one with specific customers, he has a specific need and we give him that need, we don’t want say ok, that customer now wanted all that, lets develop a product that does this and launch a motor like that and see can we sell it to the general market, we would not go that route, it is specific to that customer”. However it was identified that in an older company, they tried developing and launching a “whole new drive” by talking extensively with customers “went around to all the major users of this drive asked them all the questions they could think of, the goods, the bads, the differents. Put all this into a big pot and came out this new product and the product sold nothing. Just didn't sell at all and was discontinued within 2 years of its launch”. As a result the company does not conduct formal market research into customer needs but prefers to develop on key client relationships “what we try and do with our good customers is build up a good relationship with them and visit them and for some customers its’ important to get visited by a manufacturer”.
5.3.2 Company B

Company B is a 100% privately owned Irish company. Company B was established in 2003 following the development and launch of a consumer based new product. The product; was taken to the Geneva world invention show where it received a bronze medal. Company B was founded and the said product was launched into the retail sector. Over the past number of years the company has sought to build and grow their range of innovative retail products “it became obvious that having just one product in retail was just not enough, we needed to develop a range which led to the beginning of the brand”. Company B is now an acknowledged provider of consumer based household products with products available for purchase in many of the leading retailers in the Ireland and the UK. Company B employs approximately 16 people across the business functions of marketing, research and development, finance, sales and manufacturing from its 16,000 square metre facility. Company B has achieved growth through the development of a stream of innovative new products and are actively engaged in NPD on a continuous basis “we have four or five new products ideas currently in the process of development”. The product range has grown from 1 product in 2005 to 24 products listed under the brand in 2011. Products range in price from €5.00 to €10.00 and are classified as impulse buys. The company primarily serves the Irish and UK but intends to expand into the US market.

In relation to product development activities, Company B develops new products in an ad-hoc manner and very much at the discretion of the owner/manager, “look I’ve brought out products because I thought they were a good idea, didn't talk to anyone, I liked it”. The company employs 1 person solely engaged in R&D. Although the company has developed 5 new products within its existing product categories in the last 18 months there is no formal NPD process in the company. There has been an
identifiable drive to increase the number of products in the product range expediently, which has led in some instances to product failure “we were rushed into development, we were put under so much pressure, like when you go to a buyer you need 20 products, so we rushed the product development and a good example is shoe-covers and battery organiser”.

Company B conducts limited, if any market research (primary or secondary) prior to product development. In some cases for example, less expensive household products no research was conducted “No we wouldn't have done any on the household products, that’s €4.99 and we didn't do any”. The company does not at any stage research customer needs and is aware of this “So I suppose do we involve customer’s needs, probably not enough but I suppose its understanding what a customer needs is the problem”. When examined further about customer needs it was identified that in product development they create the need “I have to convince them that they need is there - So I identified my need and I’m creating my own psychology on this, and I think it would be great” suggesting that the company is proactive in product development and develops products based on anticipated/perceived latent future needs. In anticipating customers’ latent needs, Company B strives to meet/exceed and add value for customers, “there are a few criteria to meet, price point, function, you have appearance, cosmetics. My primary is function, we have to meet that first, it has to function, then the price point and if it doesn't do all those you don't have a product that will make it out of the blocks. So those are the 3 and if it looks good that’s a bonus and that’s where you see the customer”.

In relation to product development processes, much of the company’s product development in previous years has been based on continuous experimentation and
observations and has been rushed. Company B is aware of the negative consequences of rushing product development and acknowledges “that's not the way but you have to”. Company B has desires for a structured NPD programme “I'd like it to be more structured, more focus groups etc.” and identified the importance of research “the way to bring out products in the future is good research, good structure that says study people spot a gap, design, focus groups and develop like that” in the process but currently no such programme exists.

In a significant movement away from its core product offerings/brand, the company is currently developing a new innovative and technologically sophisticated security device. The concept for the new product originated with the owner/manager who subsequently partnered with a company who developed the software and hardware. The product itself is a completely new-to-the world product and was in the process of being patented in 2011. In a testament to its ad-hoc NPD process the product does not fit within Company B’s brand at all and consequently the company are hoping “to partner with someone with resources in that space”. This selective partnering is considered the only route to market for this product.

In relation to future plans although the company wishes to continue “creating new products” it has found itself in a position where it needs to develop the brand and increase the product range, if it wishes to expand further internationally. The focus is thus in the short-term towards the ‘me-too’ space in order to increase its product range while also “removing the risk of development”.

176
5.3.3 Company C

Company C operates in the capacity of manufacturers of electronic information display systems, specialising in: product information systems, parking information systems for local authorities, passenger information systems, public information systems for colleges and universities, display signs for the retail trade and signs for in-flight information on aircrafts.

Initially set up in 1979, in 1981 the company became part of a Dutch company specialising in the manufacture of single line light emitting diode (LED) moving message displays for the retail market. There was a subsequent management buy-out (MBO) by the Managing Director in 1988 and as part of a new direction and strategy. The purpose of the new strategic direction was to concentrate on the design and manufacture of custom-built information displays and was followed by contracts in the railway and road, cinemas and factory systems markets. In 1999 Company C extended its facility to its current capacity (60,000 square feet) to make room for large projects. Additionally, in a significant investment in automation, a new surface mount line was installed, which increased the capacity to up to 100,000 components per hour. Company C currently employ approximately 155 people in the production process ranging in metal fabrication, painting, component assembly and final test, which are completed in-house. Company B’s products can range in price from a thousand euro for a small one off display to products that exceed a hundred thousand euro for a complete network of displays.

In relation to product development activities, Company C is a solutions based product developer “a lot of the stuff that we do is for our customers, it’s not as if we come up with this and say oh........a customer comes to us”. When a potential client comes to
Company C with a problem, the company develops a customised solution to that problem and are responsive and adaptive in product development. Company C’s research and development (R&D) section develops a customised design solution for each particular customer matching exactly their particular specifications. Additionally, customised management software is developed for that particular client (for example, a cinema chain required software that would display information over the auditorium, the screens and outdoors) and a completed product manufactured. While customer satisfaction is a key objective the company does try to add-value for their clients also.

Company C offers the customers their expressed wants in terms of size, shape, weight and particular features at a reasonable cost. Customisation is offered to any client, but now that the company has a large portfolio of products in its portfolio, it encourages its sales team to use an array of options within the product catalogue. If a customer wants a fully customised product, Company C adapts their activities to suit this but additional costs have to be met, including development, tooling and engineering. In order to successfully obtain a customer’s order, the firm consults closely with the client on its exact design needs. In some cases, this can be a very protracted consultation process involving architects, engineers, and committees. Customers generally demand a working sample or prototype in very short lead times to convince them of Company C’s capabilities, which is fine “you have to be close to customers, no doubt about it, especially in B2B”. Customisation is the firm’s biggest strengths. Through its R&D team the firm can design, manufacture and install any display solution that the customer requires. The company finds that its competitors cannot compete with this key dynamic - competitors would offer a display product, of a specified specification, with limited flexibility. Due to the size of possible contracts Company C acknowledge the extreme importance of building relationships with clients “if we know the customer well enough
and he likes us well enough he’ll find some reason to get rid of the other crowd”. In some instances it can even be a condition of the contracts that the company partner with local interface suppliers.

In relation to product development processes, the research and development team is based in in-house with a further R&D department in the UK office and Sweden. Significant emphasis is placed on the area of R&D from both a hardware and software viewpoint, so that “the best possible solutions are offered to our customers”. Dedicated engineering teams including software development engineers, hardware design engineers, test engineers, and product support engineers ensure that the company’s products and services continually meet the needs of a rapidly changing market. At the time of interviewing approximately 10%-12% of business operations were in cinema but the majority approximately 75% is in public transportation systems.

In relation to future plans Company C’s focus is in the long-term and has invested substantially in research and development, so that their products are at the cutting edge in terms of display solutions, with substantial money being reinvested back into the business to fund R&D and the purchase of robotic assembly machines. Approximately 8%-10% per cent of revenues are continually reinvested into research within the company. By ensuring that the company has a strong in-house R&D capability (13-14 people directly employed in R&D), Company C is being proactive in manufacturing and is focusing on staying one step ahead of the competition. Furthermore, the company has developed a world class manufacturing plant that allows it to use state-of-the-art machinery to facilitate the development of customised display solutions. The firm’s entire state-of-the-art production facility is computer networked; enabling the sales order to be tracked throughout its lifecycle and NPD is carried out through formal
processes. This allows the firm to have a high level of control the product development cycle.

5.3.4 Company D

Founded in 2000 Company D is a privately owner run Irish firm. Having previously worked for Pepsi as a buyer of fruit juice, the owner began to see a shift away from carbonated drinks and the move towards healthier options. This enabled him to spot a gap in the marketplace for a healthy alternative to carbonated drinks and on this premise Company D was founded in 2001. Company D is currently supplying the Irish market with a range of fruit based drinks from its production facility. Company D employs 8 full-time staff and in 2011 had developed 8 products ranging in price from approximately €1.50 to €2.50.

In relation to product development activities, the company’s most recent new products were developed in 2006/2007, in which 2 new products were launched (both of which have now been delisted and production upon which has ceased) onto the market. At the time the company was looking to be proactive and saw differentiation as a means to create a competitive advantage. The company developed and launched 2 new types of smoothies, an organic version and a functional version (with added Omega). Both products were developed “off the cuff” with no market research conducted. It was very experimental and a “make it and see will it sell” product development.

In the development of these new products Company D identified what it perceived were customers latent needs (added benefits and functionality) and sought to satisfy these in the new product offering. Subsequent to the product launch and on the back of poor
sales the company conducted some focus groups where it was identified that there was only “slight” interest in the functional smoothie product. The focus groups were beneficial in that they identified that customers were not really interested in this type of product and justified its lack of sales “the reasoning behind this that people wanted their smoothies to be natural and it was seen as a natural substitute and additives were at odds with this viewpoint”.

There is no formal NPD process in Company D. Idea generation for example “comes from anywhere, the owner/manager, other staff members, customers…anywhere”. The idea for the functional smoothie with added Omega first came from family and friends who in casual conversation were all very positive, “which in itself can be a drawback”. Other than this method of informal talks no other form of research is conducted. There is no R&D department or formal new product development processes in the company. No employee is solely engaged in new product development.

The decisions to develop new products rest solely with the owner/manager but much of his decisions are based on “experience” or “cost”. For example, on one occasion the company looked at extending its product range by introducing a 330ml version of their products. The products currently come in 250ml sizes only. Again, no consumer based analysis was conducted but a technical analysis was carried out. It was ascertained that the factory at its current capacity could not extend itself to produce this product. Such a product variation would require a substantial capital investment. This adjustment was outside the current factories capabilities and resources and deemed to be “a non-starter”. On another occasion Company D considered developing a smaller kids-size smoothie (150ml). As above the cost associated with this development was too great and the idea was abandoned. The smaller bottle could not have been produced at a
significantly lower price than the current 250ml bottle. This would mean that there would be no significant price difference between the 250ml and the 150ml products. Similarly the company looked into developing tetrapak cartons and distributing its product this format but the resources to purchase a new packaging machine were unavailable and the idea was not furthered.

In relation to product development processes, Company D does not conduct any formal market research or engage with consumers in product development. In product development the company tries to identify latent needs and create customer value. Both of its most recently introduced new products were created in an ad-hoc manner, without any research. The company state that its products are impulse purchase products and that distribution channels and route to market are more important than identifying needs “If your product is there people will buy it, the most important thing is to have your products on the shelves”. Additionally, the company is somewhat competitor oriented in product development and benchmarks against competitor products. Company D is very much aware of the activities of its main competitor. They frequently look “at what they do” and much of their previous product development endeavours has been based on competitor activities. The owner/manager receives email alerts when their competitors are mentioned online, a facility provided by Google.

In relation to future plans, Company D is currently not developing new products and has decided on a short-term strategy of growing distribution channels for the next 12 months. Consequently, the company is now also distributing other products for external companies “to grow this value creation activity, is now the main activity”.
5.2.5 Summary of NPD activities in Case study companies

Both B2B industrial product manufacturers; Company A and Company C, are customer centred in their product development. The ability to satisfy customers by matching and tailoring products to expressed customer needs is both companies’ major competitive advantages and the NPD process is structured with formal NPD processes. In relation to both B2C companies NPD is conducted in an ad-hoc manner, with limited if any involvement from the consumer, with no formal NPD processes in place and an emphasis on customers’ latent needs and adding customer value. Both B2B Companies A and C are developing product extensions and product improvements whereas both B2C Companies B and D are developing new products and product improvements.

All four companies detail that the ability to develop new products is essential in order to develop a competitive edge in their relevant industries. However, the decision to develop new products varies in significance between the case study companies. Both B2C Companies B and D have historically developed new products in an ad-hoc manner within informal NPD processes and have had product failures. However, neither B2B Companies A or C will engage in the NPD process unless the sales volumes are guaranteed. Both B2B companies operate in a less risky customer centred product development environs. On the other hand both B2C companies operate in a riskier product development environment. Additionally, both B2C companies, when engaged in NPD were pro-active in their style, seeking to develop new and innovative products whereas both B2B companies were responsive to customers’ requirements.

The major barrier to NPD in the case study companies is the lack of resources, both financial and human. However the risk associated with attaining extra resources is less for both B2B Companies A and C than it is for Companies B and D, because sales are
guaranteed and a general cost benefit analysis will dictate whether to develop the new product. On the other hand possible sales volume for both B2C companies is not known and the decision to source extra resources is more significant and the resulting sales less definite. But even within the B2C category the small sized Company B is continuing to grow its product range while the micro Company D has ceased developing new products and is concentrating on increasing distribution channels. Additionally, it can be noted that the industrial based Company A and Company C carried out more market research and pre-development activities prior to product development and had more formal NPD procedures in place than the consumer based Company B and Company D.

The data suggests that all the firms except Company C (medium-sized) have a short-term temporal focus, with Company C being the only firm having invested heavily in R&D capabilities. Company C is the most established of the case study companies and manufactures a technically sophisticated product line. In all four cases the final decision to develop a new product rested with the owner/manager. Finally, B2B SMEs rely heavily on building relationships with key existing customers.

The following section highlights the key issues in relation to product advantage from the case study analysis.

5.3 Qualitative findings regarding Product Advantage in SMEs

The purpose of this section is to advance understanding by viewing product advantage in its natural setting alongside other product development processes. The three components verified in Section 4.3.1 are utilised to frame the findings; that is, product
innovativeness, product superiority and product meaningfulness (See coding framework Figure 5.3).

![Figure 5.3: Product Advantage coding framework](image)

Each product advantage component is now presented in light of the case study research and findings on the product advantage activities presented (sections 5.3.1-5.3.3). A summary table depicting the relative importance attributed by the owner/managers of the case study companies to each component is presented at the end of each section. Evidence of the factors that influence the product advantage strategies of each owner/manager is then documented in section 5.3.4 and an overall summary of the product advantage activities in the case study companies presented in section 5.3.5.

### 5.3.1 Product Innovativeness

The owner/manager of Company A highlights that 3 product innovativeness characteristics are typified in their product offering: problem-solving, technical performance and uniqueness. Indeed the owner/manager identifies problem-solving as a key advantage of their products “excellent on problem solving, it would be one of the things... we did a customer survey and it would be one of the most important things they'd put us up on”. Technical performance is also important “So anyone who talks to us or product that we send to them, technically would be well up there, we have had no-one coming back to us with problems with our product”. Finally, uniqueness is also considered an important product innovativeness advantage “where we tend to get our
uniqueness is in its ruggedness as in for industrial markets as opposed to for cheap and nasty things so ruggedness is a big thing” [Company A].

The owner/manager of Company B finds that being able to solve consumer problems is a key product innovativeness advantage for them to present in NPD and that this advantage typifies their brand “we develop a range of products focusing on keeping you tidy” “one consumer may want it for class distinction one because it solves a problem”.

In this instance the ability to solve problems is the umbrella strategy and innovativeness characteristics such as; uniqueness, provide benefits and individual attributes and features, work to facilitate the achievement of this and provide innovative and unique solutions to consumer’s household problems.

Company C’s owner/manager relates problem-solving, uniqueness, provide benefits and individual attributes/features, as the innovativeness advantages that their products possess. Indeed these characteristics act as enablers of product differentiation.

“we used the leverage of what we had done before with the flexibility of solving their problems if they felt look I want you to re-design the project so everything is labelled, unique plug and play, a management system telling them what was wrong, it became a little bit more than just a sign and probably our competitors were slow to supply that” [Company C].

Additionally, Company C is operating in a software related industry and as such technical performance is important to present - their products must perform to the minimum industry standard.

“the new product here is going to have different optics, so we have a huge amount of research to do on optics, which we have nearly finished on, we have a whole pile of software to do to get up to the NTCIP protocol which means that
To enable differentiation and provide benefits were considered by the owner/manager of Company D to be important elements of their product offering, however on two occasions the owner/manager attempt to introduce these elements into new products failed and the resulting products were discontinued.

“At the time we were looking to differentiate ourselves from others in the market and create something new and we developed and launched 2 new types of drinks an organic version and a functional version (with added Omega benefits). Both products were developed “off the cuff” and very little market research was done, which I suppose may have added to their failure” [Company D].

These product failures have led the owner/manager to believe that product innovativeness elements such as differentiation, uniqueness or provide benefits are in fact not that important in their market.

In summation, the owner/managers of the cases study companies identified the relative importance that they attribute to the seven characteristics of product innovativeness (See table 5.2).

| Table 5.2: Significance of Product Innovativeness characteristics to case SMEs |
|--------------------------------------------------|----------------|----------------|----------------|
| **Company A**                                  | Strong | Moderate | Weak          |
| Solve problems                                 | ✔     |           |               |
| Enable differentiation                         |       | ✔         |               |
| Be Innovative                                  |       |           | ✔             |
The empirical findings highlight that the SME owner/managers of both Companies B and C consider product innovativeness to be relatively important for their products advantage. On the other hand, innovativeness exhibits moderate to weak levels of importance in the product development activities in Company A and Company D respectively.

### 5.3.2 Product Superiority

The owner/manager of Company A identifies that being superior to your competitors’ in terms of product quality is very important to their products advantage.
“Well our big advantage would be what we call ruggedness, it’s designed to last whereas our competitors wouldn't be, they'd be flimsier” We use steel you can throw it around and it would be ok where our competitors’ ones wouldn't be open to the robustness of it” [Company A].

Much of this has to do with their largest customers being OEM manufacturers “In terms of the OEMs it’s that the quality and reliability of them are good”. Product design is not important for Company A, because all products are based on a relatively old standard servomotor product platform and their products are internal components of other machines.

Company B’s owner/ manager highlights that superiority in relation to product design is critical for them “Product design is everything, it’s critical”. Indeed the small sized company employs “a full time designer and we have about seven products on the board at the moment”. Company B is a manufacturer of consumer based household products and as such products should have “function, appearance and cosmetics” in their design. The products being developed in Company B are generally IP protected and as a result quality relative to competitors’ is not important.

Product superiority characteristics are identified as important by the owner/ manager of the consumer based drinks manufacturer Company D. There are several alternatives in the market for Company D’s products and resultanty the owner/ manager identifies that they must compete directly on quality and superiority elements relative to competitors. Indeed the owner/ manager closely monitors competitors actions “to keep an eye on what they are doing quite frequently and I receive email alerts when competitor are mentioned online”. The solutions based Company C tenders for contracts to develop products specific for customers and as a result competition is only in the initial pre-
contract stage. The owner/manager of Company C highlights that the initial stages are characterised by meeting performance standards and cost and as such product superiority is not that important.

In summation, the owner/managers of the cases study companies identified the relative importance that they attribute to the four characteristics of product superiority (See table 5.3). All four case study firms attribute different levels of importance to these elements (See Table 5.3).

<table>
<thead>
<tr>
<th>Table 5.3: Significance of Product Superiority characteristics to case SMEs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Company A</strong></td>
</tr>
<tr>
<td>Be superior</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
</tr>
<tr>
<td>Of better quality</td>
</tr>
<tr>
<td>Have better product design</td>
</tr>
<tr>
<td><strong>Company B</strong></td>
</tr>
<tr>
<td>Be superior</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
</tr>
<tr>
<td>Of better quality</td>
</tr>
<tr>
<td>Have better product design</td>
</tr>
<tr>
<td><strong>Company C</strong></td>
</tr>
<tr>
<td>Be superior</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
</tr>
<tr>
<td>Of better quality</td>
</tr>
<tr>
<td>Have better product design</td>
</tr>
<tr>
<td><strong>Company D</strong></td>
</tr>
<tr>
<td>Be superior</td>
</tr>
<tr>
<td>Be better relative to competitors offerings</td>
</tr>
<tr>
<td>Of better quality</td>
</tr>
<tr>
<td>Have better product design</td>
</tr>
</tbody>
</table>

The empirical findings presents evidence to suggest that on average product superiority exhibits strong to moderate influence on the NPD activities in three of the case study firms. The exception is in relation to the NPD activities of Company C where the
owner/manager identified weak levels of importance for all four superiority characteristics.

5.3.3 Product Meaningfulness

Company A is a customer centred solutions based company developing new products for B2B markets and as such the owner/manager highlights meeting customer needs as the most important characteristics to present in NPD. Indeed the owner/manager identifies that ‘meeting customer needs’ is driving their current NPD activities

“we kind of let the customer lead us on in terms of product development. You know our focus really is very customer focused” “the way the customers have driven us is we're tending towards more the specialised, so the customer would have a very special application and we would design around that……that is our niche, highly engineered, low volume” [Company A]

An example of a customer focused activity is found in one of the company’s current projects, where a customer has a specific need and the company are re-designing their product “they want it 20ml thinner and that might sound easy but it was a complete re-design to take 20ml off it”. Likewise, the owner/manager of Company C see the ability to be flexible in NPD and meet customers’ needs as important to their advantage

“we are flexible to changes in the project, they want prototypes and they want this and then they start feeling ok well this company can do what they said they can do….. we work in partnership with customers long term, long term basis is what we try to do with them how we designed with them and that’s what I think our strength is, flexibility” [Company C].
Additionally, the owner/managers of both Companies B and D highlight that meeting customer needs for them involves meeting the needs of retailers and getting their products on store shelves. This is achieved through pricing and sellers margins [Company B] and by “Talking to retailers, asking them what they want, we have sales representatives, who are constantly in contact with the retailer” [Company D].

Evidence is also found from all four case study companies’ owner/managers that matching customer perceptions in the form of good experiences and reputation are important to product meaningfulness. Customer perceptions are formed over time and influences word-of-mouth and purchase intent. In relation to the end user matching customer perceptions is significantly important for both B2B product manufacturers (Company A and Company C). The owner/manager of Company A identifies that matching customer perceptions takes the form of experiences “Good experience with us, they know us, so you do try to build up a relationship with them, especially from the engineering side, especially with the OEMs”. However with Company C matching customer perceptions takes the form of reputation and previous works done

“we could demonstrate that we have done virgin rail and a couple of case studies very similar where there was different types of signs again reference points” “It’s definitely the reference points, I don’t think an Irish company going to Israel saying oh we’ve done something in Dublin, I’m not sure if that would get us at the races” [Company C].

The owner/managers of both B2C product manufacturers (Company B and Company D) highlight that matching customer perceptions is two-fold, in relation to the perceptions of end users and also the retailers that distribute their products. For Company B and Company D matching customer perceptions takes the form of good relationships with retailers
“We do, very much so especially in this product, talking to them, showing it to them, what they like” [Company B], but also “For my end customers, users even, the advantages that the products offer is in perception and that is the most important advantage to present” [Company D].

The ability to be cost effective is also seen as an important product meaningfulness characteristic to present by the owner/ managers of the case study companies. Large portions of Company A’s customer base are original equipment manufacturers (OEM) that Company A supply with parts. These customers then must sell their completed machines to their customers and as a result are constantly looking for cost savings “In terms of the OEMs…….. price is always an issue”. The owner/ manager of Company A thus constantly tries to implement cost saving measures in the manufacturing process to be able to compete with competitors “get costs down and get them into a scenario where they could compete with our competitors” [Company A]. For example a recent cost reduction has been accomplished by re-designing a component part and making it cheaper to produce

“Ah one of the big savings we did on that was this part here which was magnets and what we call the fronting bed it’s all one piece where other people would have two pieces we have one piece, reducing cost” [Company A]

The owner/ manager of Company C identified that costs are very important, because in a tendering competition where several companies meet the customers’ required performance standards (which happens a lot) cost is then the deciding factor “In fact the last person in Cork said they all (competitors) said they meet the spec and so we will pick the person on the lowest price”. Indeed because cost effectiveness is becoming so important Company C is “bringing in a lean cost thing at the moment because for sure cost is so important”. 
Both Company B and D are developing impulse products and being cost effective and keeping prices down is also highlighted by the owner/manager as important “also price, our products are impulse buy but in today’s market environment consumers are price sensitive” [Company D]. This is particularly relevant for Company B “manufacturing cost is critical” because they are developing novel products and endeavour to use novel materials which increases costs “because of material, the material costs more than the box of others (competitor’s products), price is big” [Company B].

In summation Based on the empirical findings all four case study firms display a high level of customer orientation in NPD and advocate the presentation of product meaningfulness characteristics in their new products, thus the practices of the SMEs reflect previous literature. Three product characteristics emerged as key elements related to product meaningfulness; meeting customers’ needs, matching customer’s perceptions and being cost effective. Table 5.4 gives an overview of the owner/manager of the case study firms perspectives these characteristics.

<table>
<thead>
<tr>
<th>Table 5.4: Significance of Product Meaningfulness characteristics to case SMEs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Company A</strong></td>
</tr>
<tr>
<td>Meeting customers’ needs</td>
</tr>
<tr>
<td>Matching customer perceptions</td>
</tr>
<tr>
<td>Being cost effective</td>
</tr>
<tr>
<td><strong>Company B</strong></td>
</tr>
<tr>
<td>Meeting customers’ needs</td>
</tr>
<tr>
<td>Matching customer perceptions</td>
</tr>
<tr>
<td>Being cost effective</td>
</tr>
<tr>
<td><strong>Company C</strong></td>
</tr>
<tr>
<td>Meeting customers’ needs</td>
</tr>
<tr>
<td>Matching customer perceptions</td>
</tr>
<tr>
<td>Being cost effective</td>
</tr>
<tr>
<td><strong>Company D</strong></td>
</tr>
<tr>
<td>Meeting customers’ needs</td>
</tr>
</tbody>
</table>


The empirical findings present evidence to suggest that product meaningfulness is universally important in the NPD activities of all four case study companies.

5.3.4 Factors influencing product advantage

Throughout the case study analysis market needs and wants, technology, competitors and resources emerged as the defining conditions upon which product advantage decisions are based. More specifically knowledge regarding the market, technology, competition and the availability of resources dictated the type and levels of advantages that were presented in new products. This section thus highlights the impact of market uncertainty, technological uncertainty, competitive uncertainty and resource uncertainty on the choice of product advantages being pursued by SMEs.

5.3.4.1 Company A

Company A is customer centred solutions based in NPD developing customisable DC servomotors for specific customers. NPD in company A is short term in focus with a responsive adjustment style. The rate of change in the composition of customers in the marketplace, is stable, however, customers’ preferences in relation to technical specifications can alter. A formal NPD process “stage-gate model” operates in Company A and extensive market research is conducted on customers’ requirements to ensure scarce resources are not wasted by developing unfavourable products. The level of uncertainty in the market is low to moderate as Company A can tailor and customise products to customers changing preferences quite easily. The technology that supports the industry is an old technology based on a standard DC servomotor product platform.
Technology innovations in the industry are confined to the manufacturing process and involve manufacturing efficiencies. Company A has operated in the industry for a considerable period of time and completely understands the technological environment as it relates to NPD projects, and thus operates in a low technological environment.

The market in which Company A operates displays the characteristics of an intensely competitive market with many large competitors producing similar products. There are many alternatives available in the market and both price and non-price competition is intense. Company A is surviving by producing low volumes of high specialised products. Company A is operating under constrained resources and are very much dependent on customers to provide resources for product development. Indeed company A will not develop new products unless expressly asked for by customers and not until a definite profitable market for the product identified. Product modifications stem from customer relationships and the satisfaction of expressed needs. Company A is thus operating under high resource uncertainty.

Company A is operating under low to moderate market uncertainty, low technological uncertainty, high competitor intensity and high resource uncertainty and is developing products with high levels of product superiority and product meaningfulness and low levels of product innovativeness. The ability to produce superior products relative to competitors in the market and solve specific customer problems by tailoring product specifications is seen as key to Company A’s competitive advantage and survival. Company A’s close relationship with customers enhance the level of customer satisfaction with the product offering and its formal NPD process supports its success and eases the uncertainties associated with the environment into which the products are introduced.
5.3.4.2 Company B

Company B is a consumer-based manufacturer of innovative household patentable products distributed through retail outlets. NPD in Company B although being short term in focus is very much proactive and aimed at increasing customer value and satisfying latent needs. Company B’s products are problem-solving in orientation facilitated through customer observation and experimentation. The rate of change in the composition of customers in the marketplace is high and customers’ preferences are volatile. Company B does not conduct any formal market research and develops products in an extemporaneous manner on the decision of the owner/manager who is the key creative force. The uncertainty in the market for Company B is consequently high and the market is turbulent.

Product and process technology in the industry is subject to rapid change in the area of process improvements and automated manufacturing capabilities. Technological uncertainty in Company B is high, so much so that the manufacturing of its products is outsourced to Asia. There are many competitors and numerous product alternatives are available in the market but Company A uses innovativeness to distinguish and protect its products. Price and non-price competition is fierce thus competitive intensity is high. Company B has recently decided to concentrate on opening distribution channels and disturbing products for other companies as a new business strategy, and is operating under high resource uncertainty.

Company B is thus operating under high market uncertainty, high technological uncertainty, high competitive intensity and high resource uncertainty and developing products with high levels product meaningfulness and product innovativeness and moderate levels of product superiority. The ability to produce products that solve
specific customer problems with good product design is core to Company B’s competitive advantage, which is enabling the simplification of everyday household tasks. Company B does not conduct any formal consumer based research but is aware of competitor products and strategies. The information suggests that Company B’s product advantage strategy centres on producing innovative products in a cost efficient manner.

5.3.4.3 Company C

Case study Company C is also a customer centred solutions based in NPD developing customisable LED displays for specific customers. Company C’s products are primarily developed on foot of a tendering process and as such are 100% customisable to the specific requirements of the customer. Customer demand for the product is thus certain and the priority turns to supply and satisfaction. Company C is long term in focus and has a responsive adjustment style. Uncertainty in the marketplace is low as the composition of customers is stable and once the tender is offered technical specifications are met. The rate of change in technology is the industry is high; to reach technology standards in the industry Company C has invested heavily to increase the technological capabilities of its facility. Competitive intensity is high and the tendering process can be long and aggressive. It is also very difficult to anticipate competitive responses. Company C is manufacturing individual units of highly specialised products primarily for a corporate market. Although being dependent on customers for resources, resource uncertainty for NPD in Company C is low; having secured a contract for a new product company C will acquire any additional resources needed to execute product development.

Company C is operating under low market uncertainty, high technological uncertainty, high competitive intensity and low resource uncertainty and developing products with
high levels of product meaningfulness and innovativeness. The choice of this strategy is attributable to the type of solutions based product that is being produced which requires interaction with the customer and the satisfaction of customer needs as core to the product advantage strategy, coupled with a high technology product. Company C finds that a close relationship with customers, built on trust, reputation and past project success is a key factor for success, in the tendering process.

5.3.4.4 Company D

Company D is a consumer-based manufacturer of fruit based drinks distributed through retail outlets. Company D although being short term in focus is very much proactive in developing products aimed at increasing customer value and satisfying latent needs. Company D’s products are developed in an ad-hoc manner through a continuous experimentation learning process. The rate of change in the composition of customers in the marketplace is high and customers’ preferences are volatile. Company D does not conduct any formal market research and develops products in an extemporaneous manner on the decision of the owner/manager who is the key creative force. As a result the company has developed and ceased to manufacture two new products in the same number of years. The uncertainty in the market for Company D is consequently high and the market is turbulent.

Product and process technology in the industry is subject to change in the area of process improvements and product innovations. Technological uncertainty in Company D is high. The industry is concentrated with a small number of large competitors and numerous alternatives are available in the market. Price and non-price competition is intense thus competitive intensity is high. Company D has recently decided to stop developing new products and concentrate on disturbing products for other companies as
a new business strategy, and is operating under high resource uncertainty. Company D is operating under high market uncertainty, high technological uncertainty, high competitive intensity and high resource uncertainty and is also developing products under a meaningfulness and superiority strategy. Company D’s products are undifferentiated and price generally forms the basis of competitive advantage.

The qualitative analysis reveals that the case study companies operating under intense competition and technological turbulence are advocating product superiority and when the market is uncertain and resources are scare the case study companies capitalise on the close relationship with customers and build product meaningfulness characteristics into their new products.

5.3.5 Product Advantage Summary

One purpose of conducting the qualitative analysis was to identify the product characteristics that the owner/managers of the case study companies consider important and the factors that influence their decisions and thereby complement the quantitative analysis and increase understanding on the nature of product advantage (Research objective 1) in SMEs. The owner/managers of each of the case study companies highlighted the different product advantage characteristics that they consider important to present in their new products. Different elements of each dimension: product meaningfulness, product superiority and customer meaningfulness are considered important under different conditions. However it is evident that customer meaningfulness is a dominant product advantage component, in that all four case study company SME owner/managers consider it strongly important. For both B2B manufacturing companies (A and C) customer meaningfulness advantages are directed
at the end customers of their value chain however for both B2C companies (B and D) customer meaningfulness advantages are directed at the distributors of their products (i.e. retailers). Product Superiority is also important but more so for the companies with direct competitors (Companies A, B, and D). Company C is in a unique position in that they tender for the opportunity to develop customers’ products, and superiority is not important in this process. Indeed Company C often finds itself in a position where all those tendering fulfil the performance criteria of the tender and then the decision is down to cost and customer perceptions, both of which are product meaningfulness characteristics. For the remaining case study companies the specific product superiority characteristics that are considered important are very much dependent on competitive intensity. For example, Company B who produces novel and patentable products does not consider quality relative to competitors as important because competitors are not producing the exact same product, however for both Company A and D, whose competitors produce similar products superior quality relative to competitors is very important.

Likewise each case study company exhibits different levels of product innovativeness in their product offering dependent on their environment, both market and technical and the level of uncertainty associated with each. Company A’s products are based on a standard product platform the environment market and technically stable and as such the only characteristics that are important are the product performs technically and that they can solve customers’ problems. On the other hand Company C operates in an environment characterised by high technical and market uncertainty and as such product innovativeness is important. The market in which Company B operates is stable technically but market uncertainty levels are high, in that customers’ preferences are
constantly changing. Likewise Company D is operating under low market and technical uncertainty and as such innovativeness is not important.

The case study analysis advances the quantitative investigations (see Section 4.4) by confirming the importance levels and conditions associated with advancing product innovativeness, product superiority and product meaningfulness in NPD strategies. The following section highlights the new product performance measurement activities of the case study SMEs.

5.4 Qualitative findings regarding New Product Performance measurement in SMEs

The quantitative analysis in Chapter 4 explored the new product performance measures that SMEs are performing well in measuring but did not explore the measures that they use. By exploring new product performance measurement usage the qualitative analysis builds on the quantitative findings by adding insights and understanding and producing more complete knowledge. This complete knowledge on new product performance in SMEs is necessary to truly inform theory and practice. This section thus presents the qualitative findings on the new product performance measurement activities of the case study companies. In analysing the nature of new product performance measurement (Research Objective 2) the three dimensions verified in Section 4.3.2 are utilised to frame the findings that is; objective customer acceptance, development-time and reducing subjective customer dissatisfaction.
The empirical analysis highlights that on average the case study companies used between two and five measures in their NPP measurement activities. Company D’s management uses the least number of measures concentrating on two objective customer acceptance measures; unit volume goals and met contribution marginal goals “we look at sales volume and margins a lot”. The management of Company B uses three measures – two objective customer acceptance measures and one development time measure. The owner/manager of Company B highlights that NPP measurement is very much sales and margins based and that they also measure development costs “sales based, that’s it, financial activities are being done, that activity is only starting recently 4 months” “does it meet its criteria in that does it give the retailer 48% and us 50% and if it can’t then” “development cost manufacturing costs are important” [Company B].

Both Company B and D are B2C based manufacturers, producing new and product improvements, short-term in focus and aim to satisfy customers’ latent needs in NPD through an informal product development process and an ad hoc performance system.

On the other hand, both B2B product manufacturing Company A and Company C; have formal product development process in place, are customer oriented in nature, are developing product extensions and product improvements and aim is to satisfy customers expressed needs. Management in Companies A and C use five and six measures respectively. The owner/manager of Company A highlights that they measure objective customer acceptance by calculating return on investments and look at market-level sales targets “ROI and sales” “we do have a sales target this year and we will have a target next year”. Additionally the owner/manager of Company A also measures subjective customer dissatisfaction, particularly that the product meets performance and quality specifications by conducting life-tests “What we tend to do is
we go 1000 hours, run it continuously for 1000 hours and monitor whatever parameters we want to monitor about a month” and customer satisfaction “We did when we got ISO they were all on about customer satisfaction surveys and all that. And we said that’s fine and everything came back as expected all positive”.

Management in Company C uses six measures in their NPP activity. The company’s management monitor subjective customer dissatisfaction specifically; customer satisfaction, performance and quality specifications. Additionally, in relation to objective customer acceptance Company C measures sales, market share and conducts margins analysis,

“We don’t do ROI’s but let me show you (Opens EXEL with sheet with all sales, sale price, sectors, where customer coming from, market share as in how much of our output is oriented towards a sector, where is the margin coming from etc) sorry we do margin analysis as well” [Company C].

Table 5.5 provides a summary of the NPP measures being used by the case study companies.

| Table 5.5: Summary of NPP measures used by the case study companies |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| **Firm Size and Type**          | **Product Type**                | **NPP dimension used**          | **NPP measure**                 |

204
Chapter 4, Section 4.5 identified that SME owner/managers indicate that they perform best at reducing subjective customer dissatisfaction above all other measures even though only performance in objective customer acceptance was linked with product success. The qualitative investigation highlights that the case study companies are in fact all using an objective customer acceptance measures to measure new product performance. The qualitative investigation supports the use of measures aimed at reducing subjective customer dissatisfaction in both B2B Company A and Company C but not in B2C Companies B and D. In both B2C SMEs new product performance is measured very internally based on sales, costs and margins (unit volume goals, development costs and met contribution marginal goals) alone.

5.5 Summary of Case Studies

The four case studies presented have explored in further detail the trends identified by the quantitative survey. The questionnaire provided a broad picture of the nature of product advantage and new product performance measurement in SMEs. The questionnaire however was limited in its ability to explore the issues in their natural context. On the other hand, the case studies have been useful in their ability to explain the nature of product advantage and new product performance in SMEs and to identify the specific product advantage characteristics and NPP activities currently being used in firms. Also any compounding issues on the choice of product advantage strategy or are identified. However, the findings of the qualitative survey cannot be generalized to the
total population and insofar the following findings only draw from the four firms involved in the case studies.

The main findings from the case studies are:

1. *The case study SMEs are aware of the need to develop new products in order to compete and on the advantages of doing so.* All four of the case study SMEs acknowledges the need to develop and introduce new products to achieve growth. Acknowledgment of the importance of NPD was across the consumer and industrial firm divide, firm size, product development orientation and product type. NPD in both B2B SMEs was concentrated in the development of product extensions and product improvements. On the other hand both B2C SMEs are developing new products and product improvements.

2. *Product meaningfulness is a universally important product advantage dimension across firm size, firm type, product development orientation and product type.* All four SMES in the case study analysis indicate that product meaningfulness is an important dimension that facilitates product advantage. The predominant product meaningfulness characteristic to present is the ability to ‘be cost effective’ (as was found in Chapter 4, Section 4.4) followed by ‘meeting customer needs’ and ‘matching customer perceptions’.

3. *Product superiority is an important product advantage dimension in some circumstances.* Two companies, A and D consider product superiority of high importance to product success whereas Companies B and C consider it to have moderate and weak importance respectively. In relation to Company B superiority in relation to product design is critical to product advantage. However, B2C Company B is producing general household products that are sold through retail outlets where visual aesthetics are important for such sales.
Similarly Company A is operating in a B2B industry where the products are being used as components in other applications and as such quality and superiority over competitors may be a defining factor in the purchasing decision.

4. **Product innovativeness is important for some companies.** The owner/managers of two case study companies (B and C) consider product innovativeness important to their products advantage; whereas companies A and D highlight that it has a moderate to weak importance. However both companies B and C are operating in and developing sophisticated products, either in technology or by using novel materials.

5. **The case study analysis highlights that uncertainty about the environment in particular; market uncertainty, technological uncertainty, competitive intensity and resource uncertainty impacted on the choice of product advantage strategy being pursued by the case study companies.** The case study analysis suggests that companies operating under intense competition are advocating product superiority in NPD. The companies operating in technological uncertainty are advocating product innovativeness and when resources are uncertain and market uncertainty is high SMEs is advocating product meaningfulness in their NPD strategy.

6. **The case study companies used between two and six measures in their NPP measurement activities.** B2B companies A and C use more measures in their NPP measurement activities using five and six measures respectively compared to two and three measures being used by B2C companies D and B respectively. Both B2B companies are solutions based in nature and have formal NPD process in place.
7. The use of objective customer acceptance new product performance measurement activities is universal across SMEs. All four case study companies indicate that they measure sales volume as a primary NPP measurement activity indicating that they use the objective customer acceptance measure ‘unit volume goals’ in their measurement activity. However, as detailed in Chapter 4, Section 4.5 SMEs performance in measuring ‘unit volume goals’ is poor, and is constantly ranked in the bottom 25% in order of performance. This indicates that while SMEs identify ‘unit volume goals’ as important they are not successful in measuring it.

8. Neither consumer based firms indicate a preference for measures aimed at reducing subjective customer dissatisfaction NPP measures. Both B2C Companies B and D use only financial-level based measures of performance. Although both companies are producing consumer based products neither Company B nor Company D conduct formal activities intent at measuring the customers’ satisfaction level with their new product. Both companies indicate that measuring customer dissatisfaction does not need specific quantifiable analysis.

9. The number of NPP measures used may be influenced by product price. As the price of each product increases so does the number of measures that each firm uses.

10. Only Company B uses a development time measure of NPP. Company B is an impulse purchase household consumer goods and the price charged for its new products is a very important. There is a link between the time taken to develop a product and the price charged on marketplace entry.

at reducing subjective customer dissatisfaction in their NPP measurement activities. The medium sized firm uses only one measure while the micro-sized firm uses three measures aimed at reducing customer dissatisfaction.

12. The B2B SMEs had more formal NPD processes in place. Both B2B SMEs had formal NPD practices in place whereas both B2C SMEs had informal practices and NPD was carried out in a very ad-hoc manner. It was the smaller of the two B2B companies Company A that had the most stringent NPD process. This was attributed to the need to be excessively prudent within the framework of very limited resources and the possible consequence of a product failure. Both B2B SMEs kept regular and accurate control of their NPD costs. This was because the products they offered were customisable and additional costs needed to be factored into the price of the product. This was particularly important for Company A, which has seen the price that they could charge for their products reduce by 60% in the last 10 years. For Company C any additional costs need to be included into the tender at the beginning of the project. Neither of the other two B2C accurately controlled how much they were spending on NPD as long as an acceptable profit margin was reached.

13. The medium-sized SME in the study was in a position to devote considerably more resources to the NPD process than the micro and small firms. Company C had a team of people dedicated to managing their NPD process. Neither of the micro or small firms in the study was in a position to dedicate staff full time to maintaining their NPD processes. There is a sense then that the extent of NPD that can be undertaken by a firm varies with its size and resources.

14. B2B SMEs displayed exceptionally high levels of customer orientation in NPD. Both B2B SMEs were very customer centred in NPD, all their products were customisable to specific customer requirements and as such their adjustment
style is responsive (they will only develop a product if it is specifically requested). The objective of their NPD is always aimed at customer satisfaction and satisfying exactly the expressed wants of the customer. Company A identified that in no circumstances would they offer anything other than what was expressly asked.

15. **B2B SMEs displayed a low level of market orientation in NPD.** Both B2C expressed a low level of market orientation in NPD. This market orientation took the form of proactive product development aimed at adding customer value and identifying customers latent needs. However, the method chosen to gather information on the market was limited, neither SME conducted any formal market research and much of the NPD was based on the observations of the owner/manager. Notably in one case the owner/manager of Company B developed a new product on the sole justification that he liked it.

16. **The current focus of SME NPD is very much in the short term.** Across B2B and B2C SMEs, Companies A, B and D identified that the current focus of their product development is in the short-term, as in survival and not necessarily growth. Company C on the other hand has invested significantly in the manufacturing process and the manufacturing facility, the purpose of which was to increase efficiency and enable them to compete for larger tenders. The investments typify a commitment to a long-term growth strategy. However Company C is the largest SME in the study suggesting that the temporal focus of SMEs is dependent on size.

While the summary of the case studies cannot be generalised to the population of SMEs, case studies are useful in developing theory. The theory that has been developed in this research is in relation to how NPD is managed and has sought to describe and
understand in greater detail the nature of product advantage and new product performance measurement activities in SMEs.

5.6 Conclusion

The owner/managers at four SMEs were interviewed to gain a better understanding and inform on the activities that emerged in Chapter 4. For the solutions based customer oriented Companies A and Company C product advantage is firmly rooted in their ability to satisfy customers whereas the nature of product advantage for Company B lies more so in quality, cost and technical performance while Company D is rooted in cost and customer perceptions. Also the case studies would seem to suggest that B2C SMEs are not customer and only slightly competitor oriented in new product development whereas B2B SMEs are very customer oriented. The biggest obstacle to NPD is resources and product innovativeness does not seem to be important to introduce into new products. The following Chapter 6 presents the discussion based on the quantitative findings presented in Chapter 4 and the qualitative information contained in this chapter.
Chapter 6 Discussion Chapter
6.1 Introduction

The aim of this thesis was to explore how product advantage influences new product performance in SMEs. This aim was broken down into three objectives;

Research Objective 1: To investigate the nature of product advantage in SMEs.

Research Objective 2: To investigate the nature of new product performance measurement in SMEs.

Research Objective 3: To determine the relationship between product advantage and new product performance in SMEs.

Each of these is now discussed in light of the research.

The chapter is laid out as follows; Section 6.2 presents a discussion of the exploratory Research Objective 1 and Section 6.3 presents a discussion of the exploratory Research Objective 2. Section 6.4 presents the discussion relating to causal Research Objective 3 and the chapter is concluded in Section 6.5. Figure 6.1 illustrates the sections covered in this Chapter.

![Figure 6.1: Outline of Chapter 6](image)

Reflection on approach used to investigate the research objective is provided at the end of each section. The reflection will discuss what was learned? How did you best learn it? How did the field work experience lend insights on the methodological approach?
6.2 Discussion of the Research Objective 1

In addressing the nature of product advantage this section first, addresses the conceptualisation of product advantage (Section 6.2.1), second, the operationalization of product advantage in SMEs (Section 6.2.2), and finally the issues that were found to influence product advantage in SMEs (Section 6.2.3). In doing so the investigation of Research Objective 1 is satisfied.

6.2.1 The Product advantage concept

Despite the progress made by previous studies in identifying the significant contribution of product advantage to both product success and new product performance the composition of the product advantage construct has largely been overlooked and a holistic view of product advantage has been advanced. In addressing perceived conceptual weaknesses associated with the holistic product advantage construct four studies provide justification for the separation of product advantage into three independent constructs. These studies (Rijsdijk et al., 2011; McNally et al., 2010; Szymanski et al., 2007; Calantone et al., 2006) argue the need to re-consider how product advantage is viewed and the role it plays as a determinant of success. While Calantone et al. (2006), Szymanski et al. (2007) and McNally et al. (2010) focused on product innovativeness, and its’ distinction from ‘product advantage’, Rijsdijk et al. (2011) concentrate on ‘product advantage’ and distinguish between meaningfulness and superiority characteristics as separate components of product advantage.

Supporting the division of product advantage this study provides significant insights into the composition of product advantage and confirms the conceptual separation of product advantage advanced by Rijsdijk et al. (2011), McNally et al. (2010), Szymanski
et al. (2007) and Calantone et al. (2006). Support is also advanced for the view that a holistic conceptualisation can no longer capture the complex inter-related aspects of the product advantage construct. Exploratory factor analysis provided empirical evidence for the separation of product advantage into three inter-related components; 1) product innovativeness, 2) product superiority and 3) product meaningfulness. To advance NPD literature further, in particular the contribution of product advantage to NPP, these three components need to be considered separately and the unique role that each occupies explored.

Product innovativeness is concerned with technical and marketing discontinuities (Calantone et al., 2006) and the resources needed to support these. As such firms’ express product innovativeness by comparing technology product content to competitors by assessing the degree of technical and marketing resources needed (Danneels and Kleinschmidt, 2001) to develop the product. This thesis finds that product innovativeness in SMEs thus reflects the technical and marketing resources needed to solve customer problems, enable differentiation, enable better technical performance, have better individual attributes and features, be unique and innovative.

Product superiority refers to superiority relative to competitors in specific features such as quality, benefit and function (Calantone et al., 2006). Daft and Weick (1994) indicate that the strategy adopted by a firm influences information processing and the interpretation of this information and has also linked increased product advantage to market knowledge processes (Li and Calantone, 1998; Atuahene-Gima, 1995). Rijsdijk et al. (2011) found that specifically product superiority results from competitor knowledge processes. The competitor knowledge process generates insights into the strengths and weaknesses of a firm and its products compared to rivals, and enables a
firm to position the new product as superior to competing offerings within a given market (Li and Calantone, 1998) - which facilitates the development of superior products. This thesis finds that product superiority in SMEs reflects the degree of superiority in quality and product design relative to competitors’ products.

Product meaningfulness is the extent to which the new product’s attributes and functionalities are beneficial to (potential) customers (Im et al., 2008). Rijsdijk et al. (2011) found that product meaningfulness results from customer knowledge processes. In the customer knowledge processes, information is acquired through research activities such as focus groups and lead-user contacts (Rijsdijk et al., 2011), which according to Li and Calantone (1998) can be integrated into the new product. Consequently, firms with good customer knowledge processes are likely to develop new products that deliver a high level of meaningfulness to customers. However SMEs are typified by a limited number of products and customers thus minimising the requirements for formal procedures developed to gather and process customer or market information (Appiah-Adu and Singh, 1998) indicating that customer knowledge is gained in an ad-hoc manner. This thesis finds that product meaningfulness in SMEs is reflected in the firms’ ability to produce products that match customers’ perceptions, meet customers’ needs and are cost effective. The information needed to produce such characteristics is often gained in an ad-hoc manner by the SME.

In summation product advantage should no longer be considered a holistic determinant of product success or predictor of new product performance, instead each of the three components should be looked at individually and the unique contribution that each makes in the NPD process explored further. In doing so transparency is introduced into the product development process, how specific advantages that are built into products
affect the overall product concept identified and improved new product strategy planning is facilitated.

This study thus confirms the link between product meaningfulness and product advantage previously identified (Rijsdijk et al., 2010; Ledwith and O’ Dwyer, 2008; Hsieh et al., 2008; Hua and Wemmerlov, 2006; Blankson et al., 2006; Bastic, 2004 and Cooper, 2001). This study also confirms the link between superiority and product advantage previously identified (Rijsdijk et al., 2010; Ledwith and O’ Dwyer, 2008; Hsieh et al., 2008; Song and Noh, 2006; Hua and Wemmerlov, 2006 and Calantone et al., 2006). The link between product innovativeness and product advantage is also confirmed (Szymanski et al., 2007; Calantone et al., 2006; Bastic, 2004; Gatignon and Xuereb, 1997; Song and Parry, 1997a,b; Mishra et al., 1996; Atuahene-Gima, 1995 and Cooper and Kleinschmidt, 1991).

6.2.2: Product Advantage practices in SMEs

Previous studies surrounding product advantage have generally been based around the number of product characteristics that foster new product success, however studies have not examined how new product functionalities are related to the advantages of the new product and how these can be measured in the SME domain. Such an examination is important because SME management needs to understand the reasons for the current advantages of their new product as without proper diagnoses they cannot choose the best moves to enhance or defend their current position (Day and Wensley, 1988). The examination of the product advantages that are being pursued and the reasons for such advantages enable this study to identify the product advantage priorities for SMEs, priorities that can be incorporated early on into their NPD strategies and direct NPD
project activities. McNally et al. (2010:1003) highlight that “having agreed NPD project priorities prior to development helps reduce the uncertainty associated with working with unfamiliar technology and markets while at the same time enhancing product advantage”.

The quantitative analysis illustrates across firm size, firm type and product strategy that product meaningfulness reoccurs as the most important product advantage component that SMEs strive to introduce in NPD. Additionally, product meaningfulness in terms of the ability to ‘be cost effective’ is the single most important determinant of product success. Additionally, product superiority is identified as the second most important indicator of advantage followed ultimately by product innovativeness. These findings suggest that SMEs are for the most part customer-centred in product development, developing products that provide functionalities which customers’ perceive as appropriate, and that SME perceive customer satisfaction in the product offering as paramount. However, SMEs also display an orientation towards competitors in that they believe that the ability to be superior relative to competitors is the next most important dimension to the product offering. Notably, across all comparisons SMEs identify the product innovativeness dimension as the least important indicator of product advantage indicating that for the most part SMEs are not looking towards innovativeness as a means of advantage.

The qualitative case study analysis supported the quantitative investigations by reaffirming the importance of product meaningfulness and product superiority in the NPD processes of the case study SMEs (thereby supporting the validity of the findings). Furthermore, the case study analysis revealed that product meaningfulness is primarily attributable to the firms’ ability ‘to be cost effective’, which was identified in the
quantitative analysis as the only significant characteristics linked to product success. Additionally, ‘match customer perceptions’ and ‘meet customers’ needs’ were identified in the quantitative analysis as important to present in NPD. The case study analysis also highlighted that product superiority is rooted in ‘better quality’, ‘better product design’ and being better ‘relative to competitors’ offerings’. With the exception of ‘better product design’ the product superiority characteristics identified in the qualitative analysis were also identified in the quantitative analysis as a top five characteristics to present in successful products. However the case study analysis revealed that product innovativeness is important but the importance attributed to it is dependent on the product type and industry.

Chapter 4, illustrated that firms who recorded successful product development outcomes had higher levels on all but two product advantage characteristics; ‘have better product design’ and ‘be innovative’, compared to those firms whose product development was unsuccessful. The finding supports the notion that on average increased levels of product advantage influence product success but indicates a negative impact of innovativeness and design features in SME NPD success. The negative impact of both product characteristics, which have been identified in previous literature as important product characteristics, innovativeness (Heish et al.2008; Song and Parry, 1997a,b; Atuahene-Gima, 1995; Cooper, 1994) and product design (Hua and Wemmerlov, 2006), suggests that SMEs’ should be cautious when they build innovativeness and design advantages into their products. At the customer level, Calantone et al. (2006) propose that high levels of innovativeness in product advantage can reduce customer familiarity and consequently negatively affects new product success because customers are not sufficiently familiar with the nature of the new product and there may be a lower level of adoption. Also at a firm level, the cost of the technical and marketing resources
needed to generate innovative technology product content can impact on the level of profitability and success achieved.

Additionally, previous literature cites ‘low cost’ as the most important product characteristic linked to new product success (Ledwith and O’Dwyer, 2008; Hsieh et al., 2008; Song and Noh, 2006; Hua and Wemmerlov, 2006; Calantone et al., 2006; Nakata et al., 2006; Blankson et al., 2006; Langerak et al., 2004; Henard and Szymanski, 2001; Song and Monoya-Weiss, 2001 and Cooper, 2001). Low cost is a product meaningfulness scale item, the dominance of which was confirmed in this study and supported across firm size, firm type and product type. The ability to ‘be cost effective’ was identified in Chapter 4 as the only statistically significant influence on product success. Furthermore, the qualitative analysis revealed the importance of pursuing a low cost strategy in relation to product development for the case study firms. Both B2B case study companies are focused on cost effectiveness, production efficiency and customer satisfaction in NPD. Both B2C case study companies also consider a low cost base as important but also try to add customer value by producing a differentiated product. The focus on product differentiation by both B2C companies reflects an appreciation of the link between new product success and adequate recognition of unfulfilled customer needs. The qualitative analysis supports the dominance of a cost effectiveness as a the most significant determinant of product success however both B2B case study companies identify that a cost based strategy alone is enough whereas both B2C case study companies that a low cost base coupled with differentiation is the key to success.

Some authors suggest that meaningfulness is the most important component for new product performance (Narver and Slater, 1990, Yap and Souder, 1994), while others indicate that superiority is the most important (Atuahene-Gima, 1995). The quantitative
findings revealed that the smaller firms in the study (micro and small sized) are concentrating on developing products with product meaningfulness characteristics. On the other hand medium-sized firms in the study are developing products by advocating product superiority characteristics. This finding suggests that product meaningfulness is more significant to display for both smaller firm sizes than for the larger firms, when product superiority becomes the indicator of advantage. This finding supports the majority of the product advantage studies identified in Chapter 2, section 2.3.1, which were predominantly studies on large firms and found that product superiority was “the number one success factor is a unique superior product” Cooper (1994:61). Likewise in a study of small firms Yap and Souder (1994) advocated compatibility with the customer as the dominant indicator of product advantage. This finding thus highlights that also within the SME grouping the product dimensions that are being presented differ as firm size increases but the optimum point of this exchange has yet to be determined.

In summation, the primary analysis reveals that SMEs display a high level of customer orientation in NPD. The component product meaningfulness is the most dominant indicator of product advantage in SMEs and is a significant influence on product success. Particularly the ability to ‘be cost effective’ and ‘meet customers’ needs’ is indicative of success, thus supporting literature on the positive association between customer orientation and performance in SME. In studies on small firms, Blankson et al. (2006) and Verhees and Meulenberg, (2004) suggest that SMEs display a high level of customer orientation and report that being close to customers is important to their business success, as was shown in the quantitative analysis. This view was very much supported by the case study SMEs. Pelham and Wilson (1996) established a link between customer orientation and performance whereas Appiah-Adu and Singh, (1998)
found that customer orientation has a significant and positive impact on new product success, sales growth, return on investment and profitability in SMEs. Appiah-Adu and Singh, (1998) and Pelham and Wilson, (1996) contend that customer orientation is likely to be a vital determinant of success because such firms generally lack the financial resources to explore other sources of business profitability such as R&D, competitive advantage, low cost leadership or skilled staff to develop effective planning strategy.

The discussion surrounding product advantage practices in SMEs has highlighted some key findings;

- The ability to ‘be cost effective’ is the single most important product characteristic to present in NPD,
- SMEs display a high level of customer orientation in NPD and this study supports literature on the positive association between customer orientation and performance in SMEs,
- Product meaningfulness is more significant for both smaller firm sizes than for the larger firms, when product superiority becomes the indicator of advantage.

Throughout the literature on NPD several factors that influence the success/ failure of new products have been noted, many of these factors impact NPP indirectly through the associated moderating influence on product advantage. The discussion in the following section surrounds the factors that impact the choice of product advantages pursued by SMEs.
6.2.2.1: Factors influencing product advantage

The qualitative analysis highlighted that uncertainties; market, technological, competitive and resources impact on the product advantages being pursued by the case study companies. In short, market turbulence, technological turbulence, competitive intensity and resource uncertainty are likely to increase market uncertainties and market uncertainties determine the choice of product advantages being adopted.

Rijsdijk et al. (2011) examining the effect of market turbulence on product meaningfulness and product superiority highlight that under conditions of high market turbulence, product meaningfulness is more important for NPP and its importance decreases as markets stabilize. After markets have stabilized product superiority contributes more strongly to new product performance. This suggests that micro and small firms are operating in more turbulent market environments than the larger firms in the study. The qualitative information supports in part supports Rijsdijk et al. (2011) findings by suggesting that when market uncertainty is high SMEs are developing products with high levels of product meaningfulness.

In relation to technological turbulence, the theory of learning in innovation (Cohen and Levinthal, 1990) suggests that technological turbulence may also impact on the dominance of superiority over meaningful product characteristics in larger firms. Technological turbulence is defined as the degree of change associated with product and process technologies in the industry in which the firms supply. Perceived technological uncertainty refers to the inability to completely understand or accurately predict some aspect of the technological environment as it relates to NPD project decisions (Milliken, 1987). The qualitative information suggests that this may not be the case. Both Companies C and D, who are operating under high technological uncertainty, are advocating customer meaningfulness over product superiority characteristics. Company
C is a B2B product manufacturer and Company D is a B2C product manufacturer indicating that firm size or firm type does not explain the divergence. Indeed the qualitative information suggests that all the SMEs who operate under high technological uncertainty are developing products with high levels of product meaningfulness.

Additionally the qualitative information highlights that competitive alternatives and intensive completion will result in the development of superior products and when resources are uncertain SMEs develop products for current customers. Appiah-Adu and Singh, (1998) highlight that strong competition will drive an SME to seek new products that enable them to survive and in such a situation it is important to subscribe to a strong competitor focus. Product superiority results from competitor oriented process - seeking to identify and disseminate information on competitors. Thus the level of competitive intensity in the marketplace will moderate the need for product superiority in new product development strategy. In a situation where competitive alternatives are available in the marketplace competitor orientation and advocating product superiority is important. This study proposes that smaller firms tend to operate in ‘niche markets’ which are generally less competitive and where there are less competitive alternatives available. Whereas larger firms tend to operate in more competitively intensive markets, where competition is stronger and competitive alternatives may be available, and advocate superiority.

Resource uncertainty is probably the most important impacting factor on the choice of product advantage strategy pursued by the SME. Empirical research has shown that small firms can introduce radical product innovations but that their innovative behaviour is different from large firms because their resources are different (Galende and de la Fuente, 2003). As a result of the limited resources (Freel, 2000; Carson et al.
SMEs develop relationships with customers because customers are a valuable source for new product ideas (von Hippel, 1988) and they provide the necessary resources (Foster, 1986; Pfeffer and Salancik, 1978; Cooper and Schendel, 1976). This is acknowledged by Huang et al. (2004) where it was found that many SME managers believed that customer satisfaction and customer acceptance contributed most to the overall success of a new product. This discussion suggests that micro and small firms in this sample are concentrating on product meaningfulness characteristics above product superiority characteristics because smaller firms are more resource dependent in NPD than medium-sized firms. The resource dependence view on innovative activity (Foster, 1986; Pfeffer and Salancik, 1978; Cooper and Schendel, 1976) holds that firms allocate resources to innovative programs that are required of the firm by customers who provide the resources that the firm needs to survive (existing customers). Therefore micro and small firms will not develop innovative products unless expressly asked for by customers, even though exercising foresight about changing consumer needs is viewed as central to long term success (Stalk et al., 1992).

The discussion suggests that micro and small firms who have fewer resources than larger firms for intelligence gathering and dissemination gather information from an accessible source, current customers. Micro and small firms are developing products for current customers, whereas larger firms with larger resource bases develop products having assessed both customers and competitors. The quantitative and qualitative findings highlight the appropriateness of this assertion by identifying that customer orientation is the dominant orientation in micro and small firm NPD and that customer satisfaction and cost are the determining characteristics. The qualitative investigation revealed that the micro and small firms in this study were characterised by short term
tactics and reactive in nature and that customer orientation provides the focus for formulating objectives, guiding decisions and directing actions.

The qualitative research also suggests that being customer-led may be successful in relatively predictable environments where it is most important to take care of a stable served market such as B2B markets and this would seem to be the case for both B2B case study companies, but it limits innovativeness. Also a customer-led philosophy may be attractive to some managers in dynamic environments because of the uncertainty and risk associated with attempting to lead the customer. However, being customer-led in a dynamic environment will lead to sustainability but rarely lead to a position of competitive advantage since it provides insufficient stimulus for the significant innovation that discontinuous change requires. Christensen and Bower (1996) report the results of a study on how customer power contributes to product failure and conclude that developing a customer orientation appears not to be wise advice under dynamic environmental conditions. In a turbulent environment, the more enduring advantage is an ability to anticipate evolving customer needs and to generate new value-creating capabilities based on that knowledge (D’Aveni, 1994; Leonard-Barton, 1992) and producing superior to competitors’ products.

Senge (1990) identified the problem with the customer-led philosophy is that because it is reactive and short term in focus, leads to adaptive rather than generative learning and can lead to what Hamel and Prahalad (1994) call the ‘tyranny of the served market’. Han et al. (1998) suggest that a complete dependence on customer orientation can lead to a flawed organisational strategy that leaves a firm prone to a reactive culture rather than a proactive culture anticipating competitor strategies. Many studies (Van Raaij and Stoelhorst, 2008; Narver et al., 2004) suggest that firms require a careful balance
between customer-led and market-oriented NPD, to be less susceptible to the risk of myopic customer-led product development.

The reasoning for this is that SMEs, particularly micro and small firms become entwined in competency traps in NPD. Competency traps concern the propensity of a firm to continue relying on processes and practices that have been successful in the past. This study proposes that the dependency on customers creates rigidities and competency traps that reduce and stifles product innovativeness in SMEs. This situation is evident in both B2B industrial product manufacturers, whom identified building relationships with key clients extremely important for their survival, indicating that the contentious relationship between SMEs, their current customers and product innovativeness exists. A customer-led philosophy is at odds with a product innovativeness product strategy. However, on the surface and based on observations from the case study companies the customer-led philosophy seems sensible, compelling and successful for both B2B firms but not for consumer based firms. The aforementioned discussion reveals that those SMEs who are not developing innovative new products are still surviving and in many cases thriving by being customer-led in product development, for example both B2B industrial product manufacturers. This research in turn cannot support the negative correlation between customer-led new product development and product failure in B2B markets.

In summation, new product developers take actions to reduce uncertainties by collecting and disseminating information and environmental conditions are thus important to the extent that they are perceived by managers and result in distinct managerial actions. The NPD process and product advantage decisions are thus framed on a firm’s decision makers’ level of perceived uncertainty regarding the project environment (Burns and
Stalker, 1994; Capon et al., 1992; Zirger and Maidique, 1990). SME owner/managers therefore need to understand both the marketing and technical aspects of the product environment, because, developing a product with benefits valued by the customer will depend on such knowledge and consequently act to reduce the uncertainties of the project environment. However, in small firms, resources for intelligence generation (Kohli and Jaworski, 1990) are scarce, and there in many cases is no room for a specialist to conduct it. In fact, market intelligence is based mostly on secondary data (from trade journals, sector research, conferences, and professional magazines) or on personal contacts (with suppliers, customers, or bank employees) (Smeltzer et al., 1988).

The discussion surrounding product advantage practices in SMEs has highlighted some key findings;

- When market and technological uncertainty is high SMEs are developing products with high levels of product meaningfulness,
- In a situation where competitive alternatives are available in the marketplace competitor orientation and advocating product superiority is important,
- Micro and small firms in this sample are concentrating on product meaningfulness characteristics above product superiority characteristics because smaller firms are more resource dependent in NPD than medium-sized firms,
- Micro and small firms in this study were characterised by short term tactics and reactive in nature and that customer orientation provides the focus for formulating objectives
- Being customer-led may be successful in relatively predictable environments where it is most important to take care of a stable served market such as B2B
markets and this would seem to be the case for both B2B case study companies, but it limits innovativeness,

- Being customer-led in a dynamic environment will lead to sustainability but rarely lead to a position of competitive advantage since it provides insufficient stimulus for the significant innovation that discontinuous change requires,
- The more enduring advantage in turbulent environments is an ability to anticipate evolving customer needs and to generate new value-creating capabilities and produce superior to competitors’ products,
- The customer-led philosophy seems sensible, compelling and successful for both B2B firms but not for B2C firms.

The discussion in the following section surrounds the satisfaction of Research Objective 2.

6.3 Discussion of the Research Objective 2

Research on the structure of new product performance in SMEs is limited and consequently, this study sought to determine the structure of new product measures in SMEs prior to reporting on the indicators and determinants of NPP at the individual project level. Additionally quantitative analysis highlighted how SMEs were performing in measuring NPP and whether the performance in these measures was influenced by firm size, firm type or product type. A qualitative analysis then sought to identify the NPP measurements being used by four case study SMEs. Such an approach ensured that a comprehensive definition for NPP in SMEs was provided and that a complete picture of the activities, performance levels and determining factors of NPP in SMEs could be delivered.
6.3.1 The structure of new product performance measurement

The quantitative analysis provided empirical support for the re-structuring of NPP into three inter-related dimensions; objective customer acceptance, development time and measures aimed at reducing subjective customer dissatisfaction. The dimension ‘objective customer acceptance’ is related to; external objective market success, internal objective financial success, and external objective customer numbers, and reflects the degree of success of the new product, contains internal and external financial and non-financial performance measures. Objective customer acceptance relates to all the financial metrics that inform on the level of customer acceptance and adoption of the new product. Chapter 4, Section 4.5, informs that across firm size SMEs indicate that they are performing poorly on objective customer acceptance measurement.

The dimension ‘development time’ reflects the efforts carried out to achieve success and is related to performance on internal items related to the development of the new product. It is suggested that performance on the individual development time measures reflects the efficiency of the NPD process and directly effects the profit margin associated with the product. Chapter 4, Section 4.5, also informs that SMEs are performing badly on development time measurement.

The dimension ‘measures aimed at reducing subjective customer dissatisfaction’ is related to internal non-financial technical performance and non-financial external customer acceptance and reflects the degree of success in reducing customer dissatisfaction levels. Chapter 4, Section 4.5, shows how SMEs are performing best on measures aimed at reducing subjective customer dissatisfaction. Non-financial measurement is difficult to assess and measurement has generally been elusive and
measured quite subjectively. Ittner and Larcker (2003) discovered that most of the companies they surveyed had made little attempt to identify areas of non-financial performance. Table 6.1 details the scale items that comprise the NPP dimensions.

<table>
<thead>
<tr>
<th>Objective customer acceptance measures (OCAM)</th>
<th>Development time measures (DTM)</th>
<th>Measures aimed at reducing subjective customer dissatisfaction (SCDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met revenue sales</td>
<td>Launch on time</td>
<td>Met quality specifications</td>
</tr>
<tr>
<td>Met sales growth goals</td>
<td>Time to market</td>
<td>Met performance specifications</td>
</tr>
<tr>
<td>Met market share goals</td>
<td>Development costs</td>
<td>Customers’ competitive advantage</td>
</tr>
<tr>
<td>Unit volume goals</td>
<td></td>
<td>Customer satisfaction</td>
</tr>
<tr>
<td>Met profitability goals</td>
<td></td>
<td>Customer acceptance</td>
</tr>
<tr>
<td>Met contribution marginal goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of customers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROI or IRR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break-even-time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The empirical analysis on the structure of NPP in this study reveals a three factor structure classified in terms of the efforts carried out to achieve that success – in support of the efficacy and efficiency classification developed by Alegre et al. (2006). The discussion in the following section uses the three factor structure to explore the indicators of NPP currently being used by SMEs in this study.

### 6.3.2 The performance of the new product

The quantitative analysis in Chapter 4 section 4.5 revealed that across firm size SMEs new products are performing best on measures aimed at reducing subjective customer dissatisfaction. Indeed, SMEs report success on individual NPP measures; ‘met quality specifications’, ‘customer satisfaction’, ‘customer acceptance’ and ‘met performance specifications’ as the top four measures that they’re most recent new product performed
best on. However, within the order of the top four best performing measures, medium-sized firms perform better on product technical performance measures ‘met quality specifications’ and ‘met performance specification’ than on the customer related measures.

The fifth best performing NPP measure varies across firm sizes, both small and medium-sized firms perform well on another objective customer acceptance measure, ‘number of customers’ and ‘break-even time’ respectively, while micro firms perform on a development time measure ‘launch on time’. Ledwith and O’ Dwyer (2008) and Huang et al. (2004), found SMEs rate their performance in customer acceptance and product-level measures above all other performance measures. Additionally, the findings of Huang et al. (2004) and Ledwith and O’ Dwyer (2008) suggest that while small firms perform best on customer related measures of new product performance these are not the most critical in terms of organisational performance. Although research has found that customer acceptance and satisfaction were the most important criteria in assessing new product performance; research on the cause and effect relationship between non-financial performance and profitability is otherwise scant.

The quantitative data illustrates clearly that SMEs rate their performance in measures aimed at reducing subjective customer dissatisfaction above all other performance measures, a finding that is consistent with previous contentions by Huang et al. (2004) and Ledwith and O’ Dwyer, (2008). It is not surprising that SMEs indicate that they are performing better in non-financial subjective customer and technical product measures of new product performance but it is worth noting that achieving success with consumers is unrelated to whether the product produces a profit for the firm (Griffin and Page, 1993). If financial success is the overall objective then SMEs are performing well.
on new product performance measures that have little effect on the profitability objective. Similarly, the measures that SMEs new products are performing the poorest in (Chapter 4, Section 4.5) are the objective customer acceptance measures of NPP which is incidentally the only NPP dimension that had a statistically significant impact on product success in this study.

The importance of development time measures for micro firms was also noted. Literature concludes that market entry timing is an important determinant of new product profitability (Chen et al., 2005; Datar et al., 1997; Szymanski et al., 1995) through its association with reduced development costs (Bayus 1997; Gupta et al., 1992; Millson et al., 1992) and new product sales (Langerak and Hultink, 2008; Emmanuelides, 1993). Micro sized firms indicate that they are performing well in their ability to launch products on time indicating that they may be benefiting from cost reductions through the simplification of the process, the elimination of delays and from first to market benefits.

Analysis in relation to firm type detailed similarly that measures aimed at reducing subjective customer dissatisfaction are the core NPP measures that SMEs are performing well on but revealed no significant difference in the performance of B2B and B2C products, revealing that whether the product is consumer or industrial in nature does not impact performance measures. This finding again supports the motion that SMEs rate their products as performing well in non-financial measures of NPP. Product strategy however impacts significantly on new product performance, indicating that the choice of product introduced may dictate the new product performance used. As noted previous literature Ledwith and O’ Dwyer, (2008) and Huang et al. (2004) identified a certain amount of consistency across boundaries on the NPP measures being used by
SMEs. This leads to the consideration of universal cross-boundary performance metrics between Australian SMEs and Irish SMEs, insofar as universally SMEs perceive that they perform better in non-financial performance measurement. Logic would suggest that international correlations in relation to NPP activities cannot be attributed to commonalities in firm size or firm type because of different stages of economic development, differing locations on the political spectrum and cultural aspects which may result in differing SME operating environments.

However, it may be possible to compare internationally by product type (new product, product extension or product improvement) as the perceptions of SME owner/managers in relation to the appropriate measures for each product may be the same. For example new-to-the-world products may be perceived as a high risk strategy and as such deserve close monitoring of objective customer adoption performance measures but also customer acceptance measures as they will give an indication of performance prior to financial statement appropriation. Such a discussion may explain the common performance levels of SMEs between the findings of this study and another Irish study (Ledwith and O’ Dwyer, 2008) and Huang et al. (2004).

In summation, the quantitative analysis indicates that SMEs rate their new products performance as being good on dimensions that have not been found to influence product success. However, this study is not saying that firms who perform well on non-financial NPP measurement are successful. This finding identifies a gap in the literature on the existence of a link between non-financial performance and product success in SMEs and also highlights an ambiguity in literature on the measures that SMEs are performing well on and what they are actually using to measure NPP. An examination of the literature surrounding NPP measurement reveals that while most of the research on
NPD in SMEs to date has concentrated on what they should do and what they do well, there appears to be a gap in understanding of what managers in SMEs consider to be important. This is critical; if NPD management practices in SMEs are to change a coherent strategy to improve success. Previous studies on NPP measurement (Ledwith and O’Dwyer, 2008; Huang et al., 2004, Langerak et al., 2004) identified the NPP measures firms performed best on but not the measures that they most commonly use. What firms perform well on is not necessarily what they concentrate on; probably the exact opposite is true in some cases.

There is little doubt that SMEs are performing well in measures aimed at reducing subjective customer dissatisfaction, much of which is to do with their closeness to and over-reliance on current customer. However, the above discussion identified significant areas of underexplored NPD activities and that deserves further study. There is a need to discuss the link between non-financial (customer and project-level) new product performance measurement and profitability and/or sales revenue especially in SMEs who are reliant on subjective non-financial NPP measurement. This issue was examined in satisfaction of Research Objective 3 and is discussed later in this chapter. There is also a need to examine NPP measure usage over performance in the SME domain. The case study analysis addressed this gap by identifying the new product performance measures that case study SMES perceive most important thus closing that loop in this research area. The analysis in Chapter 5 sought to identify explicitly the NPP measures used by the case study companies and also that they use and perceived most important to measure. It is noted that the case study analysis sought to identify the measures used by the case study companies only and no generalisability of findings is intended.
The discussion surrounding new product performance at the product level in SMEs has highlighted some key findings;

- SMEs indicate that they are performing better in non-financial subjective customer and technical product measures of new product performance
- SMEs identify ‘customer acceptance’ and ‘customer satisfaction’ as the most important criteria in assessing new product performance,
- SMEs are not performing well in measuring objective customer acceptance measures even though these are the only measures statistically linked to product success.

The following section discusses the NPP measures used by the case study companies identified in Chapter 5 and further discusses whether NPP success criteria is universally dependent on product type.

6.3.3 The new product performance measures used by SMEs

The case study analysis in Chapter 5 Section 5.4 revealed that the case study companies used on average between two and six measures in their NPP measurement activities which is consistent with the findings of Griffin and Page (1993) and Huang et al. (2004) on the average number of measure used by firms. Table 6.2 provides a summary of the NPP measures being used by the case study companies.

<table>
<thead>
<tr>
<th>Firm Size and Type</th>
<th>SME 1</th>
<th>SME 2</th>
<th>SME 3</th>
<th>SME 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type</td>
<td>Product extensions and improvements</td>
<td>New and product improvements</td>
<td>Product extensions and improvements</td>
<td>New and product improvements</td>
</tr>
</tbody>
</table>

Table 6.2: Summary of NPP measured used by the case study companies
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NPP measure</td>
<td>Sales growth, ROI, Customer satisfaction, Met performance specifications, Met quality specification</td>
<td>Sales growth, Contribution marginal goals, Development costs</td>
<td>Sales growth, Market share, Contribution marginal goals, Customer satisfaction, Met performance specifications, Met quality specification</td>
<td>Sales growth, Contribution marginal goals,</td>
</tr>
</tbody>
</table>

The qualitative investigation revealed that contrary to the findings of Huang et al. (2004) regarding the NPP measures being used by Australian SMEs, there is widespread use of objective customer acceptance measures by the case study companies in their NPP activities. All four case study companies use at least one objective customer acceptance measure; ‘unit volume goals’ in their NPP measurement activities, indicating that the sales based market level measure is common across firm size, firm type and product type. Similarly, 75% of the case study firms use a second objective customer acceptance measure, ‘met contribution marginal goals’ to measure NPP. Two other objective customer acceptance measure ‘met market-share goals’ and ‘return on investment’ are being used by the medium-sized firm in the qualitative study. The qualitative analysis reveals that at a minimum the case study companies are using at least one objective customer acceptance measure, with Company A using one measure, Companies B and D using two and Company C using four measures. This finding indicates that case study SMEs are aware of the need to get objective data to indicate NPP and of the link between financial based measures and product success. However, in the quantitative findings detailed in the previous section revealed that firms identified
poor performance in these measures indicating a difficulty in measuring financially based measures.

The qualitative findings indicate that the case study companies measure NPP by obtaining a picture of the results of individual projects from an internal and an external financial and market point of view. They measure the level of customer acceptance of the product by producing simple project based sales and revenue results. However, the case studies suggest that non-financially based measures aimed at reducing subjective customer dissatisfaction are only being measured by two companies A and C, both of which are B2B product manufacturers producing product extensions and product improvements. Non-financial measures of NPP are important because owner/managers can get a glimpse of a business’s progress prior to financial verdicts and can get a better sense of overall performance since non-financial indicators reflect intangible value that objective measures don’t recognise. It is thus surprising that given the realm in which they operate that both B2C do not use any form of measures aimed at reducing the level of subjective customer dissatisfaction.

In summation, this study extends previous studies on NPP measurement, Ledwith and O’ Dwyer (2008) and Huang et al. (2004) by identifying the measures that firms considered important and not what they performed well on, which is quite different. The qualitative data illustrates that for SMEs’ objective customer acceptance measures of NPP are the most important measures of new product performance, and the measures that SMEs gauge to measure their new products performance. Ledwith and O’ Dwyer (2008) and Huang et al. (2004) found that SMEs’ perform best on product-level measures and then on customer acceptance measures. This identifies that what SMEs’ perform best on is not the same as what they perceive to be important or what they are concentrating their activities on.
Additionally, the qualitative analysis revealed three possible distinguishing activities amongst the sample. First, only the B2B product manufacturers in the qualitative sample were using a measures aimed at reducing subjective customer dissatisfaction (‘customer satisfaction’) to measure NPP. Second, the B2C household product manufacturer Company B is the only firm using a development time measure, ‘development costs’ in its NPP measurement activity. Company B’s products are classified as ‘impulse purchase’ products and as such the price charged is critical. Similarly the products are sold through intermediary retail outlets that require a margin of the selling price. The monitoring of costs and margins in NPD is thus very important also. Third, Company D the B2B product manufacturer is using only external objective customer acceptance NPP measures. The following section examines any influences on the choice of NPP measures being used by the case study companies. As noted in the previous Section 6.3.2 product strategy was the dominant factor that influenced new product performance in SMEs.

The discussion surrounding the new product performance measures used by SMEs highlights;

- The case study companies used on average between two and five measures in their NPP measurement activities,
- There is widespread use of objective customer acceptance measures of NPP by the case study companies, indicating that the case study SMEs are aware of the need to get objective data to indicate NPP and of the link between financial based measures and product success.
- Non-financially based measures aimed at reducing subjective customer dissatisfaction are only being used by both B2B Companies A and C.
The following section subsequently discusses the influencing nature of product type on the NPP activities used by SMEs.

6.3.3.1 The influence of product type on SME NPP measurement

Griffin and Page (1996) identified that the set of measures for assessing project-level success depends on the project strategy. For example the objectives and success criteria for a new product that creates an entirely new market will differ from those of a project that extends an existing product line. Griffin and Page (1996) highlight that the no single NPP measure suffices for gauging the success of every product development project and detailed the most appropriate set of measures for each project strategy; new-to-the-company; product extensions and product improvements. Chapter 4, Section 4.5 provides some evidence of this in that statistically significant differences were found in fifteen out of the seventeen NPP measures when different product types were compared and supports Griffin and Page (1996) contention.

Both Companies B and D are developing or have developed new-to-the-company products and product improvements. Both companies are using a blend of a low cost and differentiation based strategy. Both companies are pro-active in product development, market-driving and developing products with customers’ latent needs in mind. However, both had recent product failures and are now not developing new products but concentrating with growth through distribution. Griffin and Page (1996) identified that for-new-to-the-company products the most useful NPP measure is in terms of profits, producing a competitive advantage and market share, customer satisfaction based and the products ability to meet revenue goals. Both Companies B and D are using a profit based measure ‘met contributional marginal goals’ and a market-level measure ‘unit volume goals’. Company B is also using a second profit
based measure ‘development costs’, however neither Company B or Company D are using a customer satisfaction based measure or a measure of competitive advantage. Indeed both companies B and D acknowledge in section 5.2.2 and section 5.2.4 respectively, the lack of customer satisfaction based measurement in their NPD processes.

For product improvements Griffin and Page (1996) highlight that the most appropriate success measures are profits and competitive advantage and the most useful customer based measure is customer satisfaction. All four companies in the case study analysis are developing product improvements. Both B2B companies A and C are using a ‘customer satisfaction’ in their NPP measurement activities but Company A is not using a profit based measure. Company A is a customer-centred solutions based company producing customisable products. In fact Company A will not develop products unless expressly asked for by a customer with sufficient demand. Additionally all associated profit levels are calculated prior to development.

Company A and Company C are actively developing product extensions. Both companies use a low cost based strategy in product development, are reactive in nature and developing products with customers expressed needs in mind. Griffin and Page (1996) highlight that for product extensions the most useful measures are profits, competitive advantage and market share and customer based measures are least well-defined. Both companies A and C use a combination of profit, market and customer satisfaction based measures in their NPD activities.

In summation, the qualitative investigation reveals that SMEs are for using appropriate measures for their product strategy. However both B2C product manufacturers,
Companies B and D are not using a customer satisfaction based measure of NPP which is important when developing new products. The responses of the qualitative analysis strongly support the notion that objective customer acceptance measures are the most appropriate measures of project level performance for SMEs but also highlight the absence of customer based measures in both B2C case study firms, which can be detrimental. It is worth noting that conducting analysis on issues relating to customer satisfaction incurs an extra cost in NPD as customers must generally be surveyed to obtain the information. As solutions based in nature, both B2B Companies A and C engage frequently with customers in relation to product design and product specifications and build strong relationships with customers whereas both Companies B and D being consumer based do not. This indicates that consumer research for both industrial companies is more easily accessible and less costly that for consumer companies. Based on the above discussion it is clear that project strategy influences NPP measurement activities in SMEs. Research recommends multidimensional sets of measures that firms find useful to consider in determining product development success. Adequately measuring product development success by SMEs will require a certain degree of flexibility, within the multi-dimensional guidelines but objective customer acceptance measures and measures aimed at reducing subjective customer dissatisfaction are useful for all firm sizes, firm type and product types.

The discussion surrounding the new product performance measures used by SMEs highlights;

- The set of measures for assessing new product performance depends on the project strategy.
- Both B2C product manufacturers, Companies B and D are not using a customer satisfaction based measure of NPP.
• The qualitative analysis strongly support the notion that objective customer acceptance measures are the most appropriate measures of project level performance for SMEs and also highlights the absence of customer based measures in both B2C case study firms.

• This study supports the use multidimensional sets of measures that firms find useful to consider in determining product development success. In particular objective customer acceptance measures and measures aimed at reducing subjective customer dissatisfaction are useful for all firm sizes, firm type and product types.

Having discussed Research Objective 2 the following section presents the discussion of Research Objective 3.

6.4 Discussion of Research Objective 3

Understanding the different dimensions of new product performance is critical if firms are to continue to successfully innovate. The following section details the discussion based on the investigation of the causal Research Objective 3. Quantitative analysis presented in Chapter 4, Section 4.6, was used as the method to identify the causal relationship between the components of product advantage and the dimensions of new product performance. Specifically regression analysis was used to predict the value of the new product performance dimensions from the product advantage components and thus summarise the relationship between them.

It is generally accepted in the literature that there is a direct relationship between product advantage and new product performance in firms (Langerak et al., 2004; Bastic,
2004; Henard and Szymanski 2001; 1997; Song and Montoya-Weiss, 2001; Cooper, 2001, 1994, 1979; Li and Calantone, 1998; Song and Parry, 1997a,b; Gatignon and Xuereb, 1997). Langerak et al. (2004) found that the higher the product advantage the better the new product performance. Therefore, in relation to production innovation efforts, when advantages are built into new products, the products should be better received in the marketplace, or have higher new product performance (NPP). However no study has previously used the component-wise approach to product advantage to identify exactly which product advantage components influence the most or explain the greatest level of variance in the individual new product performance dimensions in the SME domain.


Chapter 4, Section 4.6, presented empirical findings on exactly which product advantage component (product innovativeness, product superiority and product meaningfulness) explains the greatest level of variance in the new product performance dimensions (objective customer acceptance measures, development time measures and measures aimed at reducing subjective customer dissatisfaction) (see Figure 4.5 reproduced below). The results of this analysis revealed that
- Product superiority explains approximately 11.5% of the variance in objective customer acceptance measures of new product performance.
- Product meaningfulness explains approximately 11.2% of the variance in development time measures of new product performance.
- Product innovativeness coupled with product meaningfulness explains approximately 24.6% of the variance in measures aimed at reducing subjective customer dissatisfaction.

Figure 4.4(revisited): Descriptive model detailing the relationship between product advantage and new product performance
This study supports previous literature in that product advantage is linked to the market and financial performance of the new product but also identifies that product advantage is positively related to the non-financial performance of the new product (see Table 6.3).

Table 6.3: Tested research matrix

<table>
<thead>
<tr>
<th></th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance</td>
<td>n.s</td>
<td>H1b**</td>
<td>n.s</td>
</tr>
<tr>
<td>Development time</td>
<td>n.s</td>
<td>n.s</td>
<td>H2c**</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H3a*</td>
<td>n.s</td>
<td>H3c**</td>
</tr>
</tbody>
</table>

* Significant at p < 0.05; ** Significant at p < 0.01; n.s. = non-significant

It is also worth noting that no relationship was found between product innovativeness and objective customer acceptance or development time measures of new product performance. No relationship was found between product superiority and development time or subjective customer dissatisfaction; additionally, no relationship was found between product meaningfulness and objective customer acceptance.

This study finds ‘product superiority’ the most dominant influence on objective customer acceptance measures of new product performance. ‘Product meaningfulness’ is the dominant influence on development time measures, indicating that the ability to be cost effective and reduce development costs is related to the attributes and features of the product that customers consider meaningful, complex attributes and features increase costs and resultantly time to market. ‘Product innovativeness’ needs to be coupled with ‘product meaningfulness’ to influence non-financial measures aimed at reducing subjective customer dissatisfaction. Previous literature has identified a relationship between product innovativeness and performance through the medium of customer familiarity indicating that for innovativeness to exert positive influences on
performance, the product must also match customers’ perceptions and have attributes that is considered important.

The following sections 6.4.1 to 6.4.3 presents the relationships identified in the descriptive model.

6.4.1 Objective customer acceptance

This analysis raises the issue of the impact on new product performance of SMEs introducing product superiority characteristics in their new products. Chapter 2, Section 2.3 detailed previous studies which identify product superiority as a dominant indicator of product advantage, for example Cooper (1994:61) in which it was found that “the number one success factor is a unique superior product”. However many of these studies used inaccurate conceptualizations of the product advantage construct as encompassing both meaningful and superiority dimensions in a holistic definition. Chapter 2, Section 2.3.2 identified a single study, Rijsdijk et al. (2011), that used a delineated component-wise structure, to examine product advantage and its relationship with NPP. In a study on high technology firms Riksdijk et al. (2011) focused on the relationship between product superiority and NPP (classified in terms of market and financial goals) but did not find a significant relationship.

Contrary to the findings of Rijsdijk et al. (2011) this study found a direct relationship between product superiority and objective customer acceptance measures of NPP in SMEs indicating that approximately 11.2% of the variance in objective customer acceptance measures is explained by product superiority. Product superiority is realized by offering improved performance on a common ground (Zhou and Nakamoto, 2007).
The dimension objective customer acceptance measures consist of measures related to both market and financial levels of product adoption indicating support for a positive relationship between product superiority and market based performance measures such as ‘meeting revenue sales’, ‘market share’, ‘unit volume goals’, ‘number of customer ‘and ‘sales growth goals’. This study also supports the relationship between product superiority and financial based measures such as ‘profitability’, ‘contribution margin’, ‘return-on-investment ‘and ‘break-even time’.

Rijsdijk et al. (2011) found specifically that product superiority results from competitor knowledge processes. The competitor knowledge process generates insights into the strengths and weaknesses of a firm and its products compared to rivals, and enable a firm to position the new product as superior to competing offerings within a given market (Li and Calantone, 1998). SMEs need to look at generating specific intelligence on competitors through the elements of a competitor oriented organisational culture. At this time, generating and responding to market information on competitors and coordination among different functions are essential in facing market uncertainties. Therefore spending resources on competitor-oriented activities would be worthwhile. However under dynamic market conditions spending resources on competitor-oriented activities would be unnecessary. Businesses operating in more turbulent markets are likely to have a greater need to be customer-oriented compared to businesses in stable markets. Under market conditions with fast changing consumer demands, emphasising expressed demands of current customers may lead to market and financial success in new product development.
6.4.3 Development time measures

Development time is defined as the elapsed time from the beginning of idea generation to market introduction (Langerak and Hultink, 2006). This study purports that development time measures directly affect costs and competitive advantage, through efficiency gains in production and competitive advantage from speed to market to the costs associated with the activities pursued from idea generation to introduction and consists. In this study the dimension development time consists of measures relating to ‘launch-on-time’, ‘time to market’ and ‘development costs’ and as detailed in Chapter 4, section 4.3.2 reflects efforts carried out to achieve success.

The descriptive model reveals that product meaningfulness is linked to increased variance in development time measures indicating an approximate 11% variance in the dependent NPP dimension. Product meaningfulness concerns the extent to which the new product’s features and attributes are beneficial to customers (Im et al., 2008) and consists of three items; match customer perceptions; be cost effective and meeting customers’ needs. The ability to produce a cost effective product has repeatedly been identified as the single most influencing determinant of product success.

Contrary to Rijsdijk et al. (2011), this study highlights that the main effect of product meaningfulness is not on market and financial performance measures but on measures associated with the cost of product development. That activities aimed at aligning attributes and features of the new product to customers’ needs in NPD, will directly affect the development time and costs associated with product development. Consequently development time measures may indirectly affect the price charged and profitability level associated with the new product.
Rijsdijk et al. (2011) highlight that the effect of product meaningfulness on NPP is positive and significant when market turbulence is high, and not significant when market turbulence is low; indicating that in turbulent environments product meaningfulness contributes strongly to NPP and not in stable environments. Turbulent environments are characterised by changes in the composition of customers and their preferences. This thesis extends the previous research by Rijsdijk et al. (2011) by suggesting that the impact of product meaningfulness on NPP in turbulent environments and not in stable environments can be explained because of the relationship with development time. First, remaining close to customers and satisfying customers’ needs is advisable as it will reduce direct costs through the elimination of unwanted and unnecessary product features and consequently only favourable products are introduced. Similarly, when customers’ preferences are stable the need to be close to customers is not evident as these are already known and there is little wastage. Second, price will have a large impact on customer preferences and purchase decisions and particularly in turbulent environments. The price charged is directly associated with development time. A reduction in development costs by producing products with high levels of product meaningfulness should result in reasonable pricing decisions and facilitate success in turbulent environments. Likewise in stable environments customer preferences and pricing decisions are known and unlikely to change negating the need to customer meaningful in NPD.

Rijsdijk et al. (2011) found that product meaningfulness is increased through customer knowledge highlighting an indirect relationship between customer knowledge and development costs. This study must therefore conclude that customer involvement in the NPD process may benefit the SMEs in two separate performance areas, in getting an
appropriate product to market on time. costs associated with development and pricing levels.

6.4.1 Measures aimed at reducing Subjective customer dissatisfaction

As detailed in Chapter 4, Section 4.3.2 ‘measures aimed at reducing subjective customer dissatisfaction’ reflects the degree of success of the new product on non-financial internal technical performance and external customer acceptance. Research on non-financial performance measurement in SMEs is scant. Indeed the need to identify a cause and effect relationship between product advantage and non-financial NPP measurement was identified in section 6.3.2.1.

The descriptive model revealed a significant positive relationship between two product advantage components; product innovativeness and product meaningfulness and ‘measures aimed at reducing subjective customer dissatisfaction’ in this study. This study highlights that levels of ‘product innovativeness’ coupled with ‘product meaningfulness’ explains 24.6% of the variance in SMEs ability to reduce subjective customer dissatisfaction with the product offering. Previous literature has identified a relationship between product innovativeness and performance through the medium of customer familiarity indicating that for innovativeness to exert positive influences on performance, the product must also overcome the negative effect of customer discontinuity, a finding supported in this study.

Literature acknowledges two different perspectives upon which innovativeness can be viewed. From a customers’ perspective product innovativeness depends on the
innovation’s attributes, risk associated with adoption and the level of behavioural change required on adoption (Danneels and Kleinschmidt, 2001). The firm perspective highlights that product innovativeness is concerned with technical and marketing discontinuities (Calantone et al., 2006) and the resources needed to support these. The level of technical and marketing discontinuities in the development of the new product directly relates to the perceived level of newness of the product. The perceived level of newness of the product is mitigated by incorporating a meaningfulness dimension in NPD.

Previous studies are not clear whether a strategy of developing and marketing highly innovative offerings does indeed hold a key to new product success. In a meta-analysis on the relationship between innovativeness and product success Szymanski et al. (2007) highlight arguments for the presence of a positive relationship between innovativeness and new product performance and a negative relationship between innovativeness and new product performance. In addition meta-analysis results suggest that there is no direct main effect of product innovativeness on product financial performance (Henard and Szymanski, 2001; Szymanski et al., 2007). The results in Chapter 4, Section 4.6 advance this notion by finding that innovativeness measures that include a meaningfulness dimension yield stronger NPP estimates and also that the estimated relationship is non-financial in nature, based on the reduction of subjective customer dissatisfaction levels.

It is clear that the relationship between product innovativeness and new product performance in SMEs is complex and that a direct relationship may not exist in SMEs. Calantone et al. (2006) found that product innovativeness had no direct effect on product profitability. The influence instead occurs through indirect paths with product
advantage (classified as product higher quality than competitors) and customer familiarity (categorised as customer newness). Calantone et al. (2006) indicate that the primary means of achieving new product success is through product advantage and the primary means of improving product advantage is through producing an innovative product. However the benefit of gaining product advantage through product innovativeness is mitigated by its significant negative relationship with customer familiarity. Firms therefore risk a reduction in profitability when customers have difficulty adapting to the new technological product content. This study supports interdependence between product innovativeness and customer familiarity.

One way to combat the pitfalls of developing highly innovative products that require customers to adapt their behaviours is to develop products with products with inherent product meaningfulness characteristics. In short, SMEs should only emphasise product innovativeness when it is coupled when product meaningfulness so as to moderate the negative impact of customer unfamiliarity with the product. This study confirms the finding by Szymanski et al. (2007) that innovative offerings are more successful when they better fit consumer needs. Hence, there is empirical evidence to document that innovativeness and performance may not be directly related to one another in a statistically or practically significant way without being coupled with product meaningfulness, which is supported through a good customer knowledge process.

6.5 Reflection on the methodological approach

This section reflects on the design and the mixed method approach used to serve the needs of the study. The purpose of employing a mixed-methods research approach in this study was to provide stronger evidence through the convergence of quantitative
findings with qualitative findings and facilitate the development of greater understanding above which could have been achieved from a single method. Quantitative designs are suited to establishing relationships between variables, but are weak in establishing the reasons for them whereas; qualitative methods help in developing explanations for the relationships.

In this study quantitative methods provided results expressed in numbers that gave objective evidence on:

- the underlying structures of product advantage and new product performance,
- highlighted the indicative characteristics of product advantage and the impact of firm size, firm type and product type
- highlighted how SMEs were performing in measuring new product performance and the impact of firm size, firm type and product type on these performance levels,
- the casual relationship between product advantage and new product performance.

Qualitative analysis then explored these findings in specific case study SMEs. The qualitative methods provided more subjective factors such as feelings, beliefs and inferences on the importance of product advantage and new product performance activities.

One of the benefits of the quantitative element of this research design was the speed at which the data was collected and analysed. Additionally with reliable, repeatable information that the quantitative analysis provided a trusted set of statistics and gave confidence to the results. However, the limited ability to probe answers was a
disadvantage and context could not be provided within the results. On the other hand, qualitative research allowed for the topics to be explored in more depth and detail than quantitative research and provided more substance because of the context (new product development in SMEs) it provided.

Upon reflection the main difference between qualitative and quantitative research methods is the approach. Quantitative research methods take a general approach with a hypothesis and then test the theory to find data that either proves or disproves it. With qualitative research methods, you're starting with a specific observation. However, although more time consuming combining them in this study provided the depth and comprehensive conclusions that was desirable. The main way it did so this was by providing the narrative to add meaning to the numbers. In summation, this approach was appropriate and facilitated the rigorous investigation of the research objectives.

6.5 Conclusion

This chapter has presented the discussion surrounding the Research Objectives. The key findings emanating from the empirical research (Chapters 4 and 5) were grounded in their respective body of literature and insights into how product advantage influences new product performance detailed. First, in discussing Research Objective 1, findings surrounding the conceptualisation, operationalization and the influence of environmental uncertainty on product advantage in SMEs have been presented. The core issues are that product advantage should no longer be considered a holistic determinant of product success or predictor of new product performance, instead each of the three components 1) product innovativeness, 2) product superiority and 3) product meaningfulness should be looked at individually and the unique contribution
that each makes in the NPD process explored. Additionally micro and small firms in this study were characterised by short term tactics and reactive in nature and that customer meaningfulness provides the focus for formulating product advantages. The ability to ‘be cost effective’ is the single most important product characteristic to present in NPD and micro and small firms in this sample are concentrating on product meaningfulness characteristics above product superiority characteristics because smaller firms are more resource dependent in NPD than medium-sized firms.

Second, in the discussion of Research Objective 2 the facts surrounding the level of performance of new products on the predefined NPP measures presented, the NPP activities that SMEs consider important and the impact of product strategy on the NPP activities of SMEs proffered. The findings highlight that SMEs are performing better in non-financial subjective customer and technical product measures of new product performance above all other measurement types. This study supports the use multidimensional sets of measures that firms find useful to consider in determining product development success. In particular objective customer acceptance measures and measures aimed at reducing subjective customer dissatisfaction are useful for all firm sizes, firm type and product types.

Finally, in consideration of Research Objective 3 the causal relationships identified in the quantitative analysis are discussed and the facilitating conditions of these relationships identified. This study finds ‘product superiority’ the most dominant influence on objective customer acceptance measures of new product performance. ‘Product meaningfulness’ is the dominant influence on development time measures and product innovativeness needs to be coupled with ‘product meaningfulness’ to influence non-financial measures aimed at reducing subjective customer dissatisfaction.
The following chapter presents the conclusions, contributions and implications emanating from this study.
Chapter 7 Conclusions, Contributions and Implications
7.1 Introduction

This final chapter presents the conclusions, contributions and implications of the empirical research findings presented in Chapter 4 and Chapter 5 and on the discussion based Chapter 6. The overall purpose of this research was to investigate the relationship between product advantage and performance in SMEs and is embodied in the Research Aim;


In addressing this overall aim the three research objectives were established.

1. To investigate the nature of product advantage in SMEs.
2. To investigate the nature of new product performance measurement in SMEs.
3. To determine the relationship between product advantage and new product performance in SMEs.

A literature review was conducted to synthesise, evaluate and integrate past and present research on the fields of SMEs and product innovations, product advantage, new product performance and the relationship between product advantage and new product performance.

Satisfaction of the Research Aim of this thesis was realised through a complementary multi-methodology research approach. The initial element of the empirical study took the form of a quantitative sample of 123 manufacturing SMEs, producing both consumer and industrial products and operating in various sectors in the Irish economy. The subsequent qualitative study was undertaken with four case companies who participated in 8 interviews to enable the interpretation of the emerging issues emanating from the quantitative element and to view product advantage and new
product performance in their entirety in a functioning product developing SME. The information contained in the case studies was extrapolated and discussed in conjunction with the quantitative research findings in Chapter 6 of this thesis.

In this context, this chapter outlines the key findings of this research, structuring the data with reference to the original research objectives. Implications for theory and policy arising from the empirical research are then explored, limitations of the research are addressed, and the chapter concludes by suggesting areas for further research.

This chapter is outlined as follows (see Figure 7.1). Section 7.2 presents the conclusions surrounding each research objective and the overall research aim. Section 7.3 lists the contributions of this thesis while Section 7.4 presents the theoretical and policy implications. Section 7.5 details the limitations of this research and section 7.6 proposes several directions for future research. This Chapter is concluded in Section 7.7.

Figure 7.1: Outline of Chapter 7
7.2 Conclusions Regarding the Research Aim

This section identifies the key conclusions of this thesis. The information from the literature review (Chapter 2), the results of the quantitative analysis (Chapter 4), the case study review (Chapter 5) and the discussion (Chapter 6), are considered collectively and conclusions are presented. Each research objective is considered on its own first and then collectively where conclusions about the Research Aim as a whole are presented in section 7.2.4.

7.2.1 Research Objective 1: To investigate the nature of Product Advantage in SMEs

As noted in Chapter 1, Section 1.3 to facilitate the investigation of Research Objective 1, five questions RQ1a-RQ1e were devised;

a) What are the main component factors of Product Advantage?

b) What is the impact of Product Advantage on product outcome (success/failure)?

c) Does firm size (micro, small or medium-size) impact Product Advantage?

d) Does firm type (business-to-business or business-to-consumer) impact Product Advantage?

e) Does product type (new product, product extension or product improvement) impact Product Advantage?

Having achieved Research Objective 1, investigating the nature of product advantage in SMEs, as noted in Chapter 6, Section 6.2.1, product advantage is a heterogeneous construct comprising of product innovativeness, product superiority and product...
meaningfulness components, with each dimension playing a unique role in the development of new products.

In achieving Research Objective 1, to investigate the nature of product advantage in SMEs,

- Chapter 2 presented a review of literature and it became evident that there is an inconsistent view being presented on the composition of product advantage. The holistic view limits the exploration of the possible role that the construct plays in the NPD process. Once product advantage had been empirically tested in Chapter 4, Section 4.3.1 and the underlying factor structure identified, the role that each component: product innovativeness, product superiority and product meaningfulness, occupies as determinants of success in the NPD process and its benefit in relation to increased performance became more discernible.

- The quantitative analysis in Chapter 4, Section 4.4 (Table 4.13) identified that product advantage is a complex construct which is influenced by firm size. Micro and small sized firms are developing products with enshrined product meaningfulness characteristics (‘meet customers’ needs’, ‘be cost effective’ and ‘match customer perceptions’) whereas medium-sized firms indicate a preference for product superiority characteristics (‘be of better quality’ and ‘relative to competitors offerings’), highlighting that product meaningfulness is more important for smaller firm sizes. SMEs display a high level of customer orientation in NPD. Neither firm type nor product strategy exerts any influence on product advantage.

- Chapter 4, Section 4.4 (Table 4.11) highlights that to ‘be cost effective’ is the single significant determinant of product success.

- The case study analysis in Chapter 5, Section 5.3 found that all four case study companies advocate a mix of product meaningfulness and product superiority.
product advantage components in NPD. However, although the quantitative findings indicated some form of generalizability in product advantage according to firm size, this was not apparent in the case study companies. Both the micro B2C product manufacturers identify customer meaningfulness as paramount, the micro B2B product manufacturer strives to couple product superiority with customer meaningfulness characteristics. The small-sized B2C also highlights the coupling of superiority and meaningfulness components as important. Additionally, the medium-sized B2B Company only highlights product meaningfulness characteristics as important to their product advantage.

- Additionally, Chapter 5 suggested that both B2B (a micro and a medium-sized firm) SMEs are myopically customer-led in product development, satisfying expressed needs, are reactive in style and focus on satisfying key customers, whereas both B2C (a micro and a small firm) are more outward looking and proactive, aiming to create customer value through the identification of latent needs and wish to lead markets. Consequently, both B2B companies interact with customers extensively and both B2C companies do not. How these alternative philosophies are enshrined in their respective product advantage strategies is open to interpretation.

The medium-sized B2B Company in the study is producing a highly specialised, high value product in a competitive but interpersonal market. The company develops products based on the expressed requests and to the exact specifications of the customer and consequently in product development superiority is not paramount. The type of customisable product that it is developing requires constant intensive interpersonal interactions with the customer to satisfy needs and ensure the product is developed in the most efficient and effective manner (overruns or mistakes in product development are
very costly), which results in the reliance on product meaningfulness product advantage characteristics in NPD. Similarly, the micro-sized B2B company interacts with customers in the product ignition stages (although not as extensively). However, their product is based on a standard product platform and not as customisable and consequently both product superiority and product meaningfulness is important. These findings indicating that product advantage in B2B SMEs may be linked to the level of customer involvement in the product development process (level of customisability of the product) which is generally reflected in the price of the product.

On the other hand, neither B2C companies in the study interact with their end users. The small-sized B2C company produces low cost (priced at less than €10) impulse purchase products for a competitive market. In their case superiority in relation to product design and cost is the most important product advantages to present. The micro-sized B2C company produces low cost (priced at <€3) impulse products for a competitive market. This company advocates product meaningfulness in terms of cost and perceptions as important product advantages to present. These findings highlight that introducing product superiority characteristics in new products may be associated with the price level of that product. However, it is unclear as to the direct effect of each philosophy in SME NPD, whether positive or negative, moderator, influencer or antecedent, something that may warrant future study.

- The discussion in Chapter 6 supports that the culture of SMEs is to development meaningful and superior products over innovative products. The discussion highlights that a primarily customer orientation culture becomes a competency trap for smaller SMEs engaged in NPD who only see the world through existing customers’ eyes, which are notoriously lacking in foresight.
The qualitative analysis in Chapter 5 also identified market, technological, competitive and resource uncertainty issues affect the choice of product advantage in the particular SMEs. Chapter 6, section 6.2.3 discussed the impact of uncertainty on the choice of product advantage strategy of SMEs and details in which environmental conditions presenting product meaningfulness over product superiority or vice versa is the best option. In stable and predictable conditions product meaningfulness may be linked to product success. However in dynamic environments it provides insufficient stimulus and may lead to product failure.

The higher level conclusion from the investigation of Research Objective 1 is that, SMEs do not perceive product innovativeness characteristics as important even though more innovative products should create more opportunities for differentiation and competitive advantage, instead depend on being close to their customers for competitive advantage. SMEs are content to develop less innovative products because they are more familiar, less uncertain, may have higher synergies, satisfy existing customers and hence a higher success rate, thus supporting previous evidence (Ledwith, 2000; Souder and Song, 1997; Yap and Souder, 1994) that less innovation may hold the key to success for SMEs. Although introducing highly innovative products into the marketplace has long been viewed as a high cost, high risk strategy that promises significant returns if executed well, and although there are many additional practitioners and academics who speak to the possible performance benefits of marketing highly innovative products (Stefik and Stefik, 2004; Wuyts et al., 2004; Grulke & Silber, 2002), this study suggests that a strategy of developing and marketing highly innovative offerings is not a strategy that SMEs should advance presently. Additionally, firm size, customer involvement, price and
environmental uncertainties may influence the product advantage strategy of SMEs.

Thus having achieved Research Objective 1, the empirical findings with regard to the nature of product advantage corroborates in part the literature reviewed. This study largely confirmed the findings of Huang et al. (2004) and also found that many SME managers believed that customer satisfaction and customer acceptance in product advantage contributed to the overall success of a new product (Griffin and Page, 1996; Lipovestsky et al., 1997). This suggested that understanding customers is very important to new product performance in SMEs. “Traditionally, staying close to customers has been a competitive advantage for SMEs” (Huang et al., 2004:123). However, this study also provided some key insights for this area of study. The first insight focuses on the division of the product advantage construct. The second focused on the negative impact of customer orientation on product innovativeness. Third, this study finds that the product advantage strategy chosen by SMEs is influenced by firm size, customers’ level of involvement in the process, price, market uncertainty, technological uncertainty, competitive intensity and resource uncertainty.

In achieving Research Objective 1 this thesis has broadened the scope and character of research on product advantage, and in so doing has overcome the past methodological flaws in this area. Previous studies on product advantage concentrated on a holistic product advantage definition and the characteristics that foster new product success. In this way, such research has failed to consider how different functionalities are related to the advantages of the new product, how these advantages can be measured and how specific characteristics influence new product performance. The methodological rigor applied throughout this thesis has sought to overcome these problems and the
information extrapolated must be taken into account if product advantage implementation programmes or product advantage protocols are to be effective. Concluding from the empirical findings with regard to Research Objective 1, it is found that the nature of product advantage in SMEs is complex, with several factors influencing the owner/managers decision on the product advantage strategy to pursue.

7.2.2 Research Objective 2: To investigate the nature of New Product Performance measurement in SMEs

As noted in Chapter 1, Section 1.3 to facilitate the investigation of Research Objective 2, five questions RQ2a-RQ2e were devised;

- a) What are the main component factors of New Product Performance?
- b) What is the impact of New Product Performance on product outcome (success/failure)?
- c) Does firm size (micro, small or medium-size) impact New Product Performance?
- d) Does firm type (business-to-business or business-to-consumer) impact New Product Performance?
- e) Does product type (new product, product extension or product improvement) impact New Product Performance?

Having achieved Research Objective 2, investigating the nature of new product performance measurement in SMEs, as noted in Chapter 6, Section 6.3, although SMEs rate their performance in the ability to reduce subjective customer dissatisfaction levels above all other measures they are in fact using and consider important financially based objective customer acceptance measures in their new product performance activities. This thesis recommends that SMEs use multi-dimensional sets of measures in their new
product performance measurement activities. Multi-dimensional measurement activities require a certain degree of flexibility as every product development project may have a different appropriate set of measures. Therefore, SMEs need to develop protocols which clearly set out the suite of appropriate NPP to match their product strategy early in the NPD process.

In achieving Research Objective 2, to investigate the nature of new product performance measurement in SMEs,

- Chapter 2, Section 2.4 identified the elusive and opportunistic way previous studies have measured NPP and identified how composition of the NPP dimension was underexplored and scant. Consequently, a 17 item measurement scale was subjected to factor analytic investigation in Chapter 4, Section 4.3.2 to identify the NPP structure appropriate to the SME domain. Empirical testing of the construct revealed a three dimensional structure relating to objective customer acceptance measures, development time measures and measures aimed at reducing subjective customer dissatisfaction. For consistency and comparability future research in the SME domain needs to use this categorisation to address issues surrounding NPP measurement.

- Chapter 4, Section 4.5 confirms previous studies in that SME’s rate performance on customer and product related measures (measures aimed at reducing subjective customer dissatisfaction) above financial and firm-level measures (Ledwith and O’ Dwyer, 2008; Huang et al., 2001; Lipovestsky et al., 1997; Griffin and Page, 1996). Additionally Chapter, 4 Section 4.5 highlighted that performance in 15 out of the 17 NPP measures significantly influences product success (Table 4.19), that NPP measurement activities in SMEs are influenced by product strategy (Table 4.26) and not by firm size or firm type. Furthermore,
only objective customer acceptance measures of new product performance are significantly related to product success (Table 4.21).

- Chapter 5, section 5.4.2, presented the current NPP practices of the case study SMEs. The qualitative data in Chapter 5 revealed that, although in Chapter 4 SMEs indicated poor performance in measuring objective customer acceptance measures of new product performance; all four case study companies make extensive use of them. Additionally, Chapter 5 revealed that neither B2C product manufacturing SMEs in the study used measures aimed at reducing subjective customer dissatisfaction but instead use only financial based measures (objective customer acceptance and development time measures). Both B2B manufacturing SMEs however use measures aimed at reducing customer dissatisfaction along with their financially based objective customer acceptance measures. Additionally, both B2B SMEs had formal NPD development processes in place, displayed high levels of customer orientation in NPD, and measure NPP by obtaining a picture of the financial and non-financial end results of individual projects. These finding highlights that there may be an association between firm type and NPP measurement activities after all, one that deserves further study.

- Chapter 6, Section 6.3, discussed the underlying structure of NPP measurement in SMEs and partially supports an efficacy and efficiency classification previously developed by Alegre et al. (2006). Additionally, Chapter 6, Section 6.3.2, discussed that it is not unusual that SMEs perform better at measuring non-financially based customer and project level measures and supports the findings of Huang et al. (2004) and Ledwith and O’Dwyer (2008) but again highlights that performance in these measures is not linked to product success. Chapter 6, Section 6.3.3 discussed that the case study SMEs are in fact using
financially based objective customer acceptance measures of NPP and extends the literature by identifying that what SMEs are measuring, consider important and what they perform well on is not necessarily the same, an issue that other studies have failed to consider.

Thus having achieved Research Objective 2, this study provides some key insights for this area of study. The first insight focused on the delineation of new product performance. The second, focused on identifying the measures that SMEs perform badly in measuring and the measures linked to product success. While previous research identified that SMEs use subjective customer acceptance measures (Huang et al., 2004) the SMEs in the qualitative study do in fact make significant use of objective customer acceptance measures. Third this study finds that the new product performance measures used by SMEs are influenced by product strategy.

In achieving Research Objective 2 this thesis has broadened the scope and character of research on new product performance, and in so doing has overcome the past theoretical and empirical gaps in this area. Concluding from the empirical findings with regard to Research Objective 2, it is found that SMEs use multi-dimensional sets of measures when measuring new product performance. These measures vary depending upon project and business strategy. No one measure is useful for all product types, nor across all firms, however it is always wise to use some objective customer acceptance measures as they are the only measures statistically found to influence new product success and if coupled with measures aimed at reducing subjective customer dissatisfaction levels will provide a balanced picture of the end results of the NPD endeavour.
7.2.3 Research Objective 3: To determine the relationship between product advantage and new product performance in SME.

As noted in Chapter 4, Section 4.2.3 to facilitate the investigation of Research Objective 3, nine hypotheses (H1a-H3c) were devised and illustrated in the research matrix (see Table 4.10 re-produced below);

Table 4.10 re-produced: Revised research matrix

<table>
<thead>
<tr>
<th>Objective customer acceptance</th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer acceptance</td>
<td>H1a</td>
<td>H1b</td>
<td>H1c</td>
</tr>
<tr>
<td>Development time</td>
<td>H2a</td>
<td>H2b</td>
<td>H2c</td>
</tr>
<tr>
<td>Measures aimed at reducing subjective customer dissatisfaction</td>
<td>H3a</td>
<td>H3b</td>
<td>H3c</td>
</tr>
</tbody>
</table>

Having achieved Research Objective 3, investigating the relationship between product advantage and new product performance measurement in SMEs, as noted in Chapter 6, section 6.4, both direct and indirect relationship were found to exist.

In achieving Research Objective 3, to determine the relationship between product advantage and new product performance in SMEs,

- Chapter 2, section 2.5 provided support for a direct relationship between product advantage and new product performance in SMEs and supported the notion that in relation to product innovation efforts, when advantages are built into new products, the products should be better received in the marketplace, or have higher new product performance. Chapter 2 section 2.5 highlighted that the relationship between product advantage and new product performance in SMEs is ambiguous and much is still not known about the relationship between...
product advantage and new product performance. It was not immediately clear whether a strategy of developing products with high levels of product advantage does indeed hold a key to increased new product performance. Also, that the relationship between a delineated product advantage and the dimensions of NPP has not been fully examined.

- Chapter 4, Section 4.6, presented empirical findings on how each product advantage component (product innovativeness, product superiority and product meaningfulness) interacts with each new product performance dimensions (objective customer acceptance measures, development time measures and measures aimed at reducing subjective customer dissatisfaction). Two direct and one indirect relationship was identified thereby empirically identifying how new product functionalities influence multi-dimensional new product performance measurement in SMEs;

1) product superiority was found to influence objective customer acceptance measures of new product performance.

2) product meaningfulness was found to influence development time measures of new product performance.

3) product innovativeness coupled with product meaningfulness was found to influence subjective customer dissatisfaction measures of new product performance.

- In identifying these relationships four significant hypotheses on the relationship between product advantage and new product performance were proven (see Table 4.29 re-produced below)

Table 4.29 re-produced: Summary of hypotheses testing

<table>
<thead>
<tr>
<th></th>
<th>Product Innovativeness</th>
<th>Product Superiority</th>
<th>Product Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective customer</td>
<td>n.s</td>
<td>H1b**</td>
<td>n.s</td>
</tr>
<tr>
<td>acceptance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Chapter 6 discussed how much of the previous literature on the relationship between the components of product advantage and new product performance used only financial performance measures as indicators of success and was how consequently the relationship between product advantage and non-financial customer satisfaction measure of NPP. Calantone et al. (2006) looked at the relationship between product innovativeness and new product profitability. McNally et al. (2010) examined the relationship between product advantage and product innovativeness and financial performance and Rijsdijk et al. (2011) investigated the relationship between product superiority and product meaningfulness and market and financial measures of NPP. No study has previously identified the relationship between product advantage and non-financial level measures of NPP in SMEs.

In achieving Research Objective 3 this thesis has broadened the scope and character of research on the relationship between product advantage and new product performance in SMEs. In so doing this thesis has explored and satisfied the associated gaps in this area of research. The nature of the relationship between product innovativeness, product superiority and product meaningfulness and objective customer acceptance, development time and measures aimed at reducing subjective customer dissatisfaction has been made explicit.
7.2.4 Research Aim: How does product advantage influence new product performance in SMEs.

The aim of this research was to determine the nature of product advantage and current new product performance measurement practices and identify any issues associated with the choice of product advantage strategies in SMEs. This aim was summarised in the following Research Aim:


Three Research Objectives, two exploratory and one causal, were devised to facilitate the satisfaction of the Research Aim;

1. To investigate the nature of product advantage in SMEs.
2. To investigate the nature of new product performance measurement in SMEs.
3. To determine the relationship between product advantage and new product performance in SMEs.

Having achieved the three Research Objectives the relationship between product advantage and new product performance is depicted in the descriptive model reproduced below.
Figure 4.5 re-produced: Relationship between Product Advantage and New Product Performance
In satisfying the Research Aim,

- The process of answering the Research Aim began with a detailed literature review in Chapter 2 on the current definitions and characteristics of product advantage and new product performance and summarised the previously acknowledged relationships between the variables. The in-depth review, presented in Chapter 2, identified that there existed no consistent definition of product advantage or new product performance or the characteristics involved in its make-up. Once this was established a review of the literature revealed 14 characteristics, identified in 16 empirical studies indicative of product advantage (Chapter 2, Section 2.3.1, Table 2.2) and carried forward for structural analysis in Chapter 4, Section 4.3.1. Additionally, 17 new product performance measures were identified from a previous study (Langerak et al. 2004) was identified and also carried forward for structural analysis in Chapter 4, Section 4.3.1. Chapter 2, Section 2.5 highlighted certain ambiguities surrounding the relationship between product advantage and new product performance in SMEs, which was tested and made explicit in Chapter 4, Section 4.6. It was now clear that a strategy of developing products with high levels of product advantage does hold the key to increased new product performance.

- Chapter 4, Sections 4.4 and 4.5 and Chapter 5 Sections 5.3 and 5.4 advanced findings on the nature of both product advantage and new product performance measurement and activities in the SMEs domain.

In conclusion, the primary aim of this thesis was to examine the under-explored product advantage construct in the SME context and its relationship with new product performance. Accordingly, and by using the advantages of; a flexible structure, better internal communications, the ability to respond rapidly to changing environments and
close relationship with customers, effectively in developing their product advantage strategy, the competitive environment with large firms will become more equitable and SMEs’ will be in a better position to compete thus enhancing competitiveness.

7.3 Contributions of this Research

This thesis explored the relationship between product advantage and new product performance in SMEs for the purpose of identifying, evaluating and clarifying the benefit of introducing explicit product advantages characteristics in NPD. By investigating the nature of and the relationship between product advantage and performance in Irish SMEs’, this research provides empirical evidence to support SMEs’ in new product development.

This thesis has contributed to the theoretical development of a number of issues in the field of new product development, predominantly in the area of product advantage and its relationship in the new product development process. The key contributions to knowledge that this thesis makes are:

1. This thesis empirically supports the conceptual separation of product advantage into three interrelated components; product innovativeness, product superiority and product meaningfulness, and in doing so addresses the conceptual weaknesses associated with the holistic product advantage conceptualisation. A definition and a measurement scale for each component has also been provided.

2. This thesis makes a contribution to knowledge by revealing that product meaningfulness characteristics are the most dominant advantages being presented by SMEs in their new products and also the characteristics that
are considered most important. Product superiority and product innovativeness are important but at different levels and very much determined by technological and resource uncertainty and competitive intensity.

3. Support is provided for a three dimensional new product performance scale consisting of; objective customer measures, development time measures and measures aimed at reducing subjective customer dissatisfaction. This scale is appropriate to capture new product performance measurement activities in SMEs. Evidence highlights that SMEs are performing worst in measuring the only dimension statistically linked to product success; objective customer acceptance measures of new product performance.

4. This thesis makes a contribution to knowledge by identifying the explicit NPP measurement activities of four cases study SMEs and highlights that contrary to previous studies they are in fact measuring objective customer acceptance measures in their NPD activities. The choice of measurement item used is influenced by product strategy.

5. This thesis proffers a descriptive model Figure 4.5 which indicates how each product advantage dimension influence new product performance in SMEs. The descriptive supports both direct and indirect relationships between product advantage and new product performance in SMEs. Additionally the descriptive model depicts the relationship between product advantage and non-financial performance – a relationship that had not been explored in literature. In doing so this thesis answers the call for a cause and effect relationship between product advantage and non-financial NPP measurement.
6. Based on the literature review Chapter 2, the empirical findings depicted in Chapters 4 and 5 and the discussion based Chapter 6, this thesis has contributed to knowledge by identifying how product advantage influence the performance of a new product in SMEs. Thus this thesis provides evidence to SME owner/managers on the product advantage activities that will maximize their new products performance.

7.4 Implications of this Research

Based on the conclusions and contributions to knowledge, the implications of this research can be categorised under three headings; implications for NPD theory, implications for NPD managers in SMEs and implications for NPD support policy. This thesis has the potential to contribute to the development of a number of practical and policy issues in the field of NPD planning. In this section key research findings are examined with particular attention to certain issues that may prove vital to managers and policy makers and SMEs alike in their attempts to improve understanding of the causal relationship between product advantage and performance and to support SME new product development.

7.4.1 Implications for NPD theory

The major implication of this thesis is that it contributes significantly to the growing area of product advantage and new product performance literature on SMEs. Through the use of both theoretical and practical applications it contributes to the understanding new product development in SMEs.
First, arising out of the literature review Chapter 2, previous studies have inaccurately conceptualised product advantage as a holistic dimension, which limited the ability of these studies to capture the nature of the construct and as a determinant of product success. Empirical evidence in Chapter 4 is provided to support product advantage as consisting of product innovativeness, product superiority and product meaningfulness components. This study thus advances NPD theory on the nature of the product advantage construct by moving it beyond the traditional conceptualisation contributing to a more comprehensive understanding of its impact on new product success and performance. Future research in NPD should no longer consider product advantage in its entirety but instead each dimension needs to be considered as theoretically separate but interrelated. Each dimension is an individual entity capable of influencing new product performance, and dependent on situation a possible determinant of new product success.

The second implication for theory is in relation to new product performance measurement. Chapter 4, section 4.2.3 provides support for a three dimensional new product performance measurement scale in SMEs. This scale identifies a more appropriate NPP measurement scale for SMEs as it can be classified in relation to efficacy and efficiency measures. The third implication for theory is that this research has identified how specific product advantage dimensions influence new product performance. In particular empirical finds have been provided to suggest a relationship between product advantage and non-financial performance measurement.
7.4.2 Implications for SME owner/managers

In relation to the managers of the SME the descriptive model could provide the basis for new product development. Given that most SME’s are constrained in new product development by limited resources, both financial and human the descriptive model will enable them to allocate resources in a tactical manner to reduce wastage.

Throughout this thesis the focus on increasing product advantage as a beneficial course of action for SMEs has been reiterated. Managers of SMEs need to understand the nature of their new product advantage given that without proper diagnosis they cannot choose the best strategy to enhance or defend its current position. Findings inform the business community that product advantage relates to the level of innovativeness and superiority over competitive offerings, however, this study identifies that these are not the characteristics that are found in successful products. This implies that SME managers should strive to increase product advantage in these areas (quality, cost, benefits or customer perceptions) in order to maximise its new product success. Managers should consistently and consciously consider all the dimensions of product advantage when they pursue NPD projects, they need to be able to identify the advantage that will produce the most reward in relation to new product performance and concentrate on it. Early in the NPD process a firm should define its product advantage over existing products; management should then ensure that the new product development team execute all processes correctly so that the intended advantage materialises in the product thus improving the products chances of success.

This study suggests that managers are measuring the new product performance measures that are easily measurable. A challenge for managers then is to invest in systems which allow them to effectively measure their new product performance in a
way that will enhance their organisational performance. Firms need to start looking at
the market performance and financial performance of their products and not just at
customer acceptance measures. Furthermore, the specific product advantage
characteristics that increase performance in these areas have been identified and the
benefit of exploring these in relation to their impact on organisational performance
explored. Managers must concentrate on achieving these advantages so as to maximise
its new products objective performance.

7.2.4 Implications for Policy Makers

For policy makers the outcomes of this thesis and the descriptive framework presented
several areas for SMEs that need immediate attention. First, the major implication for
policy makers is that firms are not measuring the new product performance variables
that will have the most impact and support to do so is needed. SME’s need help in
putting in place the systems that will help them to effectively measure new product
performance. The dimensions which SMEs are currently weak in, are the dimensions
that are most important and require immediate attention. Second, policy makers need to
introduce soft supports, which will aid firms in the identification of product advantage
that will increase their product success. Finally, SMEs need to be educated as to the
relationship between product advantage and new product performance, and the methods
of increasing their impact on organisational performance.

7.5 Limitations

As the research issues emerged from a synthesis of literature, each potential limitation
was, in as far as possible, minimised by tailoring the empirical research appropriately.
This study is limited by several factors that should be addressed in future research. A
limitation for this study is that firms from a variety of sectors were included in this research project which might lead to the findings being too general, future research could be limited to specific sectors in order to produce specific results. A second limitation of this research is that it is an investigation of the relationship between one determinant of product success (product advantage) and new product performance only. Also this study only considered product innovations in its investigation. In addition, a potential limitation was the uneven distribution of successful product introductions compared to unsuccessful products, an aspect of the study which warrants further exploration. A limitation on relation to the quantitative analysis is the small sample size (N=123). As a result some between group’s comparisons could not be conducted.

A further limitation exists in relation to the case study analysis is that generalisability of research findings across is not possible as SMEs are not a homogenous group. Thus, issues such as the homogeneity of the industry sector in which the SME operates, and the size of the SME might be considered by some to be a limitation, this variety was considered necessary to give greater depth and richer insights. Another potential limitation of this case study research could be attributed to the interviewees. They consisted of the owner/managers; greater richness could have been achieved by involving specific company employees involved in new product development. Finally the case companies’ were all based in a shannon region of Ireland within a two hour commute for the researcher, it is noted however, that geographical variables could have had an impact on the research findings.
7.6 Future Research

The thesis suggests that the NPD literature should adopt a more refined conceptualisation of product advantage by distinguishing between product meaningfulness, product superiority and product innovativeness. Future research should address product innovativeness, product superiority and product meaningfulness as separate interrelated determinants. Such a distinction would likely generate a better understanding of the role that product advantage plays in enhancing new product performance. Indeed, doing so will lead to increased prediction and the ability to plot the cause and effect relationships between product meaningfulness, superiority and innovativeness and product success, and thus support the NPD process as managers will be able to choose an appropriate product strategy to maximise its new products success. Chapter 4, section 4.3.1 provided empirical evidence for a three dimensional product advantage construct consisting of elements relating to; product innovativeness, product superiority and product meaningfulness. However, whether a different factor structure exists for different firm types or firm sizes could not be investigated. Future research would benefit from a comprehensive investigation of the product advantage structure across firm size and type.

More complicated models are necessary to identify potentially relevant antecedents, moderators and mediators of the advantage-performance relationship. Future researchers are encouraged to pursue the identification of such elements, both additional moderators and relevant mediators and antecedents.

This thesis used subjective data of product advantage and new product performance. Although subjective data often lead to results that are similar to those based on
Chapter 4, section 4.3.2 provided empirical evidence for a three dimensional new product performance construct consisting of measures related to; objective customer acceptance, development time and measures aimed at reducing subjective customer dissatisfaction. However, whether a different factor structure exists for different firm types or firm sizes could not be investigated. Future research would benefit from a comprehensive investigation of the product advantage structure across firm size and type.

This thesis identified that the choice of product advantage strategy is moderated by environmental uncertainties. This area would benefit from a longitudinal study detailing the impact of each of the aspects of environmental uncertainty on product advantage strategy development.

7.7 Conclusion

In conclusion, based on the literature reviewed in Chapter 2, and the empirical findings depicted in Chapter 4 and Chapter 5 and the discussion based Chapter 6, this research provided a definitive characterisation of how product advantage influences new product performance in SMEs. From the perspective of SME owner/managers product advantage does in fact hold the key to increased new product performance and for the purpose of engaging in better product development processes, implementing definite product advantage planning protocols is beneficial.
References


288


300


Appendix A: Quantitative Questionnaire

The questionnaire attached is designed to elicit information from you about the current product characteristics and advantage and new product performance strategy at your firm. Please select a product that has been introduced into the marketplace in the last three years.

Answers range from ‘strongly agree’ to ‘strongly disagree’ or ‘very poorly’ to ‘excellently’. Please give serious consideration to each question and remember there is no right or wrong answers; it is your opinion I am looking for. To complete the questionnaire please place a number from one to seven beside each question. It is estimated that the questionnaire will take no longer than ten minutes to complete. Your responses are completely confidential.
Section A: Company Background

Instructions: Please answer the following questions to the best of your ability. If you feel that you are unable or are not in the position to respond, please move on to the next question.

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Please Tick Box</th>
</tr>
</thead>
</table>
| 1 | Does the firm provide Products or Services to the market place?          | □ Product  
□ Services  
□ Both |
| 2 | Are these products / services of a consumer or industrial nature?         | □ Consumer  
□ Industrial  
□ Both |
| 3 | How many personnel are currently employed within the firm?                | □ Less than 10  
□ Between 11-50  
□ Between 51-250  
□ Over 250 |
| 4 | Is the company Owner or management run?                                   | □ Owner  
□ Management |
| 5 | During the last business year, what was the firm's turnover?              | □ Less than €3m  
□ Between €3-50m  
□ Over €51m |
| 6 | How many new products did your company introduce in the last year?       | ________ |
| 7 | How would you best describe your firms strategic orientation?            | □ Innovation  
□ Quality  
□ Cost |

Section B: Organisational Performance - OP

Instructions: Please use this scale to indicate your agreement about how well your firm has performed over the last year relative to competitors on each of the performance indicators mentioned below. Please do not leave any blanks.

<table>
<thead>
<tr>
<th></th>
<th>Performance Indicator</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sales growth.</td>
<td>OP1</td>
</tr>
<tr>
<td>2</td>
<td>Profitability.</td>
<td>OP2</td>
</tr>
<tr>
<td>3</td>
<td>New product success.</td>
<td>OP3</td>
</tr>
<tr>
<td>4</td>
<td>Sales share new products (i.e., products introduced in the last 5 years).</td>
<td>OP4</td>
</tr>
<tr>
<td>5</td>
<td>Market share.</td>
<td>OP5</td>
</tr>
<tr>
<td>6</td>
<td>Return on Investment or Internal Rate of Return</td>
<td>OP6</td>
</tr>
</tbody>
</table>

308
Please answer the following sections C through to E in relation to your company’s most recently introduced product.

Section C: New Product Development - NPD

<table>
<thead>
<tr>
<th></th>
<th>NPD1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A project manager was used in this project</td>
</tr>
</tbody>
</table>

Instructions: Please tick the statement that most relevantly describes the product.

The new product that you have selected is a product that: **NPD2**

1. For the first time allows you to enter an existing product category
2. Supplements one of your firm’s established product lines
3. Provides improved performance or greater customer perceived value and replaces an existing product.
4. Other

The new product that you have selected performed: **NPD3**

1. Far above expectations
2. Slightly above expectations
3. Met expectations
4. Slightly below expectations
5. Far below expectations

Section D: New Product Performance - NPP

Instructions: Please use this scale to indicate your agreement about how well the new product you selected has performed on each of the performance indicators.

<table>
<thead>
<tr>
<th></th>
<th>Very Poorly</th>
<th>Poor</th>
<th>Somewhat Poor</th>
<th>Undecided</th>
<th>Somewhat Good</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>MLM1</th>
<th>MLM2</th>
<th>MLM3</th>
<th>MLM4</th>
<th>FM1</th>
<th>FM2</th>
<th>FM3</th>
<th>FM4</th>
<th>CAM1</th>
<th>CAM2</th>
<th>CAM3</th>
<th>CAM4</th>
<th>PLM1</th>
<th>PLM2</th>
<th>TM1</th>
<th>TM2</th>
<th>TM3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit volume goals</td>
<td>Met revenue goals</td>
<td>Met sales growth goals</td>
<td>Met market share goals</td>
<td>Return on Investment or Internal Rate of Return</td>
<td>Met profitability goals</td>
<td>Met contribution marginal goals</td>
<td>Development costs</td>
<td>Customer acceptance</td>
<td>Customer satisfaction</td>
<td>Number of customers</td>
<td>Customers competitive advantage</td>
<td>Met performance specifications</td>
<td>Met quality specifications</td>
<td>Launch on time</td>
<td>Time to market</td>
<td>Break even time</td>
</tr>
</tbody>
</table>
Section E: Product Advantage - PA

Instructions: Please use this scale to indicate your agreement about how well each of the following statements is an accurate description of the new product that your firm introduced.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Undecided</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Product advantage is defined in terms of:

1. Be better relative to competitive offerings \( \text{PA1} \)
2. Be unique \( \text{PA2} \)
3. Be of better quality \( \text{PA3} \)
4. Solve problems \( \text{PA4} \)
5. Enable better technical performance \( \text{PA5} \)
6. Meet customers’ needs \( \text{PA6} \)
7. Enable differentiation \( \text{PA7} \)
8. Provide benefits \( \text{PA8} \)
9. Have better product design \( \text{PA9} \)
10. Have better individual attributes/features \( \text{PA10} \)
11. Match customer perceptions \( \text{PA11} \)
12. Be cost effective \( \text{PA12} \)

Thank you for completing this questionnaire
Appendix B: Interview Topic Lists
Interview 1

Emphasis: Introduction to the company and New Product Development Activities

Interview objectives:

- Familiarisation with the company.
- Introduction to key products services and processes.
- Exploration of new product development activities and product advantage. and new product performance activities

Interview questions:

1. “Can you tell me about your business?”
2. “Has that changed over time? How so?”
3. “What size is your company relative to your industry?”
4. “What kind of markets do you serve?”
5. “What products/services do you provide?”
6. “Can you tell me about your most recently introduced new product?”
7. “How many new products have you introduced in the last five years?”
8. “Are you currently developing new products?”
9. “Do you have any future plans to introduce new products?”
10. “Why do you develop new products?”
11. “Can you tell me about your firms NPD process?”
12. “What activity does your firm mostly concentrate in
   1. New product allows us to enter new markets
   2. New product supplements one of the firms established product lines
   3. New product provides greater customer value and replaces existing product
13. “Why did you choose this type of product?”
14. “What is the advantage that your most recent product holds?”
15. “Does this contribute to its success?” “How?” “Gauge it”
16. “Can you tell me about your firms’ customers?”
18. “What are customers needs?” “How do you know that?”
19. “How does this compare to your competitors?”
20. “Do you gather information on potential customers’ needs, wants and specification?” “How”
22. “Do you look for ways to offer customers more value?”
23. “Do you consider being close to customers’ to be significant to your product advantage?”

Interview 2

Emphasis: Inform on Product Advantage and factors influencing choices

Interview objectives

- Exploration of new product performance activities.
- Explore issues that influence decisions.

Interview questions:

1. “What is the most important aspect of your product that your customers are looking for?”
2. “How well did you understand aspects such as target market, customers’ needs, wants and preferences for the new product?”
4. “How important is the level of product innovativeness to your competitive advantage?”

6. “Is your new product performance measurement activities the same for all product?” “Why?”

7. “What impacts on your new product performance measurement activities?”

8. “What impacts on your choice of product advantage strategy?”
Appendix C: Interview Transcripts
Company A

Interview with Company A

B: Firstly, can you tell me about your business, background etc?

J: We all came out of a factory above in Ennis, started up there in 1973 by an American corporation. From 1973-1988 we were part of what they called Kolmorgen, that was the American corporation then and in 1988 AEG in Germany, bought the factory up there because they were getting into servomotors and all that sort of stuff and then in 1995 AEG went belly-up and we kind of am we were caught in between stools, this part of a French corporation had bought some parts of AEG called Sedulec but we were not a natural fit so in 1998 another American corporation Pacific Scientific bought us so we were up there in pacific scientific until 200 when another major American corporation Danaher motion, started buying a lot of motion companies all over the world and they bought us and they also bought Kolmorgen who were our original owners, so we all came under the same umbrella in 2000. And they had bought companies in the states, Sweden, Switzerland here, Czech, Germany and they went off and did a big survey of all these companies they bought, what the hell do we do with all of them and the upshot was they were closing the Ennis plant and moving it all to Czech republic and at the time our main customers up there were robotic builders in Germany and we were selling 30,000 motors a year to them and they transferred all that to the Czech republic. And what they were going to do with the older product was obsolete it so Paul and I, at the time I was working in the Ennis plant and Paul had been transferred to the American plant, we approached them and said look here you are obsoleting all the old products, we are prepared to buy them off you. So they said OK and we bought whatever parts, raw materials, drawings, all that sort of stuff that was related to the old product and we took it out in 2001 cause at the same time they were closing the factory. It was kind of an out for them cos it meant that the older product they didn't have to look after it we were going to look after it and it was enough for us and we had a product that we could run with straight away. So that's where we started. That happened in 2001 and we started in Ennis then and in 2006 we came down here, so what we do then is electric motors, DC servomotors basically is what we do, you know in various sizes and power. Its old technology, it’s not the up and coming technology but it’s a niche market that we are into it.

B: Has much changed since the beginning?

J: The big thing that has changed is price, price has just tumbled to a third of where they were back when we started off in 2001, you know when we started off in 2001 you could be commanding prices of 300-400 euro now its €100 and something euros. In regards technology no, it wouldn't have developed because it’s a very mature technology so where we tend to get our uniqueness is in its ruggedness as in for industrial markets as opposed to for cheap and nasty things so ruggedness is a big thing we'd be selling on price. Really the two things that we would have but what we have...well we found over the last few years, we're not really sure what direction we
should go in, should we go after the high volume, when we say high volume we're talking about thousands of units or should we go after the specialised and the way the customers have driven us is we're tending towards more the specialised, so the customer would have a very special application and we would design around that and that’s where we would be strong in that sense we wouldn't be as strong in the whole manufacturing as getting thousands of units out at very low cost. So we are kind of graviting towards small quantities but highly specialised.

B: What markets do you serve?

J: All various markets but our biggest would be antenna control that communications antenna for controlling the satellite dishes. We have big customers in Israel and America for that, packaging machinery would be another one we have in China, semiconductor there's various stages of semiconductor manufacturing and we are in China where they mix the crystals, it’s a mixing thing they do and it has to be very controlled speed so we are in there and then we are into all sorts of....anything with a machine, packaging, antenna, metal cutting, metal forming, textile anything where machines move basically but in terms of our strongest, packaging and antenna would be our two strong markets. Its ideally suited to antenna because whets the biggest advantage is that for production units the brushless motors would be a lot more efficient and faster than a brush motor where if you wanted to produce 200 of those bottles in a minute it’s a brushless motor you'd want but in antenna where you might position it and you'd stay for an hour and then you might position again, it’s a very stop and go application and its ideal for that and its ideal for mobile because a 12volt battery would run it and you might be up in a mountain and don't need to have all this 3phase power going up to it and that sort of stuff. And that’s why we are good in the antenna section and brush life doesn't really come in because it’s such an easy application because you don't have to change brushes or you don't have that problem whereas you would in a production orientated machine where it all output and up put and speed and uptime and all that stuff. Everything we do her is export and at the moment it’s probably 60% in America, 20% Europe and 20% in China, America is a big market for us at the moment. That’s the way it works.

B: What's the biggest challenge facing you at the moment?

J: Thousands of them, internal and external. I suppose our biggest challenge here is, we are small (8 employees) and we are competing with the big boys. Between myself and Paul who is the other owner we would look after all the functions of marketing, sales, design, production hr so you have to do all those functions and it can be a big challenge a big strain on us at times because we just don't have the resources internally to delegate or to get other people to do it because we are small. SO that’s a major challenge internally and externally you'd have major challenges in terms of, when we start playing against the big competitors they could wipe us off the face of the earth if they wanted to, you know we could go in with a price and it might be pretty good but they have such economies of scale that they could drop it and wipe us away and we've seen that in a few applications where you'd be going in there, particularly in China where it happened with a German manufacturer for an application for opening and closing doors in
subways, in the trains and it was about 4 or 5 years ago and they were getting ready for the Olympics, and that’s why we designed this small motor for it. And it was to replace a German manufacturer but the German manufacturer just came in and wiped us out with price.

B: And who are your main competitors?

J: Our main competitors would be people like MAE and motor power in Italy, Italy is a strong market area, in Germany you have people like dunker and gefit in America you would have people like Macmillan and CMC. Italy Germany and America would be our 3 main competitor areas, You'd also have the Chinese, the cheap and nasty Chinese but they're competitors to everyone so we'd often find that in China you might be going in with stuff but they go to Taiwan and but something in Taiwan anyway. But America, Germany and Italy would be the 3 main areas where we would see most of our competition coming from, Italy is very strong, they can sell really competitive priced stuff but we are looking at our niche of highly engineered you know we are moving into that sort of stuff whereas anyone that is selling high volume can't engineer you know or they might have minimum water quantities or they wouldn't have the speed of it and so we go into the engineering niche market of it.

B: Do you have much information about the products that your competitors would offer?

J: Oh yes, we would yes, we'd do benchmarking and ah and in fairness a lot has to do with our own resources and cost and so forth, you know we wouldn't be up there with the top guys they'd be way ahead of us, in certain things and in other things we'd be pretty good like we're competing in the US now for ah against Pitman which are a big US manufacturer but yet our motor is a better motor technically than theirs, our problem is that we have a noise (it’s going into a very quite environment) and because of our build structure it’s a small bit noisier than there's so we are trying to look at a way to see if we can reduce our noise, it’s to go into a lab it’s a wafer spin, for doping wafers and that sort of stuff but our motor is better than the American one but it’s just you know etc..You wouldn't notice it really it’s only when you start doing tests that you know.

B: Do ye carry out a lot of product test, prototype tests etc.?

J: We would yeah I suppose there is two types on the engineering side of things there is two things we've done. When we bought the stuff off Pacific Scientific in 2001 there was frame sizes, 63ml, 75ml, 110, 150ml, and on the 3 other ones they were an old legacy type product that they had they never ran engineering work on them, they let things kind of go to rack and ruin so the first thing we had to do was to reinvent all them again, get costs down and get them into a scenario where they could compete with our competitors because there was just no work done with them for 10-15 years so we had to do some basic work there. So the first motor that we designed from scratch here was this one the 63ml, we weren't in that market and traditionally above in Ennis they weren't in that market we said we'd go after that and it’s the one that we are pushing hard, it’s a low cost motor that can go into various types of applications and ah it was
originally designed to go after the door opening in Beijing which we didn't get but because of its size and so forth we found other areas that we can go after with it, so in Sweden and in England we are working with getting it into robots so we are working with our agents over there at this moment in time to try and push on them. It would be our lead product in terms of..... It’s a size that has a big application because it can go into a variety of applications and also its cost is also good, we’d be competitive with the competitors out there even though they could wipe us off the face of the earth, if they really wanted to but we are competitive in terms of price.

B: How customisable would that product be to customer specifications?

J: That one wouldn't its fairly standard. What we did on that was we took all the information we could get on our competitors on that size motor and I suppose the things that are important to us are what size should this shaft be, where should these 4 holes be in terms of their pcd, what size should the spigget be and what you do is you'd put them all into groups and say whose in that group and that group and you'd come up with a best fit and you'd always have one or two mavericks that would be totally might have a different strap size but you'd usually get a fair idea about where places are and you’d design around that and we’d put in our own little things then afterwards. Ah one of the big savings we did on that was this part here which was magnets and what we call the fronting bed it’s all one piece where other people would have two pieces we have one piece, reducing cost we'd use high power magnets where they'd use low powered magnets and that sort of stuff. That would be pretty going after the main market, that’s not specific.

B: Tell me about your agents?

J: We've agents then in most countries, what we did was again from the old factory we had built up a .....there was a number of agents all around Europe which would know the product and where all the product would have been sold to in that country and we knew them pretty well so we went to all of them and we got and asked them would they stick with us and they said yeah so we have then and we have picked up a few new ones particularly in America and China, the ones in England, Germany, France, Sweden and those places would be guy who would know these products from years past so that was a big advantage-they didn’t have to learn and they also knew within their own country where the customers were and what would customers use, so that’s what we would predominantly do. The odd time we do deal direct, we do our own direct mail shots and marketing and phone calls and god knows but we tend to go through the agents a lot of the time because we find in a lot of the countries they like that local presence you know between the language or in America import export that type of thing.

B: How significant is being close, local to the customer?

J: Very significant and again it’s another area that am, there's our resources...we often played around with the idea should we hire somebody to go to either the European countries or America or even china but it’s all got to do with costs really, how much would it cost you know and you get a guy on the road, it could be 12 months before
anything happens. And am were looking at costs, at the moment we kind of do it all here via the agents, that’s the way we work it.

B: Can you tell me about NPD, are ye currently developing new products?

J: Oh yeah, we'd have a pipeline of new products particularly in areas where we'd find.. and we've kind of either try and have the market need us as opposed to thrown something out there and we'd get and you know we've built up over a period of time the kind of queries that would be coming back to you the kind of thing you know by talking to the agents, the kind of things out there that they would see out there that is not there and ah we have about 7 or 8 projects in the pipeline that we need to work on and what we need to do id prioritise them and see which would go where and the other advantage on that is that you would get aid from Shannon development or enterprise Ireland.

B: How significant is that aid?

J: Very significant, what it would do for us cos we are in the middle of looking at the pipeline at what we'd do, you know it might allow you to hire an engineer for the lab or something like that, where at the moment myself an Paul do it and you're in the middle of that and you're pulled away to something else and the aid we'd get from enterprise Ireland would be very significant, it probably would allow you to hire an engineer to hire someone to do a lot of the ground work in that lab and all that.

B: Have ye anyone working solely on R&D.

J: Well Paul does it but he does it with his other jobs, with his other functions so there is no-one there full-time and that’s our focus, it’s really frustrating, it’s really cost versus thing and we've found in the last year and a half business has got tough and people, I don't know whether it’s because of the whole credit crunch thing but people now are very cagey before they start buying stuff so we are kind of going through a rough period ourselves as well so.

B: How many new product would ye have introduced over the last five years?

J: Just that one (product previously spoken about) it’s the only one, well I suppose we resurrected one, there was a product that they used to do above in Ennis that they killed off and we resurrected it again, it wasn't rocket science because allot of the stuff was already there it was just a matter of finding new vendors for the parts and so and so forth, so we reinvented it so that was the only one that we developed and launched from scratch. And now we are looking at the next pipeline, whets the next one we should do.

B: How significant is the decision to develop new products?

J: Very significant, well its significant in two fronts I suppose, really if we go after something we really need to be sure that it’s going to be a winner, we don't want something you'd spend your time and al....and even though we'd use a tollgate system to do it which is a market analysis and you have to do your costing and projections and you have to go through five tollgates as they call it and if any tollgate comes up and says things you just stop it there and you're not going to launch a product if you find
that after you've spent everything that this thing isn't going to work or it won't sell, so it would be very significant we have to ensure that there would be ah pretty good chance of sale. So a lot of our projects in one sense could be customer that we'd find...yeah a number of customers would be looking for this type of product and we'd go and talk to them and say if we had this what would you envisage in terms of sales and we'd add all that into the mix and also that it would be a strategic fit within the company that it’s not something harebrained off the wall type of stuff.

B: Can you explain the 5 toll gate system to me; I’m not familiar with it?

J: Yeah it came from, it’s the whole lean manufacturing thing, it came from when Danagher motion bought the thing one of the big thing that they were into was lean manufacturing which they had copied from Toyota business systems and they ah......basically it’s a... the tollgate system in terms of R&D it goes through 5 phases. Phase no. 1 would be a very quick and dirty and nasty thing in that you'd come in here for an hour and put out ideas, it just throw them out, then you go into tollgate 2 which is a market analysis and it could be just deskwork or you might be talking to the agents but you do market analysis and see who's out there doing that work at the moment, what price range, expected revenue all that sort of stuff and then you get into tollgate 3 which would be kind of it gets a bit more meatier then in terms of how, whets this going to look like, whets the design going to be like, whets the specs of it. This stage is not a not a lot of capital money would be spent a bit of time would be spent with engineers and marketing people and when we get into tollgate 4 then its gets a bit meaty in terms of no you need to start buying capital equipment, now we need to start looking at can our product facility take it, also then all the marketing people start coming into it and putting in their speak in terms of its very likely that you will get this type of sales, so it’s the whole return on investment type of analysis because when you get into tollgate 5 its then the money starts to spend, your starting to spend money cause your now ramping up......you know after each tollgate a decision has to be made by the committee or people do we go or do we stop and every time you go it'll be consequences of it so you have to make sure by the end of every tollgate that you've all the...that you have everything looked at. And because when you get into tollgate 5 that’s when you are sailing, marketing people are saying yeah it’s a product that we can sell, engineering are saying yeah it’s a design we can do, production people are saying yeah we can build it so now you're buying in equipment you're buying in your......your laying out your floor for it and then tollgate 6 is the physical launch in terms of how do you tend to launch it etc....so it’s a structured way of going from concept to commercialisation and at any stage in the middle it can be stopped you know someone might come on and say that we are not going to get sales for this and we've had a few, every project......well we'd split our projects in here into three small projects which don't need any toll gating just sustained engineering and then you'd have a second one that would be what we'd call a small to kind of medium type of project where you wouldn't use al the five tollgate system you might use one or two and you'd have a big one where you'd use all five and ah we've had ones that we'd have used all five and we've had ones that we have stopped for whatever reason. What would stop things really is your return investment is ...sales that type of thing out there. So it is a designer made system that we've picked up from
our time with Danagher and it’s a very good system for R&D, and they also had a very good system for production, for lean manufacturing, one-piece flow all that kind of thing in terms of product. When we were starting off we were going to take over the world but what we have found now that a lot of that lean manufacturing is geared towards a standard product, high volume, whereas our is non-standard product and not high volumes so there is not a lot of the lean manufacturing that you can't bring in but the R&D side of things yeah you can definitely do that yeah that doesn't matter if you are making 5 or 5000 pieces you still go through the same process, so it’s a pretty good process and what it means that once you launch you've forgotten nothing down to the small things like is there special tooling required, is there special equipment required that you're not going to launch something onto the production floor and then realise that we never...so it’s a good system like that.

B: Can you tell me about you're market activities?

J: In terms of the technical side of things what we tend to do..now we had a customer in Sweden for a robot now it was a competitor motor and they had problems with it and what they did on that particular scenario even though we had a lot of info on it anyway was to send us a scrap motor. So we'd ;look at it particularly from a mechanical side of things to see if it will mechanical fit and design our own and so we gave then 60 units about 2-3 months ago, they through a life test and if they pass they'll go ahead and order production quantities. And at the moment they are going through life tests out there at the moment so what you'd find is that the people would give you a competitor motor or the part no. of the competitor motor and we'd have the info here and we would redesign around it and give them a form fit to replace it. In that sense, in the other ways of marketing we.....we've just completed the redesign of our website, we got a guy in Galway to redesign our website and he's working with us for 6 months going through a six month programme of designing websites, we're focusing in on the UK in terms of getting ads onto trade magazines, we're doing a mail shot here ourselves of newsletters that'll go around the world so its kink of a six-month focus on general marketing where we are just going to try to get us out cos our feeling is that one of our biggest drawback is that we are not known, nobody knows us, we're not a brand we are a small company in the west of Ireland, they don't know who we are, we have exhibited at shows yet and it’s one thing that we are playing around with now, should we start now what should we do, but this is a six month focus on it, to get our name out there to see if we get anything back on it. That’s going out to the general market whereas now between our agents in the different countries there would be a certain amount of customers who would know us and they would come through with they're general requirements and we would design from scratch or they might have a competitor motor, they might be having a problem with, or someone they don't like and they might wanted to have a competitor motor cloned which we would do. So our marketing is done from here, our agents don't market us per se they would have us on their website in terms of our product but they wouldn't be out pushing our name or our brand.

B: Would they also be distributors for the product?
J: Yeah when I use agent or distributor they're one in the same person. Some people are just you know...especially china, people in China would be very office whereas in Europe people are very technical, technical orientated...they'd be problem solvers as well they'd be integrators as well, they'd know the servomotor market, cause its complicated as well with machines and all that it's not just somebody in an office buying or selling commodities, so these guys would have value added, like they'd go into a customer and the customer might have a problem or want to design a machine or something and they might have 7 or 8 different products that they might be representing and they'd say well that DC motor and I’m also supply from this guy and they'd build up the solution from what they are carrying.

B: How well do you understand aspects of the target market, customer needs and wants etc?

J: We think we know, we'd like to think we know but at times I don't think we do because one of the big problems again is our location, our market is Europe and America and Asia and we are not in the middle of the market, you know if we were positioned in Germany you'd probably be with customers more often you'd hear from them more often, you'd be at trade shows more often, you'd be talking to people in the know and even though we might think we know what they want we don't, it would be one of our weaknesses and its really back down to resources because ideally myself and Paul should be out of here every week, in one of the countries, visiting but if we're out from here then there is problems back here and so it’s one area that would be a major concern for us...how to get a better understanding of what customers want, talk to customers.

B: In relation to the performance of a new product, how does the company measure NPP?

J: In parts of the tollgate ROI would come into it, I suppose product performance, you'd measure it in terms of technical performance in the lab, you'd benchmark against a competitor who's number one there and you'd do life tests internally and you'd compare in that sense. In the commercial we don't have a five year plan, well we kind of do but trying to implement it at times is pretty hard ,you know when we launched this product we were hoping we'd sell 1000 of these units this year and we are nowhere near it. Now we are pushing hard to do it but at this moment in time it hasn't happened yet. Now there is one or two customers that if we can win them, particularly the one in the states if we can get rid of this noise problem it would be a big push towards that but we don't I suppose......we do have a target this year and will have a target next year but if we don't make this year whets the point putting a target there next year if it’s not achievable. In any of the.....or the amount of investment that we put into a thing would be related to what we'd win back. We put in a big investment into a new motor for a customer in Israel but we knew he was going to order it so it was a no brainer but this we're launching it and it may or may not go so you'd never know so you'd be very careful about what money you would start laying down, because a certain amount of tooling would have to be payed or equipment bought so you'd watch things. So you'd say we'll wait until we get to 1000 units a year before we buy some sort of equipment that in the
original time we said we'd buy but we will if we get to a certain point so as not to spend thousands on .....so we'd be careful in that sense. Maybe too careful maybe we should just go but again when you're a small company and don't have any backup resources etc. you know you have to keep the cash flow going not like big corporations that would have deeper pockets that they could go off and lay investments and if they come to fruition and it’s not the end of the world but for us it could be the end of the world.

B: How much of an obstacle is financial constraints?

J: Massive obstacle, it would be the biggest single obstacle, if we had a lot more resources there would be a lot more done, financial constraints would be number 1 in terms of R&D and that’s why see Shannon development as being a major plus, that you could hire someone in to do that sort of work and they would grant aid you and whatever.

B: Would you consider customer acceptance as a measure of performance?

J: No we have no issue there, when we start going into customers first, I suppose the first big issue for us is price, once we get over that we have absolutely no problem, we’d be very confident. So anyone who talks to us or product that we send to then technically would be well up there so acceptance, we have had no-one coming back to us with problems with our product. It’s getting over the small company no brand and price is the big issues, if can get in there with that. In relation to branding that’s where our agents help us out, customer will say granted small company in Ireland but you are here I can talk to you or whatever, once we get over that acceptance is not an issue.

B: Just in relation to product advantage, whets your understanding of it?

J: Well our big advantage would be what we call ruggedness, it's designed to last whereas our competitors wouldn't be, they'd be flimsier. We use steel you can throw it around and it would be ok where our competitors’ ones wouldn't be open to the robustness of it. The guy who puts this onto a machine is probably a fitter and they tend to pull and drag and throw it around. Our big thing is they are good and solid and rugged.

B: What would be their expected life?

J: Life would be ...... it varies, we've seen ones shipped out that could last 20 years before something goes wrong. The bushels would be the only thing to get repaired so I’d say 10-15 years life and after that some things would break down.

B: Repeat business.

J: Well yeah it depends on the sector for example the packaging sector...always new machines and if you get into OEM's repeat business is good. A lot of our business in America is aftermarket business, because the market is so big and Kolmorgan have such a massive customer base in the US, we're finding we're getting all their customers back to us, which is an aftermarket business, maybe not repeat but every month someone new comes in whereas in the OEM in Israel and China we might get a blanket order for 2
years. 20 a month or something like that, for building antennas and that. What we need going forward is more OEMs because with OEMs you can forecast, more stable, usually a quantity every month while with aftermarket its very spot, good month bad month, but an advantage of aftermarket is you can charge more for them so you get better margins, where for the OEMs the margins are low. So yeah you would get repeat business, a lot of our agents would give us that from their customers but going through them. But we can’t forecast for next month but if we had more OEMs' we could.

B: What would ye offer that the competitors wouldn't?

J: Well in terms of the aftermarket, what our biggest advantage is that our major competitor is charging double the price and double the lead. So is a no brainer for us, it’s a very easy win, especially in American and the fact that we our competitors was our parent company back in the 80's so we make the very same product, we don't have to say it’s a clone or anything it’s the very same product. In terms of the OEMs it’s just that the quality and reliability of them are good so they keep coming back to us but price is always an issue with our customer in Israel, we were there a few months ago and they brought it up again, so you have to keep that on board. There is a chance that they could go elsewhere next year, but in terms of the motor we are ISO here so we do ensure that everything that goes out the door is pretty, top quality. Good experience with us, they know us, so you do try to build up a relationship with them, especially from the engineering side, especially with the OEMs that they have access to the engineering if they have any technical questions, they can get the right answers and not pushed around from person to person.

B: The level of product advantage contained in the product, is it directly related to the performance of the product or is there other factors?

J: There is other factors, it wouldn't be the only factor, because at the end of the day that’s what we say is our advantage, customers mightn't think so. Its not as rugged etc.....It’s from doing our own benchmarking over time that we can say that our is ...... and should last longer.

B: And what would be the contributing factors to the success of it?

J: Motor .......or business?

B: The product.

J: Not unless, what we try and do with the goodish customers we try and build up a good relationship with them and visit them and for some customers its important because they never get visited by a manufacturer so some of them find that, they'd be chuffed with that...particularly the Israeli’s, for 2 reasons the political reasons and people weren't visiting there and also even though our guy in Israel might but 200 of these a year for another motor manufacturer that is nothing, they would not warrant a visit to a customer who is buying 200 a year whereas we would. And they'd be pretty chuffed with that and also we can talk about things face to face better than over the phone etc....I know particularly with our customer in Israel that would be a factor.
Certain amount of loyalty but at the end of the day an awful lot of it comes down to price and people will look all over the world, Taiwan, China, US it’s all down to price. We try from here to keep on top of our customers and agents, meeting them talking to them.

B: In relation to the following how significant is uniqueness?
J: No, it’s not unique

B: In relation to product advantage how significant is quality?
J: Yeah, we're good on quality, very significant

B: In relation to product advantage how significant problem solving?
J: Excellent on problem solving, it would be one of the things... we did a customer survey and it would be one of the most important things they'd put us up on.

B: In relation to product advantage how significant is innovativeness?
J: No not really.

B: In relation to product advantage how significant is technical performance?
J: Yeah we would be on par with everyone else on that. no better, no worse.

B: In relation to product advantage how significant is product design?
J: Mid table

B: In relation to product advantage how significant is customer perceptions?
J: Am we get ISO here at the start of the year and part of that we had to do a customer survey, so we picked the top 60 and overall the perceptions would be, overall excellence QDC was excellent although anyone who had a problem the number one problem was cost, we were excellent in terms of packaging, doing business with us, problem solving so perceptions was good and very important.

B: In relation to product advantage how significant is individual attributes?
J: We'd be mid, with everyone else, nothing better or worse than anyone else.

B: How would that be in relation to the competitors offerings?
J: We find that in relation to the competitors offering that, I suppose some competitors have a lot better motors than us and could we get there we could but it would mean massive investments, so god but that’s only in one single area, the brush area they use a different method to put on these than we do and there’s probably are better but other than that we'd be very same than any other competitor. And it’s actually that area that is causing the noise problem for the one in America but it’s a huge investment and that’s
the problem. So we'll see can we work around it in different ways, because when you're small you’re caught in a lot of areas.

B: Can you tell me about the products fit with the company’s existing marketing and technical capabilities? How important is it to the product advantage?

J: Very important, extremely important, there is no way that we would go ahead and make a product here that would not fit with our strategic fit of where we are going. A few people have come to us and asked us to go brushless and we've said no cos we find if we go brushless and it’s still motor it’s a huge strategic move from where we are going to. But the main reason is that we go ahead and design a whole new set of brushless and it could cost us €500,000 of investments and your another me too, competing with about 200 more competitors trying to find a piece of the market and we wouldn't have the resources, the sales or marketing channels to go and do that. So we decided to stay with the old technology and go after the niche side of things, where big boys don't want to play cos it’s not big enough for them and its fine for us. So it would be very important that any design we do fits in with our core competencies and so forth in house.

B: For me too products, would that market be considerably larger?

J: Massive, yeah it is very large, on the brushless side of things there is some very big players out there and they've all lost a whole new range of motors competing with each other so we'd have to be up there competing on that level and the resources that they have behind them and their R&D sections to come up with the latest and greatest technologies and materials, we just wouldn't have the expertise here to do that. And you'd be competing against them. You'd have to come up with a product, it would be a grand little product but probably somewhere around the middle and probably too dear anyway so what you'd end up becoming a very same as we are doing here but in the brushless section producing for applications where the big boys don't want to go so you'd be looking at specialist and that’s what you'd go after. We did serious think about going brushless, we had a customer in Sweden who had a problem with a special type of brushless motor and we did seriously consider it and we would seriously consider it if we got some sort of a half commitment from a customer saying well if you could develop to this spec (that they'd lay out) we'll buy then we would really consider but in terms of designing something and launching it into the big market....no.

B: Would you be aware of all the technical aspects involved?

J: Oh yeah, we'd be very well aware of it cause we worked in it. Paul our engineering guy was the one who designed a whole new range of motors for Danagher motion which be one of the number one companies in the world when he was over in the states so yeah we'd know about all the new technologies, we'd be very much involved in all that sort of stuff. And from talking to, this servomotor business is very much a closed shop, the people that are in it have been in it for years and there're the same people you meet at shows and you know you talk around, everyone knows everyone, no new
people. Even all the agents have been agents for the Ennis factory since the 80's. Same in America.

B: Can you tell me about the cycle time from concept to introduction?

J: On average if someone came in looking for a quote we’d say 4 weeks but last night an order came in from Germany, there is a machine down and we'll try and ship it out today, so we'll build it and get it out. That's a big plus and its one we try...using canban systems to work harder at, you know if you have the sub assembly bit for it the build itself might only take you 30min, if you all the individual parts lying on shelves, that’s the key to it...now will it generate more sales for us probably no but it will give the impression 'that was good yeah'.

B: For a new product?

J: That one was a year, the one for Israel was about 6 months and that would be the fastest unless it was a very small thing. About 6months to a year.

B: That timeline would be acceptable in this Industry?

J: No we'd like it a little shorter...the six month one we worked on it full time and I’d say a bigger factory wouldn't do much more, that would be from concept to physical shipment of the parcel, getting in the parts, trying them out but for a new design yeah I suppose that would be on par with the rest. I know in Danagher it was about 2 years but this is one motor, there's was a whole family of motors so there was about 7 frame sizes it took them about two years and they had all the resources behind them, 500 people working for them, yeah so to launch a new design in a year, yeah that would be good.

B: How important would a reduction in that time line be?

J: You could take shortcuts if you want a reduction, yeah but an awful lot of time of dead time would be testing.....life tests and life tests take time.

B: Can you explain the life test?

J: What we tend to do is we go 1000 hours, run it continuously for 1000 hours and monitor whatever parameters we want to monitor about a month...but some time then you'd be half way through it and something might happen, the electricity might fail and you'd have to start again, so you could lose two are three months so what we tend to do is have so many tests running together, one testing this and that maybe 10 tests running and someone to monitor and get engineers in three eight hour shifts and that would speed up things but you wouldn't design and launch any type of a new product in less than a year, to do it properly..

B: How coordinated are activities in the factory, organisational communication between departments?

J: Very coordinated yes, you see myself and Paul run all the major departments and then we have the guys on the floor doing production. Paul and I are talking every 2min so we'd be very fast, we'd make a decision there and then whether to do it or not do it or go
with it or not go with it. We wouldn't have that type of bureaucracy that you'd have in a bigger company.

B: Is that an advantage?

J: Major advantage, sometimes it can be a disadvantage because we might hum and haw about things but in relation to making a decision we can do it in 5 minutes and I know when we worked in Danagher motion it could be weeks, meetings here and meetings there before a decision would be made. But sometimes you might get distracted and it might go to the back of your head.

B: How significant is being market potential; is your company aware of the market potential?

J: Oh god we are and our company has a very small slice of it because it doesn't mean an awful lot for us because we are a small company we don't need a lot, but the potential out there is big but what we have found over the last few years we're not going after big orders. For us we'd get customers coming in with orders for 200-300 units every year whereas in the past our competitors wouldn't be interested in that but what we have found now particularly in the last 5 years, they're as interested in that 200-300 as we are. So they are also going after the, market as well. What we don't want to go in after is someone who is looking for 10,000 units per year, no we don't want that we are not able for it. And they also want that so we are finding that they are also competing against us.

B: How competitive is the market; are you aware of the intensity of competition in the marketplace?

J: The market is very competitive, we started off in 2001 and it wasn't very competitive, it was much easier get customers but the big boys are interested now. The brush market might be small in comparison but nobody is discontinuing lines or anything like that.

B: How advantageous is an awareness of marketplace competitiveness to product advantage?

J: I wouldn't think of it as significant to product advantage just something that you must know, if you don't know the competitiveness where are you going. I don't see it as an advantage in that we haven't taken advantage of it, we can see what our competitors are doing but we haven't produced anything better or gone to do anything better. We know about it but we haven't done anything about it.

B: Which would you consider more significant to product advantage, knowledge of customers or knowledge of competitors?

J: Knowledge of customers from our business sense anyway, we are led by our customers. If we had a more in-depth knowledge of what our customers want I fell that we'd be better off as opposed to our competitors, in terms of the business we have. Our competitors might think different. But in some cases the customer doesn't know what they want, and sometimes they need someone to say this is what you want.
B: Has listening to customers ever been a disadvantage?

J: Sometimes it can be, they can put you on a wrong trail particular if you’re talking to....we did a major push in the states about 2 years ago, we did a kind of road trip from one end to another talking to people and what you tend to find is that customers will be giving you his perspective of things and a lot and at the time we found was all the guys we visited all wanted to become agents for us at the time and even though it might sound flattering they were only looking after their own angle but then the big killer would come out 'we want to be exclusive' and we'd say no cos they say this as an easy buck......other guys would be looking at their angle, 'if I had a motor that could do that I could sell that'. So sometimes yeah listening too close to customers can put you on a wild goose chase but we would be very prudent here before we go into any design or anything that our prototyping would be, god there is a good chance of a sale after it. No innovative new products and see would it fly.

B: Can you tell me about the factory process?

J: Paul and I we look after engineering, sales, purchasing. Ray looks after finance. On the floor we have Tiber in Quality and 4 operators so basically an order comes in, or queries, for a product that we have...we'd slot it into a product time put it up on our system. We have a meeting here every Monday and we allocate who gets what and out it goes. Another a query for a product that we don't have....I’d work with Paul in engineering and we'd come up with a design, a drawing, spec give them a quote and the order might come in....we'd look then at what parts need to be bought in and we buy the raw materials........for all standards we'd have them all on the floor and then it is put on the schedule and same as before.

B: Does each operator work in Cells?

J: Yes each operator works in cells. We can walk down that way. We separated ....the motor is made up from 4 different components, mechanical, armitature taco and each one of those has their own self contained cell. Suite to us because most motors we'd build would be in batches of 1 to 5, its not continuous production and everything is beside.

B: Everything is built to order.

J: Yes well we would have .....for the most popular product we'd have the subcomponents build like that guy in Germany we'd have all the sub-assemblies built so you could build it in an hour. Yeah we'd have no finished units in stock. That’s the nature of this kind of business, our is customer special. We'd often go back and look at it and think but constraints it never happened.

B: What's the future strategy for NPD in respect to Callan Technologies?

J: Yeah, well as I said earlier we have a pipeline of about 5 developments that we are working on...at the moment we are just playing around with the idea of where we are going to go in terms of ......there is one area..it’s kind of a niche area again...it’s a high
powered motor predominantly used on forklifts and moving vehicles where you'd need high power and that's an area that we are thinking of going after to see if that's an area we could move into. We've had some success in a small way over in the US with it so we're thinking of.....it wouldn't be development as such because we'd have all the building blocks here just putting it together differently, so we have about 5 or 6 projects like that and we have to make a decision very shortly on that which one we do or we might even do 2 or 3 depending on the cost implications or the resources some might not need an awful so we might combine. They'd be similar enough that you might be able to spread the costs and people around or whatever. In terms of where we are going, we are going to be a custom manufacturer of DC servomotors, that’s what we do, we're not high volume, general market, so we have to go after the custom market area no general so any of our designs would have to fit into that. That would be our focus going forward, very focused, at the moment we have both OEM and custom. We will always need the volume guys there're your bread and butter, pay the bills

Size limits, you know. We find ourselves fighting a lot......we need a good production manager on the floor. The more we are down there the less that gets done up here in terms of new design, new customers and that’s what we should be doing everyday not down the floor. Need to concentrate on growing. Need extra staff to alleviate the burden. Branding getting name out.......nobody recognises......we find once we visit....a few orders might come in.

No business in Ireland, no machines built, no production machinery......Germany number one, Italy and France..

No issue dealing internationally, deal through agents and have been dealing with them for years....no issue...also product is technical parameters so they'd be able to read anyway. Maybe is an issue for initial contact....girl on office......not same chat when not in English....Germany no chat, it’s all business.....so we need the agents, comes with disadvantages, margins etc...If we were going to employ in Germany one guy wouldn’t do you need two up on an 100,000 per year, for that they'd want to be ringing in sales of €1million plus and that wouldn't happen too quickly so it's not feasible.

90% order through email rest fax, nearly all price customised etc.....

We're been in Germany and Italy in the last 2 months and what you find that when you come back you have opportunities to quote for very specialised projects and there is no guarantee and we'd put in a lot of work design, drawing and cost it and go back with a price and sometimes it doesn't work and can be frustrating ..........when you come back always a lot of work to do.

Buy everything now from China or India........logistics is hard but others find it

**Interview 2**

B: Has much changed since I was here last?
J: An awful lot has changed. I can't remember exactly what it was like on the last day you were here but 2009 was a disaster. The bottom just fell out of the market, all manufacturing. We were at that shows last year and everyone was saying that, everyone had dropped down 30-50% based on 2008. In about Feb 2009 it started right up to October of this year things have improved dramatically up 30-40% on 2009. What we have found since Oct it has gone very quiet again, the last quarter is not looking good. But for us what we found is that we got two good wins this year, one from Israel and the other from the US.

B: Within your current product ranges?

J: No it’s actually with a company that makes servomotors as we do but they make brushless motors, and whatever application it is going into they wanted a tacko, which we manufacture for our motors so we now manufacture for their motors and it was good high volume. And we are getting another one now where they want the same but they want it 20ml thinner and that might sound easy but it was a complete re-design to take 20ml off it. But if that improvement is passed it means that we could potentially double our sales to them, because last year what we shipped to them only went on one product but if we get this right it will go on all their products. So we are hoping now and testing it this week and hoping that this will come to fruition. What that will do for us is next year it will give you a base every month, because they will order something like 3000-4000 units spread over the whole year so you are talking about 300-400 units every month and that’s a great base to start off with. And the same with the guy in the states. The guy in the states is about 1000 units for us again and again that would be spread over the 12 months so again it is a good solid base. And then you’d have all the other type of business that comes in every week, every day that you can't forecast for but always comes in. So if we can get our base risen we hope that 2011, but this is very much dependent on those two people to hold thing up, so we really do need to work hard to ensure we win them.

B: A lot of negotiating?

J: Yes, because price is a major issue and ahh you know we really want to win so we have to look at our margins here as well and let that be the basis in terms of keep the lights on and keep wages paid and then the other business can make the profits for us. And on top of that we are working on 3-4 new projects at the moment and if they came through at all.

B: New products?

J: Yeah totally new products.

B: Brushless?

J: No ah in fairness we just don't have the resources for it and it’s a bit like the chicken and the egg. We first want to get the resources and go on to build our top line, we don't want to go borrowing to invest in the place and borrow whatever off the banks. You know we thought considering what happened over the last year was possible quite
prudent thing to do considering the way the banks went and cash was king and all that stuff. So we are trying to grow out of our own profits and that’s slow but we reckon if we can get over and get a small bit more critical mass you could start hiring in resources that would allow you to accelerate back upwards and onwards.

B: That’s 3 products that you are looking at developing?

J: Yeah well they wouldn't be new products, they would be based on our standard platform, and three new customers are looking for new applications.

B: Existing customers?

J: No two are new customers, one in Sweden and one in the UK and they are brand new and the other one is through existing distributors, new end customers we will call them because we distribute in Switzerland and another distributor in Sweden and they’re looking at different applications, a different end user. But to us the distributor will be the customer basically.

B: How do you manage the NPD process?

J: We use the tollgate system and we seem to be very much customer driven, we won't sit down and say ok we are going to design a dc servomotor that’s going to be all bells and whistles and do this, that and the other. We don't do that but we look at it and say ok we are getting in various requests from customers for this type and the other and we kind of let the customer lead us on in terms of product development. You know our focus really is very customer focused.

B: Are customers involved in the process?

J: Well it would be very basic, when a customer wants something it is either mechanical interface difference or different electrical within the motor. And for us that would be the thing to do, you are still basing it on the basic motor that we have today but you are tailoring the output side we the customer is putting it onto his machine or wherever he might want and you are tailoring the magnetic side of it to suit whatever speeds, currents and power he is looking for. And that’s not development per say, well it is development but it is easy for us to do it because the fact that most of our work is all manual and we can quote and say well that’s a different size wire and a different number of turns and a different length of magnetic and we can do it like that and off we go. You know it won't mean any major input in terms of new machinery or new work practices or anything like that.

B: You make and send to the customer?

J: Yeah

Do ye do your own in-house tests or is it then sent to the customer to test?

We do all our tests her, we test from a quality point of view and from and if it a new motor came out that was very different from what we do we would put it up in the lab to do tests not so much a life test but a rating test to do, it does what it says on the tin
basically. If we say that it is a one kilowatt motor that it is a one kilowatt not 900 watts or whatever. We do that for motors that are very different to the motors that we have today because we have all that done and we are not going to start repeating these things for the sake of it. So you know our product development would be very much customer led.

B: Was the most recent product a major re-development?

J: For the crowd in Israel, it was a major redesign of our existing part but that was because he wanted it 20ml shorter so it meant redesigning every part of the design to get that 20 ml out of it.

B: And removing that 20ml, would that be a significant innovation?

J: Well innovation might be too strong a word, no it wouldn't, there would be tacko's as small and smaller even but our tacko's would be that bit more robust. Now when you get that into that smaller sizes things can become that more flimsier but i think that one of the advantages we have for this customer is its robust, it’s really robust and you could throw it off the wall nearly and still pick it up.

B: That would be its most significant advantage?

J: Yeah that would be the big, the number one advantage of our products, making them very suited to industrial applications and so they can take abuse.

B: Would product innovativeness be important in the industry?

J: No, not in the dc because the DC is a tried and tested kind of product and you know it’s being like that for the last 20 years so any of the innovations that are coming out are in the brushless side of things and any innovations there are in the manufacturing side of things, how quickly and cheaply you can manufacture these. Now they have done very cute things there in electrical designs and how fast they can wind and all that sort of stuff. In terms of what the customer is seeing there is not really innovation there although the costs might be coming down alright.

B: Is superiority a significant contributor?

J: Well yeah I suppose, well at the end of the day we see a couple of other motors that would be pretty robust in from France or Japan and they would be pretty robust as well. Well i suppose what we have seen in the last years is that a lot of our competitors are getting out of the DC market because it is not a growing market, it’s a very niche type market and in general automation it is more of a nuisance to a manufacturer than anything else. So a lot are getting out of it and we find that we are getting in as replacements and when you replace a motor you have to replace every single aspect in terms of and all seals, it has to be plug and play. So to do that is not that easy because there is so many different, there's the mechanics and then there is the electrics inside of it all has to be the same, so that is what we do and we think do it well and there would not be many like us that would do that unless you were buying big big quantities where we do it for ones and twos and we are finding a lot of business there. Where for us the
DC business is declining we are kind of seeing a growing market because competitors are living it. But in terms of product innovation no, it's a tried and trusted product and you know no-one is putting it into the DC motor. They would put it into the brushless motor but not into that.

B: Is there room in the DC market to innovate?

J: I think if we were to innovate in any way it would be in-house, in terms of how we manufacture it, we are still a bit too labour intensive and not really from a customer perspective. And that's where we would see the major innovations not in product design or anything like that, no.

B: Are all products specific to individual customers?

J: Yes all specific to customers.

B: You match what the customer wants/needs?

J: Yeah we match whatever machine the product is going onto. And when it is going onto a machine the first thing it has to do is mate mechanically and that joins up the same part that the holes are in the right places, the screws sizes are right, that the shaft is the right diameter and the right length, that it matches the connection is what he wants, that it's a flying lead or connector or whatever. On the backside that he might be adding something onto it also and if he is that we have the dimensions back here and then internally the guy could come back to you and say we want a 3000rpm one newton metre motor, that a 3000rpm you will get one newton metre from that motor and it won't overheat and it won't fail. So that is where we work but normally in the business the guy will come back to you and say yeah we want a motor that’s 3 newton metres 3000rpm and that they might say to you, you know there is a lot of standards, so they might say to you it’s got an IEC face and it’s got sharp diameters x mm and then there is all these standards and we would know what these mean.

B: Where would all these specifications come from?

J: All these specifications would come from the customer, etc. the shaft is 12mm by 6mm and that’s enough for us and he would tell us that it will operate at 3000rpm and i need to get 12 newton metres out of it. Now if he didn't, he could come along and tell us what the machine is and we would work it out for him but that doesn't tend to happen a lot, machine operators tend to know what is required. The only person that wouldn't know is if some fellow had a machine out the back but machine manufacturers would know what is required.

B: And ye meet those specifications exactly?

J: Yes exactly or exceed, whichever.

B: And is there scope to exceed?

J: Ahh there is yeah.
B: Exceeding the specifications, does it happen a lot?

J: No, it happens sometime but it’s more of a ok thanks. He might say i want 2000rpm at and we would say ok, do all the calculations and say this is the size of motor you need but by the way actually you can get 20% more than what you were looking for if you want it, they'd say fine grand thanks for letting me know but i don't need it i asked you for 20, i don't need 25.

B: Would many come back and say they don't want the extra?

J: Well they actually don't make any comment on it, would you believe. If they come and what really we would see a lot of it is in our when we are replacing a competitor motor and the competitor motor might be a two newton metre and we'll say well our replacement has the same physical size its physically shorter and has 2.5 newton metres and he'd say that’s great. Where that would really come into play is when you are selling to the final customer that you can say, this motor is more powerful that your old one but that is all there is. The machine in fairness was probably designed first day to take 2 newton metres and you are not going to take 2.5 out of it. You know it’s designed to get this out of it. It just might physically not be able to get there. We usually just have it as a nice extra; you know if you are buying this have that for nothing.

B: Existing or new customers?

J: Existing customers, generally for new customers you give them what they want. If you try and exceed it generally what happens is that the price goes up also and then maybe you are a higher price. With these products price that is number one, ok you can try and sell your value after that in terms of what is in it and all that but the thing you have to meet is price. That’s very difficult because you are against tough competition, now we are not always the cheapest so we always find ourselves selling our value, now the price is there or there about we wouldn't be out of the ball park. But these guys will angle over €10, a motor will cost €150 and they will haggle over €5 or €10 and they'll say sorry lads and that €5 or €10 could be all the difference for us you know. So you try to sell you value then, you know it’s got 10% more power, even though they mightn't want it. That kind of thing.

B: Are competitors doing the same thing then?

J: Oh god they are yes. They would, a lot of our competitors are big name people so we are against the big brands. So we have found that for some unknown reason people respect big brands and even though you can get shit quality from big brands, they'll still stay with them because they are big and they are there. Brands that’s when you are getting into manufacturers, an end user will take a unit from china to get his machine going, he doesn't give a damn but when you're getting into manufacturers, yeah. Well they want to make sure that you are not going to be there for a few years and then gone and with the big brands they are not going to go over night and you get the service and you will get the support and all that stuff and with us i suppose they'd be half afraid and that is one of the reasons we are going on a big branding marketing exercise for the next
year or two, just to get our name up there. We are over here on the west coast of Ireland and they don't know us from Adam you know.

B: What kind of marketing?

J: Well we do both direct marketing and through our agents we have in other countries. The agents we have know our products very well so we don't have to give those training courses or anything like that, they know our products as well as we do and we also do direct and that's the way we work it. And what were the major findings.

B: And being close to the customer and meeting needs exactly. How does that impact?

J: Well it depends what you mean by meeting customer needs, in our old company what they did was they were launching a whole new drive, this was about 10 years ago and they had a major plan of in theory it sounded lovely, they went around to all the major users of this drive asked them all the questions they could think of, the goods, the bads, the different. Put all this into a big pot and came out this new product and the product sold nothing. Just didn't sell at all and was discontinued within 2 years of its launch. And when they came up and told me how they were doing this i was like yeah impressive, it has to win, you are asking people what they want and then is it like Henry Ford and his car when he asked people what they wanted they said faster cars...do people know what they want and where they found where people were successful was following a particular sector. For example where one company looked at was at the packaging sector and concentrated on machines that did packaging, or machines that open doors etc. and found out what companies want in that sector and yeah they got it right and became world/market leaders in that sector. I don't know for us most of ours are one to one with specific customers, he has a specific need and we give him that need, we don't want say ok, that customer now wanted all that, lets develop a product that does this and launch a motor like that and see can we sell it to the general market, we would not go that route, it is specific to that customer.

B: Give the customer what he wants, is that sufficient, does it add value?

J: Well I would say that there is enough value in meeting what he wants, than adding extra onto it because in the nature of our business, if you get a motor that operates that machine as it should then he is happy with that. The fact that it can do an awful lot more you know it doesn't really add more value to the thing, there is no point in having reserve there when it is never going to be used, it’s no good and what happens then is because it can do more there is probably extra cost in it and they say look i would prefer to get the thing to do what I want it to do and get it for 5% cheaper. The fact that you could have extra value for us no it would not work. It’s a great selling point in saying that.

B: Do you measure customers’ acceptance?

J: We did when we got ISO they were all on about customer satisfaction surveys and all that. And we said that’s fine and everything came back as expected all positive except for cost, a bit expensive. So we stopped that and what we do now is visits and we’d
have a pre-set of questions that we would have in our head and we would ask them 5 or 6 key questions. And get what we call voice of the customer, get them to tell you either (a) what they would like to see more on your motor and (b) on delivery, are you good, bad etc. And get those 2 key things and not rating 1-5. And from these get the voice of the customer and we are really only starting to monitor these this year. What can we do here for this customer to ensure that he is locked in and won’t switch to another customer.

B: How do you communicate with customers?

J: Predominantly by email, but it is very personal, you would be speaking to the design engineer and it would be going over and back and so on. Very seldom that you would send a motor out and not know what it’s for. There is a lot of thought put into the purchase. Its a fairly big investment in that you don't buy motors every second day of the week. A buyer will look at it hard; they will want to know who is making it and are they competent and all this sort of stuff so there is a lot of interaction with the customer. In our business you will never win a customer unless you visit them, you have to visit them. There could be a year of toing and froing with emails and technical data’s and all that and there could be a prototype sent over but truly to get the customer you have to meet them, you might get a few motors off them but that is all they'll give you. You have to meet them, they have to see you because you know motors, even though there is a lot of competitors out there, to change a motor on a machine is a big job. If you get onto a machine you really have to mess up to get thrown out of it, so in essence is equally as difficult to get in there. Once you are in there you have to make a big and you build a relationship then. We were in Israel lately and we met with 4 customers there and all 4 of them said to us, you're our number one supplier and i think if we can keep them satisfied in terms of pricing and service we will always be they're number 1 they are not going to look elsewhere because it’s a big job to take out your motor and get someone else to match it in terms of mechanics and electricals. We are unique in on sense that in we will do high customisable motors in small volumes, there is not a lot more out there like us. There'd be companies out there who would do customisable motors but they want high volume and smaller manufacturers don't want that, so that’s why we would be very customer focus and that’s where our innovation comes in, we will work with the customer and give them what they want and not design a whole new magnetic circuit and be patented and all that sort of stuff, we wouldn't have the resources for that.

B: Do you measure new product performance?

J: Well we would, we have a small motor, it was the first motor that we designed and launched ourselves and we did kind of go and say this is what we hope we could there. It’s a unique product and a unique card number so it is very easy to find out how sales are going from it and what we found is that sales are going slower than we anticipated. We thought we would do it in the first year but now it’s looking like year 3 or 4. So sales are generally what we would measure.

B: Market share?
J: No market share is really too low for us to bother measuring, when you think about it the European servomotor business would be worth in and around €7 billion worth of motion and we would be just over a million of that, so very very small market share in general motion. You can start breaking it down into DC smaller motors but i have never seen a report that will break it down into smaller sectors by product, so how many of these that a sold a year i don't know but i have tried it with CSO because we have the tariff codes of this. So i said the tariff code of this is 1234, can you tell me how many of these was sold in the country and they kind of can, they group a lot of stuff together but you can in Ireland anyway find out how many of these units were bought in. But to try and get that in Europe you probably would have to commission someone to do a report, you will get or buy reports but they are pretty expensive around €10000 and they will give you the overall motion market and that is too big for us, we'd be only a small bit hidden in that report.

Last year we were approached by a motor manufacturer in Germany which makes motors like this and much smaller so they were not competing with us. They are mainly, like their motors would be used in car doors, wipers and they were looking to increase the industrial side of things, various countries where they had no representation. They came over and signed us up basically. So part of our key was we went to what, what the sales in Ireland and we hadn't a clue from Adam because we hadn't sold a motor in Ireland. We never had all our sales were export. So i rang the CSO and i gave them the tariff codes and they could tell me over the last 5 years, €5million imported in 07, €3 million in 08 and so on. They could also tell me the number of units, 5000 or 20000 or whatever but they couldn't say where, e.g. Dublin, Galway etc. But what we found was in 06 so there must have been one big event/company or something. But i couldn't find out. I could find out. But i reckon the information is there but it is probably split over 5 different agencies, no central agencies, because all this information must be known. I kind of said i had other things to do and didn't spend any more time on it. I know we will be meeting another motor company in Nuremberg next week and that’s the first thing they will ask us and we have done feck all on it because we have been busy on our own stuff and that’s always number one, if the other motor business comes in great yeah you will take it but of wouldn't do much work on it. I don't know what they saw in Ireland and there probably is use for it somewhere. You know ideally you want a person to say that’s your product line and go away and do it. Again it’s a cost and resource we don't have.

B: How many staff do you currently employ?

J: It fluctuates, we were a 6 went up to 9 and now we are at 8. Because we won an award this time last year and it was nice and we got €9000 of prize money and it was grand because it was just before Christmas year. It meant zero to us in terms of extra business but it’s nice to have. Generally last year we had two new customers, US and Israel (gotten by agent) while the one in the US is our own. And we were with him last week and he said to me, at the start i told my staff that these guys would never make it and ye did, fair play. I never asked him why he thought. Maybe because we were small and we wouldn't be able to manufacture because he was talking about 1000 units at a
time and for us that would be big volume, we are more into 4 or 5's. A lot of ramping but you just have to change things in terms of the raw materials you are buying in and you have to watch things in terms of processes are robust. If you are building one motor and something goes wrong, you can fix it on the fly but if you are building 1000 you have to be spot on right, right through the system.

B: Do you check?

J: Yes every motor goes through a 100% check both mechanically and electrically. Quality is a major major. In manufacturing there is a slight bit of wastage, something always goes wrong but generally we are running at about 95% yield, we might have to scrap 4 or 5 out of every 100 or so etc....But we deal with it, you have to. We would like to think that we could order in 1000 parts and 1000 units go out but that doesn't happen. But i don't think we are unique in that.

B: What are the key aspects that makes a product a success?

J: I think I must from our side of the business we would put quality and cost and what you would call launch-on-time we would call delivery. As opposed in any product, on-going product quality, delivery and cost, we have systems matrices in house to monitor to watch and if we get those right we start winning in customer acceptance and margins that another different thing. But definitely if you get quality, deliver, costs customers will repeat buy off you and not one above the other but all three equally. And the other type of thing now we have never gone in there because of the type of motor we have but I have seen it thrown in there by other companies is called innovation. Quality, cost, delivery and innovation. And innovation can take many forms it doesn't have to be whole new product, a re-design it could be an innovation in terms of service or even there as benefits but in terms of our business would be the main things in getting new customers and maintaining customers and keeping them and if you can get them right you should have a pretty good business. And that first came from the company we worked in first in Ennis, Danagher motion and they took that from the Toyota business systems back in the 80's. But what we have seen from going out to customers and talking to them is quality, delivery and cost. I suppose our market is different to others, we are not here to be the new world leaders in terms of new innovative product, that’s not our business, we want to be the leading supplier of DC servomotor because in the nature of our business you don't need a lot of new innovations or design or development but if you can meet quality and cost that’s matches customer perceptions. Buts that for us and that would fit what we go after in our business. But I would think that it might be similar for other businesses and that model would make sense to me big time. When we started out our business in 2001, the top three things we said we would put measurements in place for contingency watch, quality, delivery and cost, not saying we are great at it but we do try and focus on it. And we say that if we look after those three we are looking after the customer and that suits our business model.

Probably in nature of micro business innovation isn't a requirement for business success, maybe when you get bigger it is. But from what I have seen, maybe when you step outside the niche market. Probably when you get into the mass market you need to
innovative. Where the old company Danagher motion successfully innovation was in world class manufacturing, bringing in processes to stop wastage and so on.

For us innovation wouldn’t guarantee success but those would, quality, delivery and cost. If you can do those right, unless you have a product that nobody wants. They are exactly the right things assuming you have a product that people want, you get those three things right and you are there and that is for new and on-going products. They are the three things we point out to every vender and we measure the vender on all these three. Those three and communication with the customer is also important and we have newsletters going out to them every month. After a couple of years you know you build trust and be confident enough that if you look after quality, delivery and cost and communication, its good.

Company B

B: Can you tell me about the business?

M: We have an engineering company that we started in 1996, which has very how would I put it we started in 1996 driven out of demand for engineering in Ireland in 1996. I had come back from America in 1994, I had trained over there to become a tool and die maker, which there is none in Ireland, there's a lot of toolmakers in Ireland but very few specialising in high precision metal stamping. I went to the states in 1987 and trained how to do that, came back in 1994 and in 1994 I worked in Molex for two years and about that time the demand in the mobile phone industry was growing at a rate of knots and as luck would have it that was my skill, I had worked in the states doing exactly that building tools for the mobile phone industry and as luck would have it again you would say Molex in Shannon became the sole supplier to Nokia for a lot of their components so that was how elite tool and die started in 1996.

In 2000-2001 I didn't like the way the economy was looking, even though we were on the verge of the Celtic, we were really getting in full swing of the Celtic tiger I personally didn't like the way we were going. I could see what was coming in from China and the Far East in the tool point of view and their skill level was growing and their ability to supply was improving by the day so I didn't like where it was going and tried to diversify a little bit within the tooling sector to see if there was other tool making I could do given that was my core competency-the high precision stuff- seeing what was coming in from the Far East at very good quality it was only a matter of time before my customers would start going over there because the cost factor was a third or maybe a quarter so I started going after other tool making to find it was very hard to get it out there. It’s very hard for a dentist to wake up in the morning and say you know what I don't want to be a dentist anymore I want to be a doctor. It doesn't happen like
that so I tried to become a doctor, try it for a year and wasn't good at it so tried to become a chiropodist. In other words what I’m saying that I tried within the tooling sector different things to see was there some opportunities but sure I’m a tool and die maker, I’m a specialist in high precision. So I kind of gave up the chase in that in 2004, I wouldn't say gave up the chase, throw in the towel but I exhausted every aspect of it and came back to my core, at the time I had 24 toolmakers that was in 2003 I had 24 toolmakers over the next 3 years I brought that back to about 8 which is where I am at with 6 toolmakers. So not giving up the chase on diversification, didn't like the place the tool making was going I wanted to get close to the consumer, I was very far removed in the engineering to the consumer - I did a good job and supplied the tools to Molex who supplied to Nokia who supplied it to car phone warehouse who supplied it to the consumer I was five links down the chain. If I did a brilliant job and Molex did a shitty job I was out of business etc if nokia did a shitty job then Molex and myself were in trouble etc......I was so far away from the consumer that even though I was rated the second best supplier of precision tools in Europe to Molex, we passed out a company Philips from scoring chart they had up we went from number 14 to number 2 in 2 years which was fantastic but the problem was when we got to number 2 there was no demand left for us the demand gone, so when all that thing started in 1997-98 we were only number 15 in 2001 we were number 2. The problem was in 2001 the demand had started, the demand was always there, the supply started to improve from the far east and the supply started improving and more so and actually what really happened was that a lot the mobile phone companies wised up they actually just changed the shape of the phone and not the functions, they added the odd function. When mobile phones first started coming out you could ring with them then you could texting in phones what we did was we designed and built all the metal in the phone so every time they added a feature there could be 2-3 new tools to go with it, in a typical nokia phone in 1999 you probably had 16 different tools. So then they started standardising that and said to hell with the features we just start changing the body and making it agronomical which fucked us up, the part that we wanted. We didn't do the casing and all that. So in 2003-2004 I designed a product and we took it to the product (because time on his hands) out of necessity (coat stand feel, no need for stand all I want is 4 hooks etc........). We took product to world invention show in Geneva and got the bronze medal, sometimes it can be dangerous (the worst hand in poker you can have is the second best hand) it gets you in trouble that got us in trouble in that we thought we a thing that we were going to make millions, so we struggled we took it to the states, got it into QVC and through distribution in America and spent an awful lot of money on it, got the patent, because afraid of someone seeing it, horsed money into patenting and when we took to the market the demand was there but just not to the level we need it to be there. But anyway what I liked about it was the name and the tool making was tipping along and I was removing myself from the tool making because had been working on it for 10 years, the structure, machines etc were there they could manage themselves so I had very little involvement so I decided at that stage that I was going to start making an effort in the household space. We called it the … hanger and I had a vision that we were going to develop a range of products focusing on keeping you tidy. That was 2005 we got the hanger into the market in Nov 2005, we followed it up with
laundry baskets and things that we started sourcing from China and we now have 14 products (outsourced distribution) we are in the Irish market, UK, talking to Can, Ger etc......So for the past year have been developing new products, fast forward with that trying to get it into a many accounts as possible, Hopefully by 19th December 2008 in 300 shops in Ireland another 300 in UK with a view to pushing it onto Europe, that’s the brand called ??? ( message “its all in the name”). Brand is currently in Atlantic, 4home, Woody's and Heaton’s but hopeful for Supervalu, Dunnes, Tesco. Most popular product at the moment is the Car bin, best selling product in Atlantic. Running out of Car bins. 5 products that are their own, others are rebranded with name. In 18 county councils in the country, each ordered 1500 to give out with road tax to help keep litter off the road, 21% litter on roads comes from cars. A hot product at the moment and own design, two functions car and folds into itself. The big thing is people to go into shops looking for them, word of mouth only went into shops 8 months ago, the place our product needs to get, what has learned about retail world, if you are selling something for under €10 it needs to be in the Supermarket, if you are selling something for €1000 it needs to go into 4home because you only need to sell one of them in a week but when you're talking about low retail price it’s all volume based and the volume is inside in the supermarkets. So in an effort diversify I found that I couldn’t become but we found skills that we were good at, design, packaging, toolmakers and turned two or three of them into designers, re-skilled the staff and now we have more people working in Company B. 7 in Company B and 5 in other company, back up to twelve and vision in 2 years is to have about 30 people in Ireland with Company B, push it on with good distributors, design support and we have in Company B - how we tried to develop the company, we have new design which you can protection (the way forward) Re-brand (not the way to go but for people to start looking at you, you need to say that we have 20 products even though 50% of sales comes from one), 30 % comes from another, 15% etc..... Brand Loyalty important, Company B.

Just last Friday put an application in for patent for a new product (revolutionary) to rival dyson but in a different sector. Laundry rather than vacuum but we looked at what he did and did something very very exciting, all guesswork took a daily chore and looked at it and how you can improve it, you can stumble on it or study it one or the other. I believe he stumbled on it. Look at the process, if you want to Hoover you have to role it across the carpet accepted. But break it down into attributes lead, winding of the hose but the bit that was always a problem was the bag so he saw problem with bag so got rid of it. The technology was there to do it, remove the dirt made it different and branded it. So we took a daily chore called laundry hanging out clothes and we studied it, myself and team. have to walk to clothes line, clothes have to get air, garment had to be on the line and we looked a women doing this and the only awkward piece was the peg, they were clipping the peg and putting it on and it was falling on the ground and getting dirty and a shower of rain was coming and they were rushing to the line and holding the clothes in one hand trying to unclip the peg in the other, pegs fall lawnmower. So it was the peg was the problem and every year you change you pegs, if they fall or are out over the winter and gets dirty, wood rotes, rusty so we took the peg and revolutionised it.
Peg was shown, details and demo, no clasp, on a string doesn't fall, new material sourced from Germany springs back into place. Taking out the wood, spring etc.....Thought it was a nice idea and took it to the UK last week and after going berserk with it. Long lasting durable. Testing it at the moment. First thing English asked was it dishwasher safe and I thought he was mad, they wash their pegs in England, talk about different cultures. In England don't leave their clothes pegs hanging on the line in Ireland we always do. Said at meeting never fall off line but women said that we always take our pegs in because they always did it. Different cultures. English company very bullish on this - going to change the way people do their laundry. New peg won't get dirty, rust etc................Phase 2 new material that you will be able to pull garment off the line. At phase 1 phase 2 will have a mechanism that will just click, don't know how to do this yet but will work on it. But this out to around 6 different housewives in the last six weeks and response has been scary. Patented last Friday, thing about this patented the hanger straight away, this once it was made, when patenting you have 12 months when its very affordable to put a global patent on the product, in this time period you can see demand and decide if you want to carry on, previous occasion in this 12 months only bringing hanger to market, call then where you want to patent each costing 4-5 thousand whereas if had brought to market gone out there I wouldn't have patented it at all. If the demand isn't strong enough to cover the cost and now going to remove, for peg the actual product was there tangible before patent.

B: How long was development time?

M: From concept to patent date 1st Aug was 7-8 months.

B: Many prototypes?

M: Lots around 5 prototypes at that stage. With different materials, the original plan was just to fix problem of falling on ground and original prototype was regular peg with a string on it because I didn't see this as being a big problem but when it was consumer tested the women said well I still have to do this bit can you get rid of this for me. So when we went back with it again until they had fixed .........all done with an ad hoc consumer tests. Going to be called the green peg. Maybe change it to the Company B close peg for brand loyalty. Normally pegs are 30 for 2.50, we'll be selling 30 for 10.00 - how we are going the separate yourself from the market? going to charge so much they'll have to say there is something in this. We are doing it because of material, the material in the peg costs more than the box of others, price is big. Financial controller’s wife etc......

We want to make something you do once or twice a day so easy that (went upstairs) for tests on a close line etc.................discussed product. First prototype shown. Glued to see could they manage with one or two part moulding for cost efficiency purposes and it will. Maybe in time to come a two part mould can change colours, adding features to personalise etc.....Only one size peg. Back in office...

B: How many are engaged in R&D full time?
M: 0, No-one when a time comes to develop a product then we'll put a team on it. Hopefully in 3 years time but not at the moment. At the moment concentrating on one product, marketing efforts etc. Could not afford at the moment to have someone engaged full time in R&D in new products nor could afford to be bringing new products to market takes 8-9 months to bring one to market. What we need to do is to stage it in such a way that we have 8-10 products flying off the shelves in accounts across the globe, in two years time when revenue is coming in we can then look at having design and development and sourcing. At the moment it is broken up with sourcing on the left and operations and on the right design and development, used to be 2 designers now only one.

B: Can you tell me about the NPD process? from concept to commercialisation? Is it in stages?

M: Yes there is gateing that we use? What process do we use? You come up with an idea you have to find out 2 things? Is it marketable and can you make money. So really you can put it through all the gates in the world. The thing is it marketable the way we find out that is through questions and answers, focus groups.

B: Do you do a lot of market research?

M: Well yes we did a lot of it with the peg. Price points is very important, asked people what they would pay for it, might not be a great structure in that but that is that method we are using?

B: How confident are you in your market information?

M: A lot of it is good. A lot of it is gut, also can we convince the market put a PR plan in place if it’s something new and very innovative that you can change, can we convince the market that this is the only way to go.

B: Product advantage how important is newness, radicalness or is it its problem solving?

M: A bit of each, the price will turn it into new and radical and the function will solve the problem. A bit of each one consumer may want it for class distinction one because it solves a problem. Won't know till I get out there with it. We can up with an idea for organising handbags, showed it to 30 women they loved it, took it to the buyers they wouldn’t list it. It’s great to have an idea that the market wants but you must have an idea that the shops wants to list. You could have the best product in the world but you can't get it to the consumer, the key is to get it in front of the consumer and the way to do that is to make sure the buyer wants it. The buyer knows there customers etc....made the mistake, consumer said they wanted it buyer said no.

B: Customer orientation?

M: Need to be close to the consumer, no point coming out with something the consumer doesn't want but its two stages get the research from consumer but before you order make sure the buyer is on line - get order before you manufacture. Because consumer
wants it doesn't mean you can get it to them. might be conflicting etc. Out of pegs the retailer is making 40c out of us 2.50. I break the customer process into 3 customers, consumer, manager, owner all wanting different things. Give all three what they want.

B: Competitors? Who are your main competitors?

M: JML in Ireland and the UK.

B: How confident are you that you know what they are doing?

M: In the this space there is no one focusing on Company B "it’s all in the name" But maybe in future going away from Company B and getting clever, we’ll associate Company B with clever products. But do we monitor what JML yes we monitor their sales merchandising etc. outselling them by 4:1 - but when starting a new product 80% of your profit will come from 20% of your profit but you need the others. In 2 years we will have 40 products, 40 SKU numbers but may only have 10 products dropping off the products that don't work. We have started a programme with UL a design competition with second year students. Have them designing for tidy. Judge on design, marketability and see how it goes and get the Company B brand out there through innovation, I love the process of product development he loves.

B: How significant is product design to product advantage?

M: Product design is everything, it’s critical - but you never know if it’s right. It’s the till that will tell you. You will always get suggestions. But this is what it is and the market seems to want it. Product design and marketing crucial. Development cost is also, we have a bench mark, 20% of retail, if you can't make it for 20% of retail it’s not marketable, not enough revenue for everything to take it. If you can do that then look at your design but you have to hold at that. But PR and marketing is probably the most critical factor in getting the product out there, marketing can be in store advertising merchandising TV. getting the customer to know the advantages, to pay more etc... How can I do this that’s my problem? I might have to charge 3 euro or 10 euro or even say if you want this you’re in a different league, I don't know that question yet. But we need to know what the guy next door is doing. So marketing is key love to have this......but retailers won't etc...medium.

B: How do you measure your product NPP?

M: Sales based, that’s it, financial activities are being done, that activity is only starting recently 4 months, for the first 2 years trying to survive now putting in structures. If had really marketed the hanger could have sold loads but had no structure at the time, what working on now is structure, company, till making sure managers are happy. Making sure retailers are happy worked very hard at it. To a stage that now I want to set up strategic partners in every country though distribution and our job would be to design, develop, package, market and get it to distributor and we work on marketing side and let the distributors sell and ship and we work on support but we have started to measure product performance and going forward it will all be cash related.
B: What’s the biggest obstacle to Company B?

M: Money having enough of it. To getting off the ground or to progress? Money cash enough to do what you want. New products soaks up so much money trying to get an idea off the ground. Having enough resources. Going back 3 years its catch 22, you can't get listings unless you have a brand and my first obstacle is we only had one product, so I needed more etc copied other etc....... But if I had to do it again I wouldn't have I’d have focused on the 4 products we did invent. New product sock clip demo. But if I had enough money I would have said stop designing a pack of new inventions when we hit the market with them but you can't do that we had to sell the hanger, make a few pounds, sell this one etc and it just soaks up a lot of money so the biggest obstacle is money and desire. But now that we are where we are it’s not a bad place to be, economic downturns doesn't really affect us. Sales have trebled in the last 3 months, pitching differently, merchandising differently, also price is still low in relation to large capital expenditures. But we hope to be in UK, Germany, France, etc.... and hopefully 3 of them won't be suffering a downturn and surely by having enough cover we'll be covered if there is a downturn.

**Interview 2**

B: Have you developed any new products in the last few months?

M: Well yeah we have developed 4 or 5 new products.

B: Which is the most recent?

M: We are developing a product about the size of an iphone, it comes with a sim card, you plug it in and should any alarm go off in your house, any alarm, there is no wiring, no training and should any alarm go off in your house it will ring up to twenty mobiles within seven seconds. So we have spent the last 18 months, it's almost a step away from the Tidi product range but. we have about 5 products in Company B that we have taken on, developed launched and then parked them because it’s an 18 month process, we would like to make the process of developing and bringing it to market in six months but it’s just not possible so it is an 18 month process and its very expensive and when you are developing new products you are treading new waters so the best product i think we have nobody wants it and a product that we just branded is the second best seller. So i think there is a need in my house and we thought it was great and we have developed two products in the last year, taken them to market and they have crashed and burned. And then you look at a product i found and imported and it’s great. So while we will be creating new products, is finding products and it goes away from what we market Company B as creators not copiers, should finding products and increasing the product range be the short term strategy, because the brand is good. So should we at the short term look at the "me-too" space and you are removing the risk but also develop. Like we were rushed into development, we were put under so much pressure, like when you go to a buyer you need 20 products, so we rushed the product development and a good
example is shoe-covers. Maybe there is no market for it or maybe it is the packaging.

We want to be product developers and when you stand in front of buyers you don't need
to argue price or things like that because it is your product and they can't get it
anywhere else. It's a case of amalgamating the strategies. It’s trying to find a short term
strategy of building up our brand but also developing our own products at the same
time. We have a full time designer and we have about seven products on the board at the
moment that i need him to back at, but I’ll be giving him more time to develop it and
not rushing him in future and follow the structure.

B: Your most recent product is a step away from the brand?

M: Yes totally, the only similarity is that it will go into the same stores, the distribution
channel will be the same but it won't be branded the same.

B: Does this product allow you to enter a new market or is it the same market?

M: It’s a new market, completely new space and it is highly likely that we will partner
someone in that space because they have the brand and security or we might just launch
ourselves because we will have the route into the Irish, UK, German and Canadian
markets opened but nothing under the tidy brand - a different brand.

B: Did you develop this in-house?

M: No I had the idea and I had the brand, the market and a I’ve partnered with a
company in Limerick who have developed the software and hardware. It is quite a
sophisticated product technologically. The main benefit of this product is compatibility
and convenience, no wires, no need for tradesmen or anything, i can just buy this
product, i can plug it into a socket text a command to it and that now is it. This is
mobile, you plug it in text a command from my phone either ‘notify’ or ‘text’ or
whatever, the system now knows you and it will text you or anyone else. And it will go
off, you can call it back and you can hear the environment of the house and because
each alarm has a different tone, you will know which alarm is going off. Now it waits
for seven or eight seconds because it could be just another noise…..tv etc so it has gates
to say, its loud enough, second and third frequency and all together it’s an alarm. So that
is what it does. My house was built in 2005, I have an alternative solution but my father
does not. Another thing is 99% of houses have smoke alarms but only 1% is monitored.
But while we are going after smoke but it will also do carbon monoxide. We have been
developing for the last 2 years but we only filed for a patent in July. We should hear
back from the UK patent office on patents shortly. What’s unique to our product is that
easy but when you buy it you will need to know about coverage and all that stuff, so
there will be a clear story - its needs a signal and power.

B: Are consumers involved in product development?

M: We do, very much so especially in this product, talking to them, showing it to them,
what they like, what they don't but we were patent sensitive so we only involved family
and couldn't go outside that for fear of disclosure. But since that we have sent it out to cousins and family and are for this product involving customer a lot. Which is the right thing to do you can't rush this product and we are involving customers in relation to function and what they would like to see. Look if you market anything correctly it will sell, the challenge we have is to get the message to you and play on your mind and heart and for you to say I can't do without this product and it is worth €240 and that is the challenge, how we market that.

B: How do you define what customers need?

M: Well I have to convince them that they need to monitor their smoke alarm. I have to get to them that an alarm should be there to tell those outside the house that there is a problem inside.

B: How did you identify that need?

M: It’s not that I’m identifying I’m creating it and its coming from my father that if the alarm goes off in his house he won't be able to get out. If a fire goes off in my house, my primary concern is to get out of the house with the kids and I would love it if my neighbour knew at the same time as I did, that’s a necessity or luxury that I would love. In tandem with saving yourself if there was someone to help. So I identified my need and I’m creating my own psychology on this, I think it would be great.

B: Would you consider the product very innovative?

M: Well it kind of, we are going into new territory we are going into a space, well we know that there is a market for alarms. Its new territory although we monitor intruders and the product is technically sophisticated. Also there is a new law coming in in relation to noise pollution, that if your alarm is going off for more that 20 min you will be fined €300 on the spot, but this and you won’t be fined €300. At the moment we are waiting for the patent office and I suppose the technology is there. But we are quite unique, in that how it decided that’s an alarm going off in the house and you don't need to train it.

B: Is it technically very sophisticated?

M: It’s quite sophisticated but I am aware that the two guys in Limerick are two of the top guru in software/hardware in the country.

B: Did you do much market research on it?

M: The only market research we did was how many homes had some alarms, how many are monitored, how many have intruder alarms, how many are monitored, how many have carbon monoxide alarms and how many are monitored, we did a bit of research there. We did a bit of research on what’s already out there in the market; we did a bit of research on price. We know what our price point needs to be so we did a bit of research on that and then we did focus groups and asked would anyone buy it. I’d always be very cautious about asking people would you but that, because they say ah yeah I’d love that and then we say, would you pay €250 for it and they say ah jaysus i don't need it that
bad. There is a difference between liking a product, wanting it and paying for it. So getting them to take it at the tills is the challenge. It’s a huge product for an international market, it’s not for the Irish market, there are 21 million homes in the UK, 19.7 million of those are alarmed but don't monitor them. We have a lot of interest in Canada also. The same people that are selling that make-up will be selling this. Take for example that product (make-up), it has no relationship with Tidi, except that it’s the same van but what i am trying to do now is fill the van. I have the relationships made and the route to market and now i am concentrating on this, i have the means of putting it up on the hook and the people i am talking to in the UK, internationally they offer the ability to put it where it needs to go. I did an email on it, a 2 pager on how it works and the reason why you need it. And I’m tapping into elderly/disabled relative, you at home at night and not being in the house at all and which is a huge problem. I'm creating reasons to buy this product. The opinion coming back is I'd buy it for my elderly relative but i wouldn't buy it for myself. So we may just go after that market, we may just concentrate on one and let it become viral after that.

B: In relation to the type of products, compare the new product to the older impulse consumer household products, would you have spoken more or less with customers over this?

M: No we wouldn't have done any on the household products, that €4.99 and we didn't do any but that is wrong as i said at the beginning it should be more structured, I’d like it to be more structured, more focus groups etc. Look I’ve brought out products because i thought they were a good idea, didn't talk to anyone, i liked it. And that's not the way but you have to, it’s the pressure buyers put you on and its naive because if i went to a show in China i could bring over 10 products and brand Tidi and she wouldn't give a damn and that maybe the strategy for the short term build the Tidi brand using a tactic of finding someone who has developed a product that has been proven in the market. The way to bring out products in the future is good research, good structure that says study people spot a gap, design, focus groups and develop like that. But that being said our most success product was designed on the way down from Dublin in the car. I had a problem with rubbish and i said, i need a bin for my car and i want it this this and this and i was home i knew what it was going to look like and came into work the following morning and said find me one of them and he couldn't so i said design it. So i suppose there is for and against impulse, there are two examples, car bin and shoe covers. But to answer your question, without a doubt involve customers as early as possible.

B: Why kind of involvement? Information sharing or co-development?

M: Look at a minimum information sharing and I suppose to an extent maybe co-development so long as it doesn't hinder.

B: In relation to meeting customer needs, is that something you strive for?

M: You should probably strive to exceed it

B: Always?
M: At a minimum meet it but if they get more than they expected is a bonus, it mightn't be a necessity but you have to meet it. There are a few criteria to meeting it, price point, function, you have appearance, cosmetics. My primary is function, we have to meet that first, it has to function, then the price point. You have a few things that says well if you don't do these things you don't have a product, it has to do what it says on the tin, it has to have a price point that the consumers will pick up on and it has to generate a profit to all parties involved in the process and if it doesn't do all those you don't have a product that will make it out of the blocks. So those are the 3 and if it looks good that's a bonus and that's where you see the customer. If it does a little more then you are exceeding but at that stage the benefit in that is .........it’s a bonus. Does it determine whether you buy it or not.

B: Does exceeding increase the likelihood of success of the product?

M: It increases the likelihood of success of the product, the brand and everything associated with it but it doesn't increase the likelihood of you buying it day one. The challenge to buy it day one is price and others. So i suppose do we involve customer’s needs, probably not enough but i suppose its understanding what a customer needs.

B: Shown the descriptive model for confirmation or disconfirmation?

M: Well everything you have shown me there is good, definitely quality and cost and benefits (i think I’ve said that already). Yeah i think it’s good and definitely customer perceptions are hugely important for the initial purchase.

B: What about the lack of product innovativeness in the model?

M: Well innovativeness is very important and i think SMEs need to come back into the innovativeness sphere, maybe they are just not operating in that, it does cost. Now quality is a given but is in innovation capabilities.

B: How many employees do you currently have?

M: 16. I can only tell you about the sphere I’m in and our strategy for growth is to copy, its not what we want to do but the our resources are in channel to market. I would say the space i am in at the moment, innovativeness would be well down the list and if i had more resources more market penetration innovativeness would be very high because i would need to develop new products. When you look at it, whether we are right or wrong, small firms have limited resources and we have to decide where we want to concentrate our resources and when you are a nobody and you are concentrating on innovativeness. You might as well buy a lottery ticket you have as much chance of winning whereas when you have the resources and the structure, the wherewithal and wherewith outs to execute a product to market and you have all that set up and its working then innovativeness is the key part of activity because i have all my work done. For us the hardest thing in bringing a product to market is the channel. Dell could bring a product to market easily because they have all the channels open so for someone like Dell they have to be innovative because they don't have to worry about resources, distribution market sourcing but for me at the moment it’s all about developing markets
and opening all these markets and when I have this done, then I need to supply him with all these new products so that’s when innovativeness becomes very. So I would love to put three people in a design room but at the moment if I have three people I’m putting them driving vans because I’m limited to my resources. You have to decide what your strategy will be and go with it. I saw something in a book one time, I think it was called the beermat entrepreneur and it said look this is what you need, entrepreneur in the middle but then you need a good finance man and sales man but when you starting something I don’t have the resources to do that. It’s all well and good telling people what they need to do when you have got but financially speaking you can’t do it. What we have tried to do is build a brand from scratch and make it an international brand without acquisition being part of the strategy, building and developing so it’s in a time that take for example EI, they had a strong brand and I’d say there focus is innovation at the moment. So the hardest part in the business is to create the channel and when you have that done that then it switches to supplying it with creative, innovative products. You have to open the channel first and then they will constantly looking for new products. You can’t get the accounts without the products and you can’t get the products without the accounts, you need to be able to fuel development. So I would agree with a lot of that model but innovation needs to be there but at a time, it’s the timing of the application of innovation if you know what I mean.

B: Is that then why you are partnering in this new product?

M: Absolutely its resources and this isn’t my sphere.

B: In relation to new product performance do you measure it?

M: We do, we use does it function, does it meet its criteria in that does it give the retailer 48% and us 50% and if it can’t then. We guide it until you take it to market and we do our own bit of research on that then...focus groups but again the information is varied and not always consistent. People don’t know always what they want. So what do we use, we call our typical customer Helen, we ask in our own focus groups does this make Helen’s life easy, next what can you sell it for. We need to analyse costs then and ensure we can make a profit. Next does it functions and we can’t go into another other space. Price point is critical, quality and cost is critical, manufacturing cost is critical.

B: Do you use any other financial measures?

M: I have an accountant Paul who started with us 2 years ago and he has started to bring in a suite of new measures and expertise. At the beginning we went by the seat of our pants but look he’s great at the moment but look if you have a financial person at the start you won’t get off the ground because he will bring so many reason to you not to. You need to bring one in but at different times. We probably should have done this and done that but we just couldn’t at the time.

B: And what’s the biggest challenge to you at the moment?

M: Building the brand, we need to have 30-40 products in the brand. I suppose the challenge is that we don’t belong to a category. If we were laundry baskets then we
could become creative in laundry baskets and talk to the laundry basket buyer and i show her and i good develop and develop. But we do not belong to a category, we are getting there because we have a travel and a household category developed now what i need to do is pull them out and present them in the specific categories and stop trying to sell a car bin beside an laundry basket beside a travel hanger, there is no cohesion. And then in those ranges have 10-15 products in each of those on separate stands positioned in the correct place in the stores. Product positioning is huge, we are getting hammered at the moment because we are getting hammered by Dunnes to develop and the problem is i should narrow that down and develop the travel range, so get the designer to....at the moment he has 6 or 7 products on the board, two could fall into this category and two probably into a completely new category, so no...find a category and develop that range and don't go beyond that. I'm very much following on the lines of JML and JML do it very successfully, they would have everything from window wiper from and all on the one stand and i think he knows what he is doing so or maybe he doesn't. So i know i need to develop my categories, but at the moment I don't have the resources but maybe in another 12 months and maybe run in categories but I need the resources, i don't have the bodies. So i know what i want to do but i don't have the people to do it and all you are hoping that you have the channel open and it stays open. You have to work hard to keep it open also. And you can then start looking at store by store and product positioning, compare stores and see why the product is selling more in one store over the other.

B: Do your current merchandising staff look at this?

M: No not at the moment, they don't have the time to do it, they are just putting stuff up on hooks but i want them to in time, at the moment they are generating products. Hopefully I will employ one guy who will go away and compile reports on how to drive sales up 20%. I need a sales manager and I need people to do that and you know so.

Company C

B: Can you tell me about your business?

P: 10% to 12% are in cinema, now we have moved more towards public transportation systems and now 75% of what we do is public transport systems and literally we have moved from building on success I think for example we won the New York underground maybe that was because we won the Paris underground and before that we had won the London underground so there is a little of that joined up thinking going on there. I came across this expression, I can't seem to find it anywhere "adjacencies" so what we to look at say core competencies that is adjacent to railways and we are looking at bus and we are trying to come up with what’s actually pushing us into developing a new system for buses is that there is a major tender coming out, sorry that is out that has to be in by October for London bus. So it’s a very big contract for London bus so we are developing a new bus based on the general specification says and that’s generally why
we are doing it. I'm waiting on your questions on it but the NPD is not very linear, it's not as if we have gone to the market, the market says this, the market says it wants bells and whistles on it, we are actually going to have 6-7 months to develop it and we release it to the market. It doesn't happen that way for us, and there is a lot of weaknesses in that model for us, one is that we wouldn't have 6 months, if the market wants it wants it now in 6 months’ time it could be very different and technology is different, we moved from LED to this LCD type product s as well for the railway market and that's literally because the market was going that way. But a lot of it is customer driven so we are actually very marketing orientated in a way in that a lot of the stuff that we do is for our customers, it's not as if we come up of this and say that oh (with the exception of that-pointing to a row of products on show in the car park) am a customer comes to us and says look we have been doing business with you for a long time we want you to do this or develop this or look at this and that's the way we tend to go, so now I await your questions.

B: Well now what I’m specifically looking at is product advantage, if you have all your unique selling points such as your gel battery etc for that product why did it not succeed?

P: Price

B: Was it solely to do with price?

P: Price

B: Cost?

P: Price, price, price. The market if we had analysed it properly and actually in fairness once we had decided that was what we were doing the analysis of what we was out there and the price that it was at was very good. We got a couple of bids from Cork, we tabulated them with North Carolina of all places to see what the general price was. What happened was is that if you look at this particular one (product) in Ireland there is no standards this particular product in ah, this particular type of product - the reason why we were interested in this is that we have done I’d say about 200-300 mobile signs in Holland but our customer has actually been the chassis maker himself and the chassis maker over in Holland runs on diesel and the reason it runs on diesel is that it has to get up to a certain brightness level. And therefore we felt that we know what we are doing in regards we know what the sign has to look like, if you use solar panels you won't get the power necessary to reach the European standards and for some reason in Ireland there are no standards on these things in England you won't see any of these things either they are trying to move towards a standard before they are released. So, I’m going to below something out of the water with you then, as soon as you get to a standards it’s very hard to start looking for your USP at that stage because what happens is it goes to tender and to differentiate your product is very difficult when you go to tender, does it tick this this and this point well it does, ok well does your competitor tick these boxes, well they say they do. So it’s very hard and again price comes into it when you get to
the table, the table is can you do this this does it have this brightness? has it passed the BS standard? is it EN this? you what other things.

B: How do you then differentiate from your competitors?

P: Well you see, the one thing I’ll tell you now is that we are all over the place regards, in what particular market are you talking about?

B: Lets stick with the product we were speaking about, those (product on display outside)

P: I think then really what you’re looking at is brand you can call it brand but reputation. That’s one that isn't selling. Let’s do three case studies. 1. the one in Holland is going to be diesel, we've gone to highway agencies in the UK and said which do you prefer, if you go with it they won't be the same brightness levels but they are adequate but they won't reach your static signage that you see on the plinths that has proper power going into them if you go diesel it means that you have a noise factor that’ll mean if you are outside somebody's house and you are doing nighttimes work you’ll have a diesel generator going outside. So there is a noise pollution issue, which the greens brought up yesterday and the other issue with diesel is that somebody has to be filling the bloody all the time as well so there is a level where somebody has to be keeping the generator going all the time, and there is other green issues as well. So in the UK they will not allow anything and in Holland, I don't know why its allowed in Ireland but there is no standards on these things, anybody can bring in these whilly nilly thing. Two things happen to us though, the majority of things coming in are from Canada and America and the dollar has really helped them, really helped them I think you have to track the dollar, well you don't have to track the dollar to know that 5 or 6 years ago it was at parity now it’s at 1.5, 1.47 actually I think this morning. So they were importing anyway and all of a sudden we were under-engineering but then the next thing is there 13,000 or 14,000 it was costing them to send in had become in euro terms much cheaper. The other area then is they are one-coloured, we thought three-coloured the councils would be very happy about this, with pictograms and ahm again talking about market research they said they would be interested in it but when it came down to procurement what they tended to do was say look, we are giving this bypass and this particular company has to have five of those in. What’s five of those, well if you've no specifications in you just go for the lowest one because they are contractors and contractors just say look I don't care if they even work, as far as I’m concerned I have to tick, my project says that I have to have 5 of those and I do, do they work I don't care and that’s literally the way they go about them. And the councils basically when they went through procurement as well maybe there is a finance person going as well it’s the cheapest one works. In fact the last person in Cork said they all said they meet the spec and we will pick the person on the lowest price and then we will move up accordingly if we can rule him out technically, you know oh you said it does this but it doesn't do this move on and move on but we weren’t the most expensive but at the same time, so that’s that particular one. Now the other in Ireland is that we have just won a nice contract for
the National Roads Authority (NRA) which is the highway signs, its the framework agreement for all the highway signs in Ireland (looking at website to show me various sign), this was a real though one to win now because it was international competitors and ahm we had actually done one, we had done the first M50 and then we this one so we would be in traffic sign, this is the variable message one here and this is the M50 one. So we had done the M50 one here, traffic info and the second one then we won was this one here the M1 and what happened was that went out for the next four as a tender but it went out as a bundle, it didn't go for those it went for the civils, somebody running all the fibre optics the emergency phones so it was kind of a system integrator and we just went right same as before we all just work together but what they did was they decided to go buy from England and it didn't integrate into the system so much but they had kind of introduced people into Ireland and then what we did was we had to go after all this tender now, so what this tender is for all these signs all over Ireland in a framework agreement and it came down to the last four, and then last two and then we got it so and we are just signing that. The reason I really mentioned that is the new one here is going to have different optics, so we have a huge amount of research to do on optics, which we have nearly finished on, we have a whole pile of software to do to get up to the NTCIP protocol which means that everything is going to be almost like a network device and we also have a whole pile of mechanical work to do and they were into me last week saying there is so much project work to be done on this, when is it going to be completed but I couldn't really pushed the button until we had actually won the contract. So we are very busy now trying to get that done. So that’s the second case, we have won that and we have a whole pile of work to be done on that, the third one and the other reason then is that while we are happy about developing for that, is that give us is actually to an EN standard so that brings us back into Holland bids and UK bids, everywhere else, Spain are not too particularly keen on standards and they usually go local, I think actually in Ireland we get very keen on standards to be honest with you, when you see what the Italians and the Spanish and the Portuguese you know turning a blind eye to standards its annoying sometimes you know we seem to be more Germanic in that regard and you know what standards are but I suppose standards are like table stakes, you don't get into the game unless you have some sort of, some sort of standards, so the USP, not so much on that I think our USP unfortunately on that was that we had already done it and that we were Irish I think and never out of the picture as price because it was a tender. The four people that were in it, the people that we feared the most and when it was down to two I definitely thought it was done to us and this company called VMS in England and it turned out it wasn't, they were out of out the ball park in price, now we had really cut it down cause we needed the business and we wanted to develop on it going forward and this particular company was up for sale and had obviously put this particular contract in as a fated company to sell the company as well so price is very important, very important and something I have heard recently from Gerry Murphy of enterprise Ireland, who looks after all the enterprise Ireland offices abroad said Irish companies don't understand or underestimate the power of some of the European purchasing managers. So what you are trying to do from what I understand, is am you are trying to differentiate the good, the buyer is trying to get it back onto price and that balance is sometimes is skewed in favour of the purchaser a lot
of the time especially if you can’t make good points, you can make good points but at the end of the day I’ve had people in today looking for more software people in because our product is getting better and I’m saying your finding it very difficult to demonstrate that benefit you know buy from us because our software is plug and play - if you can’t get that across to the customer and there is no point in losing a big contract and well that fucker never did that the competitor he didn’t do this, he didn't have that or he promises and he didn't deliver, its no good, its no good to us its gone you know, you can score points but at the same time we have to pay the wages. So I really I don't want to belittle anything it’s a little like the CSR one yesterday, it has to make business sense on the CSR, I don't know who's decided to become the moral conscience of the business world now but CSR is all and good but it has to make business sense. From your point of view and NPD and the differences, yes a good sales person has to make that and knows which buttons to push but at the same time don't underestimate at the moment that some of the purchasing, some purchasing are not looking for strategic alliances there not looking for a great, there not looking for ahm partnerships, there not looking for long term whatever - they are looking at the job that they have been given a mandate to reduce costs by 10-15% and where they go looking for is a supplier and if your down the food chain you will be beaten the shit out of and that’s the way it goes in my opinion and also when it goes to bigger tenders when they start putting into tender documents that’s when it starts becoming very difficult to make your killer buy from us because and all of a sudden it gets a little bit muddied as well unless of course you can write the tender that’s the big thing, that’s different if you can partner further upstream and your actually writing the tender or helping somebody with the tender then you might be able to sneak in well make sure it has lanterns or make sure it has. The third case study I’m going to tell you about at the moment we are in bid for at the moment all the railway signage for Israel is in play - all of it it’s an 8 million contract, for us to win it will be massive and we are in with a consortium because there has to be a system integrator it has to be a sign manufacturer a local installer and a local Israeli who translates usually is a system integrator in this case a German who translates all that into Hebrew and implements it as a project and as the tender document was so obscure when it came out its like this person here has to have install systems over 50 stations, this company here the manufacturer has to have done 300 signs over ground on railways but has to have supplied LED signs into Israel in the last 3-4 months and the installer has to have installed signs in Israel. So lucky enough we had a relationship with a not a very fruitful one we've had a distributor in Israel for the last 5-6 years not our product but he's actually been installing traffic lights and a new traffic light actually has intelligence in it which will tell you if one or two of the LEDs is faulty, it goes back to the management system which tells you that by the way traffic head number two has, it’s not catastrophic but if it goes down to 4 or 5 you need to replace the head. And they actually could say well that we've installed 5000 of these so we tick this box, how many intelligent LED signs have you 5000, so there’s a lot of that sort of going on so they even say in the bids that they go for technical and all this but it’s very hard to get that across in paperwork, you go and sell to them, you go and present but then I have our local Israeli guy going it’s going to be cost that wins this, they want the best and there saying they want the best but they want the best at the lowest cost, doesn't everybody. But that what it is.
B: When you’re looking at the areas of technical performance, innovativeness, product design, benefits which is more important?

P: Well lets go back to my my. I had a fascination with Japan when I was growing up which I managed to go and work in a Japanese company and live in Japan and everything else and one of the key things that always stuck out in my head was the "equa morita" the Sony walkman, no amount of market research told them that it wasn't going to fly. We went to enterprise Ireland for them to do market research for putting electronic signs into multiplex cinemas in the US, we had heard a rumour some of our competitors had done it, came back there isn't a market there right and it turned out there was a fantastic market there, all this new building has really been built on American cinemas. So customers might tell you they want this or they don't this but the moment of truth is are you going to sign this purchase order, and it could be anything, it could be I don't like you, I don't like your product - well what don't you like - I like theirs, well why- I like their pictures you know silly little things and maybe we also say that sometimes its due to personal relationships as well or we call brown envelopes that sort of thing, so yeah fuck it I’ve given you a case study, customers says they want this this and this the moment of truth ahah(no) do you know what I mean. Are you prepared to pay for it? I'm having the same problem at the moment I've said people will you pay for software. Yeah we want to do this this and this yeah will I have to develop it and pay for it. Yeah so it’s very very very difficult out there at the moment and there is a lot of games going on as I told you the purchasing guy if you were a purchasing guy we don't do it in Ireland, I mean a really serious purchaser who knows his job, sorry we do have them in Ireland people like the Dell people or people who are really working on supplying stuff on the supply chain. What they want is to have 3 or 4 or 5 people with complementary goods to say right you don't perform you're out you're in, that’s what a good purchaser wants. It does this well yeah fantastic yeah it does but what’s the price can I justify it can I make it look you know and I just don't see all this theory of people working together as partnerships, strategy, strategic suppliers and all this sort of thing, I’m actually very worried when somebody says to me well I want you to be a strategic supplier to me. What’s, nobody's like that as far as they are concerned they have a job to do and as less we're specified where the customer says you must use Data-display then it’s a lottery really and you have to fight your corner. One of the big areas, going back to the third case study the Israeli one which we haven't won but which we are doing about it is was was our reference sites that where we really from a point of you were flexible, I know it says in the spec here this is what you want but in California we did this because it was very warm, we had to have white and have a sun shade this is something might want to think about. In Paris we did this, in new York we did this, in England we did this and that’s what our presentation was, our presentation the real one that we were trying to do was get away from price but don't kid yourself it’s not always there and say look we want to demonstrate to you that if you use us in your project you are going to change your mind guaranteed and we're flexible to meet that and number two we're going to show you the reference points where customers came to us and said now that we have the paperwork out of the way this is what we really want and we're
prepared to work with you in partnership with you on that and that’s when the partnership starts getting when all the commercial terms have been put aside and we don't usually charge as much as we should probably do for change, changes in the project cause we are quite flexible they want prototypes and they want this and then they start feeling ok well this company can do what they said they can do but the best way you can demonstrate that is by reference points and for a company a country where we are, when the rain clears eventually that’s the Atlantic ocean, we're probably as far away from our strategic customers as you can possibly get, you're in Israel anybody and his dog who makes what we make is in this particular bid plus every system integrator who ever did a railway is in this bid and your trying to say chose us and the reason what we were trying to say look, look at our reference points and we did a couple of case studies and showed them how we worked in partnership with customers, long term, long term basis is what we try to do with them how we designed with them and that’s what I think our strength is flexibility when we manage to lock onto a project and for us from a cost point of view whether we do it this way or that way is kind of minimum because we are so flexible anyway, we're doing designing anyway that’s what we are doing all the time, if we weren’t if there was one product it would be made in China as well so it’s 10 of these 5 of those sort of thing. And just on the other thing I’ll tell you about the cost thing we are bringing in a lean cost thing at the moment cause for sure price is so important or cost is so important and that’s where we are at the moment. I think it’s very difficult at the minute, look the information is out there isn’t it, look here we are in Israel we're making a presentation and we're talking about stuff we've done in California trying to say look its hot in California, its hot here. The brightness level you require on your tender says this we feel you should be going with this and we're trying to make sure it’s the same price, trying to trying to do everything to say we won't let you down, trying to be dependable and we haven't let these people down and that’s really, really, cause at the end of the day do you know you’re talking about NPD but to be honest with you were kind of a solutions company really as well so there is going to be a bit of give and take and I suppose maybe what a customer is looking for is I need someone that I can depend on and I know from our point of view I’ve been called one or two times over to the UK and there looking for, the customer feels he needs the commitment of the CEO and chairman and everyone else and we're going to back him on this project because he's nervous and he's seen the factory, our biggest selling point by the way I think is the factory, if we can get the guy from S and CF here or the guy from RITP in Paris which we have and they walk around the entire factory and they see that we do everything in house from metalwork to design to software it gives them a huge sense of, it takes a lot of the risk out of it for them, it’s kind of the comfort zone as well.Took 18 months to this stage

B: Speaking on the Israeli contract there, ye have ticked all the boxes and have what they are looking for, what contributes to you getting there to that point?

P: So the question is if we win the Israeli contract why do you think we won it?

B:Yes,
P: I'm going to give you, because I’m a bit of a rebel and I love blaggarding this sort of stuff. There actually is a little bit of ahm. The system integrator in Israel has these two guys as agents in Israel who have been ferreting away at this for a long long time and one of the agents, his father was a chief purchasing guy in Israel going back 20 years, his father is retired now and when he retired he became a consultant for all the big companies to figure out, so we actually have an ace in there at this moment in time for the consortium to win in that he knows what everybody else is going in, how long they went in for a presentation so never ever underestimate somebody who can get close to the decision maker, never that there's no point saying oh we lost it because we didn't, you've got to get close to the people. The second one is our, I’ll try to get out of the consortium and talk about our points, so we have somebody feeding us information which is good number two he's also giving us feedback on how our presentations is going because he has a man on the inside, very mused like almost but to say that that doesn't happen. Actually it happens in every country you have somebody who knows somebody who can you just throw me a bone here. The next part is we have our key points was to say look there are three parts to the consortium, the system, the signs and the integrator we said first of all due to the software we have done we have just finished a project in Moscow with the system integrator called funfurkt, now we deal with siemens (siemens are the enemy on this project they've used somebody else, so that’s fine, we could only go in with one anyway).

B: Would you work with them again?

P: We supply into them, all of NY went into siemens?

B: Them not using you on this project this time would it influence further projects?

P: Well funny enough I came back I I had an email from Siemens saying they wanted us to do Tel Avive with us them I thought it was the same project and no no its a different project so it depends on the project manager and everything else. The siemens one is actually, what the siemens guy didn't like was that siemens had an installer in Israel, in this one he actually say that we had a distributor in Israel and he didn't particularly like it and he overruled his purchasing department, which we felt was ridiculous because this is a huge area, how do you interface with the system integrator, are there going to be issues and we said well there can't be issues we worked with them on one project in Germany which was a bit of ah long time ago, should be irrelevant but we just put a system together this month together in Moscow, with different character sets in Cyrillic, so we have worked with different character sets because they are worried about the Hebrew and maybe Arabic as well going forward and we have just finished that so ok so we are seamless on this consortium. The other one them IPI we have been doing business with for 8 years in Israel luckily they didn't ask us how much business because it’s been pittance but we have been dealing with them, we have trained their technicians over here and we do give them help support on some of the installs they do, so that was very good. Ourselves though which is the real one is they were very keen once we got that out of the way (how string was this consortium), what have you done, right so we actually have, now it’s an over ground railway but we actually have an underground railway we have NY done, we have Paris done and we have London underground done,
we also have Sweden-Stockholm done, so from an underground level it’s almost like a fashion house, London, Paris, NY it has that almost ring about it. The second one then is we could demonstrate that we have done virgin rail and and a couple of case studies very similar where there was different types of signs again reference points, how you interface with different people and the whole lot, changed it because the platform was big and everything else and then we actually used 2 examples of how we dealt with the S & CF for areas where we told them look it’s not as bright, but is underneath the canopy and here’s an example of that and here’s the sound and everything else and we used the one about the California as well which was the high bright as well. What we really tried to and we actually produced a sample, but luckily enough it was a hybrid of about 3 or 4 projects and they liked that they liked that the effort that we had gone to do some things on it and we also told them that we felt that, we criticised the sample itself saying it was too long, this is what the spec said but you are the customer so if you want it that long we'll give it to you that long, if you want it that long, we'll give it to you that long because we have our own metalwork and everything else like that. So if we win it I think it’s because of the strength of the consortia, not the strength of the consortia per se but the connections between the two I would say they can't go wrong, we also have a very good reference point where we worked with siemens in NY and the siemens system doesn't work and we've actually managed to do a little bit of work to get one or two individual stations up and running so the guys are absolutely delighted with our sign, this particular guy who has a very high falutued title who we used as a reference because it was asked for on the tender that if they ask him not only will he give us a little star on the head he will also criticize siemens which is in a competing bid as well. Fuck it you really have to think of the differences and you have to really, here's a guy who can bad mouth the opposition cause they're probably neck and neck with us and who can give us a positive one. Unfortunately we found out yesterday that he hasn't even been contacted yet for a reference so I don't know what more we can do, if we found out he was Jewish it would be even better, you know that kind of way. Its everything like that but definitely the reference points, I don't think an Irish company going to Israel saying oh we've done something in Dublin, I’m not sure if that would get us at the races. What's actually got us in the races is one we've done something in Israel before, they're very keen on that, very proud people (are you only here for the business or have you been here before) it’s almost a question of how many Jewish people do you know. And there very good business but I think they are probably the hardest people to sell to but we have, they are the best payers if they say 60 days and that’s what the agreement is, is 59 days, it’s there on the 60th day, its perfect as opposed to our Spanish and Portuguese friends that drive us nuts but I think that’s what it is, I go back to 2001, I’m trying to find it actually I have a card from the world trade centre we were in the world trade centre 2 weeks before it was hit cause siemens were based there. The two companies that we bid for were siemens and GE, basically in that particular one there was four bids and we were in with two. And how we were in on that one again was through reference points, we had just done the Paris underground, look there is almost a kind of am it’s such a niche product, it’s not as if I can say to you oh by the way how’s you ipod, it’s not as if I can ask. Somebody somewhere along the line has had to put his neck out and go with this company and either was a disaster, there is as many project
disasters in railways are there is on big projects like the implementation of ppars, you know usually they end up in tears and there is a lot of finger pointing going on as well, what they are trying to do is minimise risk to make sure the project goes very well, who's the person who is going to help them ,who is the person who stick his neck out before and are there any case studies beforehand that they can go and say by the way did data-display deliver what they said they would do and that's all they want and I think that’s why we are still doing a lot more in rail at the moment I think that’s the reason why we are. Now we are doing as much in the England as I would like to do, we are actually getting hit by a smaller company and maybe this is a good time to.....There is a smaller company in England who don't do anything that we do they sub-contract everything out, they only have 4 or 5 models but they try to....now the centre for all rail in the uk is around the Darby area its where all the interfaces for all the rail have to go through, so around this areas for some reason there has been a cluster of railway stuff and a lot of the system integrators are based around this area. We are unfortunately, our office is in Portsmouth which is a long way to get up there, our competitor is nastedelazues so your man rings you and says I have a problem they say hold on a second I’ll be with you in 10 minutes, how’s he beating us, he's beating us because he's much smaller than us, he's not beating us on price, although we found out how he is matching us on price, he's finding out what we are going in at and he goes in at £1 cheaper and sees if he can live with that and he, it’s his personal touch, I am there it’s kind of my word is my bond, you have a problem I’ll be there and that’s one area that we are a little bit slow at the moment on it in the UK, this idea of you know it goes in and it’s not working and your thinking for fuck sake it’s been factory accepted and tested, you know it’s works would you just put it back the way you know you had its like, but that’s not what they are looking for they want you to say we'll have an engineer in an hour.

B: How many different sections is there in the company, departments?

P: In the factory?

B: Yes, and how quickly can you solve a problem, does it take time to get this man to meet this man to solve a problem?

P: Yeah, yeah, we are been beat to the punch by a nimbler opponent like probably has about 12 in his organisation and we have about 250, you know that sort of way. He probably has a bit more, but as I said because he doesn't do any of the manufacturing or but he's local, we don't see this guy out of England, this is a guy who probably gets as much business as we do in the UK with less people, yeah what we are trying to do is streamline a few things at the moment because from a cultural point of view going back to that... we are going through a cultural change we are going to a very top down entrepreneur, no management team to building up a type of management team and the main areas now that I have at our meeting now would be like engineering I have, in that case I’ll tell you what I have done. I had a guy who was in charge of hardware, software and mechanical although the mechanical was almost stand alone anyway but I moved him into sales, project sales so he would be the first guy to make a call, so we are trying to be, because of this we have tried to make a guy available who is not stuck on the line
or doing this, he's actually in sales. We call him project sales manager but it's literally he's the guy who is watching those projects and hearing, I'm the person now who will help you out if you need me. Its literally a promise really, that’s what a brand is though as well a promise isn't it, we promise to, we promise that it will work we promise that you it will you know that’s what it is really. And I think that as well we are electronic sign and the sign industry is rotten, there are so many people out there that will promise you anything and everything so I can understand why people would be very a doubtful.

There is another area now that we are doing, it’s a full colour screens you know the big television screens, it turns out that there is loads of them out there at the moment and how are you going to sell them is the big area that they all cheat on the trade shows, the biggest one is to see which one can get the biggest pitch so what they do is the last couple of trade shows the people have gone to, we've have the lowest pitches 3mm or something like that I mean that’s almost television quality you know but massive screen, but they've left the screen out to take the heat away you know so it’s literally well we know we are up against everybody so we want to be brighter than anybody we want to have more contrast we want to have more pixels than anybody else. But at the end of the day unless you are going to put 5 major screens into and say well I’m going to pick that one because it is a better one you are probably going to go with somebody who has (god I sound like a marketing person now) a brand, not the brand, somebody who has convinced you that it will work and they will support you. It doesn't have to be Mitsubishi, Mitsubishi are in the market as well but Mitsubishi might but you can attack them, who fix their stuff. Do they have a European network that fixes their stuff, who back up you, you’re on match day and half your panel is down, you know that sort of thing you know so am yeah god I sound like a marketing person, it is your reputation I suppose you know. So I think what you are trying to do is you start off here with all your USP, your pre-programmed, get the sales guys in hammer home the difference right, buyer may or may not be impressed, if he's impressed he won't let on he's impressed, he'll try and play off to see who else is in the market as well and then that person will make I thing because it’s a high risk purchase he has to look and say what are the clues there is a lot of negative selling going on don't but from them, they're a shower of wankers, I’d fire a sales rep if they said that but you know what I mean don't buy from them, I’ve actually heard someone say that not in our context but all that sort of thing, it can be subtle or not so subtle but you know but a good sales person will also know the weaknesses and the pints to push on the competitor side of things. Actually I’ve employed to me I think is the most professional salesperson I have in the UK this year, he’ll say have you been talking to anybody else, what have they said about us, he's fantastic, very subtle but the same don't buy from them buy from us because we are great. Ok prove it?, well ok here's our reference list and I’ll show you this or in his case, he'll say (now he's moved around the industry so he knows this) he'll say what LED are the competition using, Hewlett Packard ones, I get in my car I’m going to bring you down to one of their installations and I’m going how bad the quality of the LED's they used, there not all the same brightness there all over the place and at the same time I’m going to bring you to one of ours and show you why ours are more expensive because we are using more quality. That’s the sort of salesperson you want, he's going to win the day for you, you know. The other thing is that he seems to get on very well with all the
other people in the industry, one of the reasons why we recruited him is he's of the industry from the industry and knows how to get in doors. And am it helps, it definitely helps. Now that’s what I think it is, I had to come to the conclusion its brand cause then I sound like am Lisa O Malley. It doesn't work exactly that way but you can call it brand, you can call it reputation whatever but it’s a little bit more subtle as well. Yeah I suppose it is, yeah Lisa is right, it is.

B: Coming back to the journey where you are at that point. Can you tell me about the products fit with existing, marketing and technical skills etc.

P: How do you develop core competencies, is that what you are saying?

B: Yes

P: Again because we are a small company there is one or two people who am who have been very instrumental in how we have been moving along, the guy who I moved in from engineering into sales, to be honest he has been in sales a long time and he has seen the future has been am and I’m going to throw it out to you because it took me a year to cop on and I had to ask them wysiwyg you know they were really looking for, we want all our signs to be wysiwyg so on the computer screen what is happening down there? diagnostics so all that area they say and got a feel of the market, this is what people are going for am. Having said that we also get that sort of information from our customers, our customers that come here because its remote and more remote since they've taken Shannon Heathrow away, we tend to have them for dinner a few drinks, you know what way do you think this is going so we have been very good on being able to take best practice from, like I found out today that NY are using their signs at the moment because it’s not hooked up to the system yet, project delay to gives info to passengers but it doesn't give them how many minutes to next train coming. I only found that out today and to me I just can't believe it, you know to me it’s just ridiculous, while the Paris one, how many minutes to that’s all they want to know. So we have also been able to take from international stuff for example his material they use in the front of Paris is a heavy ceramic for graffiti because it’s easy to clean but this is not an issue in other stations because they use a lot of cctv so but the French ones wanted a system, we are now re-doing it now so every sign in the Paris underground will be ours by the end of the year, unfortunately that it done that’s the end of it then and we have to look for something else in the Paris metro, they also do buses and I was telling you about that one. This one here(website) they wanted everything to be quick opening release and everything to go back with SNP traps to go back to management systems to say this is down, this is down, power supply is down or whatever and they wanted a mean time for repair of about 10 min and I think during off peak is the difference between time of one train going and another one arriving, so from that we were very lucky in that here was France, it doesn’t have to be France it could be the Dutch or anything else its different but from that we could figure out that we need to be developing more plug and play if there something that needs to be fixed lifetime costs ease of, so when it came to the NY one everything had to be unique, so you couldn't make mistakes and the guy says I employ guerrillas so we'd actually learned from this so when we actually told him about this project ,yeah I want that, I don't want it to look like that but the principal of the idea
of I need to be able to say management trap says that the power supply, you take this power supply down and this guerrilla put this in this place and it can only go in this place. And we can bring the system forward to say he opened the 12.54 and closed it at 1 and this sort of thing so we had a little bit of guidance from that from our customers.

B: How do you gather information about your customer needs?

P: It’s in the head, it in the head. We meet them we talk to them the projects are speced out a bit more. I'll give you another option here because none of these are same. In Holland for everything we do in Holland they are very keen on this analog clock, massively nobody else wants it you can even put the time here and everyone else put a massive clock on the bottom of it, which is important if the customer says it’s important for their need so I think probably in a lot of cases we were very lucky, in that we were in a market we got a couple of contracts, we took over a company that had already done the first London underground the first London underground over 12 years ago we started doing one or two projects in rail, we got in there early enough we got into places like Paris like London underground, NY and we used the leverage of what we had done before with the flexibility of solving their problems if they felt look I want you to re-design the project so everything is labelled, unique plug and play so nobody can make a fuck-up of it a management system telling them what was wrong, it became a little bit more than just a sign and probably our competitors were slow to say we supply that, no no its this size, well that’s the size of ours. If you went down this is a product with these guys I think the design element was number one we were prepared to design for them in a project and number 2 we were prepared to work with them and understand what they were doing. And all that information where does it come from it comes from the customer. How do we collect it? you know....... have you not done Fergal’s knowledge transfer/knowledge management course it’s in our heads, it’s not written down but if you were, if somebody were to come in and look at all the manuals and say right that one has this clock in it and has this but doesn't have this, this one doesn't have it. Just one aside, am you can always be trumped. We've lost a contract in Oslo where somebody has said, we've said look quick release up comes the stays change this board, change this board, change this power supply am this other company has come in and said, competitor, don't repair it, its small enough, just take it down and we'll give you a spare, don't mess with it just take it down, it’s got an IP address on it, we'll programme it in such a way that what you do is just take it down, not throw it away but send it back to us and we'll, here just put that one back in again. So everything all of a sudden our design team are thinking hold on a second do we go down the right way maybe we should have been thinking that way. You can always be trumped another thing is if a competitor knows that you what you’re saying its everywhere its debate, its everywhere, it’s like the American election, one is too old one is two young well I can turn it around this guy has no experience I have experience.................you are trying to win the argument, we say this is the better way, this guy says no don't do it just whip it out and put it down again. You Know
B: Do you gather a lot of information about your competitors?

P: Competitors, yeah, in fairness now again, how it is collected and where it is its in heads right ok. We do a hell of a lot of trade shows a lot of trade shows, we've stopped doing them this year because it’s the first budget that goes, the marketing budget is the first one. But in one particular year I think in the rail we did Poland etc........(7 in total) and the strange thing about it now we also do a traffic show in Amsterdam in the Rye, the Rye in Amsterdam is very international and some of the other things are international but would you believe it we came to the conclusion that the profile of the rail buyer (think old CIE) it’s probably middle aged man engineering background, chauvinistic in the way that it can only be made in the country that it is from, like the Germans will say well the solution has to be German and we found it very difficult. But the one thing is that they don't seem to talk to each other you think Christ we all have the same problem, if I was made purchasing manager of IR the first thing I am going to do is go over to Network Rail and see what they are doing and who they are using and all that kind of stuff and talk all the knowledge from them. But am at the trade shows you pick up a lot of that thing, a lot is rumours a lot is rubbish but at the same time you at least get to see who you are up against and what you are talking about, we read the trade press, the same way that they might take sales people from us we take sales people from them you know. And talking to the customer, we would say to the customer, have you been to this guys factory, what did you see, how does it compare to ours.

B: Which is more important, knowledge of the customer or competitor?

P: Knowledge of the customer because at the end of the day there is no point banging on to the customer and telling him to drop the clock when that’s almost a given in Holland, we don't understand it, we have an office in Holland. And once there was this big thing about white and black and they sorted that out by visual inspection and making a prototype. You’ve got to know both obviously but your customers are your most important I mean we, I’ll give you case study 4, NY - we tendered for it through siemens and GE, siemens had fucked up on it through their implementation we had supplied the signs and most of them are in storage, they have the new line out at the moment they are prepared to go it with us, the guy who was doing it was about to sign a contract with us directly no siemens just us directly so we felt that we could get a bit more on the margin because and then right, I have to tell you these things cause this is what happens, the NY governor whose name is Spitzer was called the scourge of Wall Street decided that he was going to have call girls call to him in Washington and they traced his account and they found it and he had to resign as governor of NY and all of a sudden because of that all contracts were put on hold, nothing’s going out and everything is moved from NY city where this should have gone into up to Albany. And they say well if you want that you have to have a tender and here we were just about to get a purchase order for all things we worked with you, we like you, he actually feels himself by the way that the NY design is his design, and he's right in a way he had the inputs we reacted and he wanted to but couldn't place the purchase order right and now we are up against an Italian company who have gone to the trouble to make a prototype
so if they make their prototype they are going to go head to head with us. If we know the customer well enough and he likes us well enough he will find some reason to get rid of the other crowd unless its price, he's told us we'd have to match the price. If the price is level or there or there about, I could work with 5-10, not 10 but single digit I can work with and ahm if we know and he knows us better he will figure out some way of making sure we get the order but we are terrified at the minute is that we are trying to keep on his good side and make sure everyone is happy but at the end of the day if we lose that there could be any reason, I won't know the answer maybe we should know the competitor, what the hell they are up to as well and so am but I don't think so. We would want to be aware of what the competitor is doing, there is no point in saying oh who the hell are they and there is no point in bad mouthing them either as well you got to go and figure out why does the customer like them, is it standards, in Germany we have done very little work in Germany they have their own standards in rail and they have a preference for a glass rather than an LED solution. So the customer I suppose probably, if we knew the customer well enough in Germany we could probably why you prefer glass over LED when everyone else wants LED maybe make a compelling reason for them to change. Yeah you have to be close to customers no doubt about it especially in B2B more so in B2B and we probably should do more of it now but you can see why people in corporate do a hell of a lot more things like, corporate boxes, etc you could definitely see how it could work better.

B: Within the tendering and project process do you use cross-functional teams?

P: Yes, oh I have to; there is nobody here who has the knowledge to put a tender together.

B: How significant is this openness, organicity?

P: Very important, very important, the one thing that I haven't told you though is the majority of the people who have been with us have been with us over 20 years. That’s one thing, I being technical now but we have a very negative, communal culture and I’m trying to make it a positive one and one of the big things is being kind of ah - like there has been people here under the old system which was a little bit autocratic, well maybe not a little bit but anyway and I’m surprised they are still with us amazed some of the arguments that have gone on in the past. What I have tried to do in the last six months is a find of ah if you want to say something you say it, if we disagree we disagree. I actually feel in the next couple of months if we were to manage anything we would be gone more communal sole, communal means people are on first name terms and if I look at the, no they are quite tight, they go cycling together, golfing together they are quite tight. A family type thing, it’s a family business, my sister is involved, my brother, brother in law and the people in the management team have been with us over 20 years. Look I've been on installs in Japan going back 20 years with our top guy, I’ve been on buying to Taiwan its they are key people, we couldn't do without them. Is it open, it’s very open and a huge amount of trust? If someone says look we are going to
need a new power supply on this, Jesus lads cost, is this going to cost us extra, well yes but it will give us this this and this, you know ok so we'll go with that.

B: Is there any systems in place to foster this type of communication?

P: Yes there is, we do project kick of meetings now. The one thing I have tried to do is to put more systems in place, going from a one person with everybody around, you know it’s like the old culture is like one person in the middle and what I have tried to do now is as you tried to see me do there I’m sitting in on meetings until they get running up and then I’m withdrawing from them and let them do them themselves. Quality is my last piece of the jigsaw that I have to get right. Am but in general they are very good and they have a pile of knowledge and you know the other thing as well, they usually have some little nugget that you have never heard because they tend, like for example the guy who's in charge of mechanical is over in Newcastle at the moment designing the new housing for the highway signs. The same guy who makes those housing makes the housing for the competitors. So he's saying he'll be looking at how we are doing it so as to .....so when he comes back to the team he'll be saying well this company is doing it this way etc ...now we'll ask him how much information he had to give out but he has that. The guys who are working with other guys on projects to do with software again, they tend to like to talk to people who do software and sometimes if you're in a meeting you're better off bringing a software person to make sure they have that. And that all that comes back in again. So if I look at any project at the moment there is definitely a software interface, there is definitely a mechanical design interface, there's definitely a hardware interface in relation to parts supplies an LED and everything else and the one thing they are missing is money, it has to make commercial sense, we have to make money. So definitely yeah it is much better but yeah the company has evolved where there was a time that one person could do the pricing, that sort of big stuff you can't do it. Can I just say to you before we've had somebody from enterprise Ireland in and she says that, basically we have 3 business models going on at the moment, the A ones which are the plus €1 million tenders, the big ones, the B's are the project ones which are 200-250 which are the ones we do per rail station and the C's are the commercial stuff which are like 15-20k in sales. So I am probably talking more about the A's and B's than the C's on that but definitely the A's and B's would have to be and even on that there is one other thing if we are doing a project we might have to bring somebody from production in to say, do we have the capacity or when are we going to make it, or how are we going to make it or you know that kind of thing, yeah its quite good, it’s not overly big either the management group isn't that but yeah I think that that has been our best improvement this year.

B: Can you tell me about the timeline from initial concept or start of a project, how significant is this?

P: No I can't, it varies so much, what we try to do is pick the projects that we have huge commonalities in, NY for example we did the presentation in 2001 the last sign was delivered last Nov. The NRA tender we have been waiting for it to come out for the last
two years, before we even start on the project. The Israeli one is being in a year and a half and we've only done one presentation. But I'll tell you one thing it seems to be getting longer, the bloody thing seems to be getting longer you know and then in contrast to that the next project in NY, I thought we were going to get a purchase order and actually we got a nice purchase order in from GE for Septa, I think Septa is in San Francisco, I not particularly sure what septa stand for but am it almost didn't even pass the pipeline it kind of came off the radar and straight in and you know we bid for it and the next thing you know we get a 900k order and they want it over three years and we're actually saying can we and GE are very big at this, give it to us and we'll bill onto the customer and we don't care if we store it. Which suits us brilliant because they bill quarterly so they're very keen on getting their revenue maximised every quarter, every quarter for them so that suits us. So it could be anything, it could be anything, there is no point even measuring it. And the other thing is it's not dictated by us but by the customer. It’s kind of one of those, we don't have much control over.

B: Can you tell me about your pre-development planning process, in relation to initial screening, preliminary market assessment, technical assessment, business/financial analysis?

P: If all that happens?

B: Does it happen?

P: Well it can happen in all of two seconds, in the old system, I’ve seen something, and I want this. Honestly a lot of it, I wouldn't underestmate the power of the company up until now and it is still there this gut instinct thing. You know definitely I wouldn't underestimate it, I don't know how to measure the bloody thing but this idea of I want to do traffic lights, you know. Like I’m not joking like today lads we are doing traffic lights, today we are doing video screens and here's one we actually did at the airport, now this came in as a customer, it wasn't pie in the sky. You know the heart breaking thing about that, we argued with these guys in France where it nearly killed us the whole resources went on this for a full year, we didn't develop anything else and the guys in France afterwards said to us we'd have paid double for it, afterwards, when they say what they got. So how does it generate, where does it generate I think now we have put a system in place where there is a whole pile of focus, there is a guy in eland saying listen there is signal heads for the railway, which is a different thing cause the customer is the same based on what we are doing and were saying let’s sort ourselves out on London bus and there is a huge, we, I have an issue at the moment with my engineers who are basically saying to me you've put us on a system of GANT charts and project completions, in the old times we were trying to plan and then somebody comes in and we're doing traffic lights or we're doing this or that and it would fuck up all their plans and then u know they'd be brought in and You promised it made, where is it and you kind of go hold on there has been 4 or 5 deviations since then. So what we are trying to do now, because the company is in trouble, not....we'll get out of it but in hard times to say let’s focus, bring it from out here back into here, so that’s what we are trying to do at the moment. A lot of it would be again salespeople generating, customer talks to me,
competitor does this seems to be a big market, what can we do. Preliminary lads knock it about, how long will it take.

B: So ye don't conduct any of these activities formally per se.

P: No, No. Well we do now, we do now. Under the new system that (product flop) would never have happened, that would never have happened now. Because at the end of the day, more analysis has been done since and the amount that we actually sell on those, the person who makes the most money is the chassis maker, we're only getting 5-10% mark-up on the chassis, so it's probably not that clever for us you know. I think definitely my brief has been and the new organisation the sales department, we want to be more external focused rather than internal focused, we have been very internal focused for the last forever but to say look and this even a person from enterprise Ireland saying start trying to develop for the market rather than you know just making it and you know mousetrap and see what happens, So you know there is some sort of process, shall we say that nothing new, there are no skunk wards nothing gets put on a project now unless we all agree this is the way we are doing it. And there has to be a whole pile of business case for example what’s the order worth? ok, that doesn't seem a lot what else can we get out of it, if we do it and it develops where does that put us up on the chain next, where is that getting us for it can we exploit that even more. So say for example a lot of the work that has gone into the software on the network devoicing for the railway signs, probably didn't make sense to be doing for one project. We sit down and but see that that can get us to here so we go and get a full market, we can't charge it all to that one customer but it gets us to here and that way we can get it to here and the next customer so a lot of that has been as well.

B: Which would you consider to be the most important activity? .......market assessment, technical assessment, business financial?

P: Now, now business/financial. Now it is, in the past a lot of it has been, well it has been engineers saying I’d like to make it as well. I know that doesn't make sense in marketing but when you are a small company where the owner is the manager as well you know there has been a kind of a challenge as well, a competitor can do it so we can do it. The only trouble is when you take on 4 or 5 very big competitors I think for us as a company we are very much like a terrier for the amount of, like we spend 8-10% of our turnover on R&D or so called R&D.

B: Is there many full time employees engaged in R&D?

P: Yeah yeah lots

B: How many?

P: Well there’s 5 here.......about 13-14. But it’s not R&D, to me its developing as we are developing the projects as we are developing everything else, it’s pure yeah that’s what they do, it depend on what way you want to classify it but I suppose if we didn't have
them its new, if we didn't have them we'd be making what we made last year, the same
time before and that doesn't seem to happen to us. Now what were my alternatives?
what’s more important, the market or the business?

B: Well what’s more significant, market assessment, technical assessment, detailed
market study and business/financial assessment?

P: If you put business/financial strategic, I’ll go business/financial strategic.

B: In relation to market-related activities can you tell me about your companies’
activities in relation, customer tests of prototypes, test markets/trial selling service,
advertising, distribution, and market launch?

P: Loads of prototypes, lots of prototypes, for NY we did about 6 or 7 prototypes. In
relation to advertising we do a lot of trade shows, I think one of the underestimated
thing in marketing is this customer visits, coming in looking around seeing what we
have in the factory chatting about their problem and its brilliant when it’s here because
then we don't know what they want to talk about, they might want to talk about software
and we can show our new software that we used for this particular station, mechanical-
can I show you they mechanical drawings that we are using for this this and this. Yeah
there is a lot of that, it isn't marketing as such but its huge customer interface, huge
customer interface and its almost purely they they're actually literally telling you, I have
a need this is my issue what do you think of this software, does this software solve that
problem or does this mechanical, it’s almost that kind of, it’s amazing what that kind of
ad hoc, do you want it to look like this, no no something like that but a little bit you
know and the next thing you know our cad cam guys draw it up and it’s like yeah yeah
that exactly. Now that drawing might go into a tender where everyone has a bit at it but
it helps that you’re first. We lost a contract for metro de lion, we actually lost it to a
person who is based in Lion we came second out of five and yet.... coming second, I
know that you get nothing for coming second in this business but in the past we
probably wouldn't even have got that far. One of the reasons was, we had actually
designed something for them that they thought was good as a prototype, we do a lot of
prototypes, actually I got an email in there during the week, but it was we would expect
you as a company to provide prototypes and the whole thing was, if the customer
doesn’t like it we are not paying you, you know that sort of a way, we expect you to do,
we expect to do these. But prototyping is the big thing and we are actually very good at
flexi doing prototypes, for the last one what we were trying to do is use commonality of
some of the things, you know you might look different but the inside of it might look
very similar to the inside of a hybrid of another one. So it’s rearranging it as you want it
that size, that’s nice, do you want to do ok so it’s a combination or a hybrid of 3 or 4
different projects, but at least we would have done the 3 or 4.

B: Do you carry out any customer tests or in-house tests of products?

P: Yes we do and external as well because some of the external is, I can actually show
you where they are working on at the moment on sunlight conditions downstairs. The
B: What length of time are these carried out for?

P: Oh........it varies, the one for S&CF actually had to have impact test, salt test, water test, so we tested it all here as best we could and then it went off to the test house and showed them this this and this, so yeah a lot of that sort of stuff. That was funny, it was for a tender but it was for a catalogue and am the only reason we got the business out of it was S&CF made a fortune last and once it is in a catalogue the station master can order what he wants from the catalogue so am we've done very well out of that but again a lot of it was done out of a pig in a poke, I mean they mightn't have bought anything but the testing was phenomenal, phenomenal, over the top we should have charged them more.

B: Are you yourself involved in the day to day guidance of the project?

P: Me in the day to day you mean operations, no, no, but I oversee them.

B: Do you employ a project manager for specific projects?

P: We actually have project managers; you see you have got to remember that we have here, Holland, UK, France, Germany so on, actually not Germany. Am we do have a project manager in each one of the subsidiaries.

B: Is the project manager delegated broad authority for the project?

P: Yes but everything would have to come through sales, the new person the project. And then he comes and tells me and them, green light or red light.

B: Who makes the final decision, how are decisions made in the company?

P: Am. who makes the final decision on a project, I suppose he has a huge latitude because he probably has more knowledge than I do but if its going to impinge on money wise or anything else to do with the business or on resources here then obviously then I have to be consulted, its not anarchy but in fairness, if I actually said who makes the decision I would endorse his decision.

B: Have you ever vetoed his decision?

P: I would, I could - would I, if I had to yeah. Very rarely though, I’d have to be hearing conflicting information from other people in the organisation to say no let’s have a look at this again. It could come from a salesman, cause our offices are also almost autonomous, I could get hold on a second we have to have this this and this done or we could lose this. You're talking about hypothetical’s that if it happens we need to have a meeting and trash it out and there pros and cons and what happens then is I tend to not a veto but more a judge, you know I’ve listened to you in engineering and I might even at that stage get on a plane and what you are usually talking about here is a project going tits up and that’s me getting on a plane and saying to the customer, this is where we are and a lot of the times its not our fault it’s just the customers just......going back to all the
Cinema's, if you missed an opening of a cinema you were gone right and the fact that they forgot to give you a purchase order 2 weeks before the cinema so we are kind of used to working with ridiculous expectations. In fact we have one at the moment where one of our better customers over the years but they have kind of dwindled now in Boston. They used to give us so much business that we used to develop software for them and now they have actually taken the hardware away from us and bought in screens all over the place they are still expecting us to make the software for free in a way or for cheap price and so we got on a plane and said listen guys it’s going to cost this amount of money and I’ve actually added plus out format because it’s not strategic anymore, its and old, the light is gone you know we are going more towards the traffic and say you know ok. Somebody always likes somebody else to take it in the neck don't they, that’s usually me, so. I would like to keep the company in that way that the CEO or Chairman is the first person to do over and say where are we guys or what you are asking is unreasonable or we can do this or we can do.......and this needs to be done from an overview helicopter view because sometimes we have rushed off and done, going back to that point there Charles de Gaulle airport it impinged on every other resource for six months, nothing got done anywhere else apart from that and every other office was pissed off from hearing about Charles de Gaulle because they couldn't see anything strategic for them going forward, they couldn't see and other business from it and it was just, why are we doing this? so you that could happen as well, so there is a guy better placed to make that decision but I would usually endorse him.

B: How significant then is total commitment to the project?

P: Well England would never be committed to a project in France. Each has a mandate to go after business in their own country, so as far as they are concerned. Now what we are trying to do is make sure that we do, that people know about it. You might come across oh we have done that in France or America or wherever, and the world being the way it is they also need to know about those projects in case they say that not only can I say but I can take you on a plane and show it to you, you want to be able to use the power of the group. But if you are in charge of the UK office that's your mandate, I don't think they would care if it was a success or a failure, there are not marked on that particular criteria, so yeah they would be upset if it was taking up a whole pile of resources, the same way now we are trying to but a lot of resources into the bid for London bus. Well we want to do something in Ireland well no, that’s what I have decided and in conjunction with everyone else around we have said that we will go for this, based on the pipeline, based on what we need to get in in the next year or two as a purchase order we know that’s what we are going to go for and we also know and we've also been considered that we have a very good chance for London Bus, there is no point throwing resources when we only have a 1 in 10 chance, we feel we have, they reckon it will be split in two tranches and we reckon there is 3 major players and we're one so it’s worth putting the effort in. The other thing as well is if we put the effort in pre-bid and we know what we are going to deliver afterwards it kind of saves time afterwards as well but we are doing it with a kind of hey if we lose it that’s resources gone down the tube.
B: In relation to resources, what kind of resources?

P: Engineering, yeah people in engineering, but you just can't throw engineers at it and certainly not know in our current climate. Although I’ve had someone in looking for two more software engineers, JAVA so if you know any JAVA software engineers please point them my way.


P: Sales. We analyse sales very very much, hugely analyse sales.

B: Do ye do any financial measures, ROI's or?

P: We don't do ROI's but let me show you (Opens EXEL with sheet with all sales, sale price, sectors, where customer coming from, market share as in how much of our output is oriented towards a sector, where is the margin coming from etc) sorry we do margin analysis as well, no point looking at sales if margins are poor. Its pretty comprehensive, the real reason we use this is for by the way, I’m not sure if we have it there the salesperson, to see what they are doing? There's no point us getting really tough down here and not figuring out what they are doing outside there either. Salespeople seem to be more transient do you know what I mean, yeah.

B: Do ye use customer acceptance measures at all?

P: The guys in England do customer surveys, and am, god you are inviting yourself to be beaten up half the time aren't you. They do, half the time I get the impression that they are doing it because they want more here, they go here’s bailey rail for example we didn't do this, we didn't do this but your kind of going but that guy is a fucking moaner anyway. I know him personally so it’s not that I am making it up and ah he has now notion of railway, this particular customer bailey rail you have to take it with a pinch of salt. Bailey came from a civils pulling wire contract and they actually used to get contracts in the railway for wiring and then they felt hold on a second 30% of the contract is civils and pulling wire which is what we do but what we want to do is actually get the whole contract and bid for the whole contract which is the CCTV cause we have to put the wire there for them so we'll do that that and we're installers anyway because if you’re up you might as well install at the same time. They haven't a notion about CCTV, have no idea about platform announcements, they have no idea about what we do. So but they are chancing there arm a little bit but what they are trying to say no no we don't want you to price for somebody being in attendance and we don't want this and we don't want this, but when it happens they want everybody .......oh we didn't get your support, we didn't. So ah we have ISO procedures, all our customer complaints are dealt with on a weekly basis, they are pretty genuine, some are rubbish, you know. I'm hard on everybody here so to say that I am complacent on this regard, but there are some people just taking the piss. Our guys in focus neon in Sweden, every year he tries to throw in oh I had to fix this sign and this sign so I’m billing you, no can I do, no chance for us to fix it returned under bas warranty which is what it is under, you just know he is taking the piss out of you, one or two of the signs we have got back, oh
you said you didn’t touch it yeah yeah well why is this changed. Now we do have other quality issues, that’s for sure but I’d rather them come back here, get analysed and our guys say hands up, this is wrong , this is wrong ,this is wrong ok fine. But ah the reason I say that was the whole strategy of Data-Display was to get our overseas offices so that we would get closer to the customers, in the past if you had a distributor you were always either too late for delivery, too expensive didn't work, make it happen, oh it doesn't work, it doesn't work, so you send a team over and they put in a bloody plug in, again it was trying to get closer to the customer but do we do them, we do, are they worth anything-if the customer across the way, and I’m sitting down meeting him at a trade show and he tell me he has a problem and I believe him, well yeah we have to take that but giving them a forum to do it, listen your only as good as your last contract as well so if they are pissed off with you they'll tell you and even if they don't tell you they'll even do more drastic, they'll go with another company. So yeah but what we do more than that is if we do lose a contract then we do go in and do an after, investigation on why we lost it, did we lose it on price, did we lose it on technical, what did they like, that’s much better feedback.

B: Financial measures would be the most important?

P: Over whether a new thing is successful?, Well yeah we can go this (product), they aren't selling, engineering brilliance, better than anything on the market but it’s not selling, so. Is that how I value success or failure, yeah yeah.

B: The activities that your firm engages mostly in, are they concentrated on allowing you to enter new markets, supplement one of the established lines or providing greater value by replacing existing?

P: No no, in fact what happened was like in the we were ending up like dial a sign where people were coming in and saying can you make this, I mean if you look at our website, Jesus Christ its literally can you do this, can you do this. But what we are looking for is a kind of am a commonality now that if we make something for McDonalds ticker for Portugal that we get this information out to the other offices and say look McDonalds in Portugal have this need, here's a photograph of it can you go around and ask all the other people have they got something similar so that we don't have to re-develop something else, so we are looking for commonality of people doing, so we don’t want...in the past we always had France doing their own thing, what we are trying to do now is a little bit more commonality between everything else that we do, that it joins the dots and if its bucketful in Holland it should be successful in England and if not why? That's what...nothing rocket science about it but am yeah. Some of the things definitely are opportunism, we just fall into them, customer rang, again marketing - sticker on a sign and I see you do this I have an idea, oh it links into a fire system, ok all that kind of stuff and you kind of go yeah ok, can we bid for it can we not bid for it. If we're that interested we’ll bid for it keenly if not we'll put a premium on it and ah yeah, we probably do an awful lot of stuff that isn't railway, transport, just to see if something brings us in somewhere else and again that’s how the cinema business happened so yeah. The other thing that we are trying to do is get our sales people together from all the other countries once a year, just to swap stories, what’s working
for them you know, how do you do it, who are you taking to what's your in, what's you presentation like, swapping of presentation like that sort of stuff and it seems to be working quite well, cause what they do then is they tend to keep in contact with each other.

B: What’s the greatest challenge facing the company in the next decade or so?

P: I can't even see the next decade, the next 3 months, to make sure we get out, get the orders in, make sure we get them out and are they are profitable and pay the bank the money, its...we now moved from a strategic to a survival over the last.......we've hit an awful storm at the moment, I think the biggest thing is ... but to answer your question in a theoretical manner, we need to scale, really we need to be taken over by a bigger company or we need to scale up ourselves, we need more scale, for what we are doing at the moment we need more scale. Either that or we retrench and become good at one thing, be it rail but then we don't do highway, we don't do rail, we don't do bus whatever. I think what we need at this moment in time is more scale and I think with the international....we've set up for scale, we have all these offices overseas, we have a massive investment in production here, we are looking...we have always sourced from Taiwan, always sourced from Taiwan so but at the same time that if they do become standard we will probably get Taiwan to do more on the supply chain. But I do feel what we need is more scale.

B: What’s the biggest obstacle to getting there?

P: Scale? I would say management team and finance; well you can get the finance. If you're going to scale you've got to have it within your own management capabilities and we aren't there yet but we are getting there, getting there but I do feel that you need a whole pile of lots of people coming management talent to say: right we are going to get bigger, if we're going to be five times the size we are now what kind of company will we look like and it will be a different management team, we'd have to be finance cause we're probably talking mergers and takeovers or you're talking about scale. Everything more or less we've done has been done organically you know, all our overseas offices have been slow, you know we haven't just gone in and bought a competitor or anything like that. We've probably been a little risk adverse but I think myself for what we are doing, with the environment being the way it is, with technology changing all the time, you've got to remember that some of our suppliers, look at even the LCD screens they're Samsung and LG and there's one other you know, can you tell Samsung to change it, fuck off. You know the power of the supplier if we go down that market, the supplier in the LED's we are a little better but we are.....I think scale would give us a little bit more purchasing power, the more power verses what we need to buy in which should help on the scale to get the costs down, cause we need to get costs down, there is no point in me telling you that price, price, price is a huge thing, I me not try to get costs down. So costs down but also we definitely need to get scale and scale might be one way of getting your unit costs spread a little bit better. You get more return for your engineers then, so I think we probably need more scale and how that would be achieved is either we are acquired but in a...so what we do it gets spread even further, you know they might say right Ireland is very good at developing new products
so we let them do NPD but we have a bigger organisation to sell it in, or we start taking over companies as well in related industries as well but again you could but those companies and find management talent within it itself that would come in as well.

B: Do you see this as an avenue?

P: Yes of course it is, there is only two avenues acquire or be acquired but we have to get over the short term thing at the moment which is survival. We got caught, this company has always been cash rich, and we just got caught because we bought out some bank of Scotland. We just got caught this year with 3 or 4 things going against us, and you know the dollar, sterling, price of raw materials and the order book and the credit crunch, that’s…it gets wider doesn't it. So that’s why that’s it. What are you trying to prove?

B: Explanation of research given.

P: They are all relevant, what you are saying there. Everything there is very relevant. If I was actually to rate them, existing skills within the company is the one, the most important one, very important and the more projects that we do the more skills that we have the more knowledge that comes in, I think that, if somebody were to say where we are, why would I give you this Israeli contract it’s because in this company when I come into it, when I walk around the factory and when I talk to the people who do the software, this is a company who has done it before or something similar, that’s what I think it is and definitely I would be very proud of our people what they've done in the past. Look Christ we are where we are and yet we can compete against French competitors, we're in Israel - it’s a very international arena in Israel, ah we compete in England, we compete in America it’s you know. .....Germany is our big one we haven't been in and there is one other country that’s its desperate to be in is Italy, cos the Italians I think ,it’s even proven by EU stats, they tend to give 80-85 I’m sure even more on anything procured goes to Italian companies and then they have the other one they do I think it’s 249k is the limit of a purchase order before it goes into tender for official tendering, you know the Italians would think nothing of writing 4*249 purchase orders. We had some bad experiences in Italy....but we've tried, we've tried. From where we are, we're a little bit like a terrier, we'll take on stuff we probably shouldn't have taken on and it’s that one you were saying there the skill and dedication of the people that made the projects happen, really ambitious projects and they really have roped in behind them, it been something and I think that is part of the culture as well which I was telling you about the communal culture where people do feel very attached to it. Now we might have broken a bit of that by going on a 4 day week for the last 3 or 4 months, people have been very pissed off, I’ve lost a few people but we haven't made anybody redundant. We're back on the 1st September anyway, so am yeah it might be because where we are cos people might say oh they wouldn't leave because....some of the people who we have are very very talented people and they could work anywhere else if they wanted. Am a lot of them would be very well travelled, our top guys between supply and....our man in Newcastle is just back from China and Taiwan doing some tests, guy in projects is just back from UK but was in US two weeks ago. We are quite an international company, although our location, we're the only factory for miles but
definitely the people has, you couldn't do what we've done without the people that we have had. The environment can I go back to, we will try to adapt to the environment so we will get there, we will because we are listening to it all the time now, the only thing is that this environment, we got caught this year, it happened very very quickly, that’s not an excuse but by fuck I haven't seen it this bad, this is really really bad stuff, it really is bad. The economist has a big mac index, trying to prove purchasing power parity theory you know what you should buy with a dollar here when you should change that into euros you should be able to buy the same amount. So what they did was they picked a commodity that they thought was more or less similar throughout the world...they have been using this big mac index for 15 years or whatever and using that index the dollar is probably overvalued or the euro is overvalued by 50% against the dollar, this is where we are at this moment in time so what do we do, well we try to change our inputs into buying in dollars and all that. The general credit has put everybody a little on capital purchase and capix like that hold on a second do we need to do it, do we re-evaluate. All that stop re-evaluating is putting all the contracts that we thought were coming in on hold so we have to adapt to the environment, we are not strong enough in industry to make anything happen but you have to be very careful about where the environment is, so that ......Technology is another that we are trying to keep up with as best we can and if it doesn't suit the market we are in, like for example say we move more and more towards indoor screens and we couldn't make them cheaper than they could buy them off the shelf, then we would have to go and find another market and we've done that 3 or 4 times, we've reinvented ourselves and that ties in to where are we in the cycle, product lifecycle theory.....how does anybody know we are on the crest of it like, in hindsight yes you can trace it but when you are on that point saying are we going to go up or down, unless you have very good forecasters in place, that’s very good as well but I definitely think that the people we have and the culture we have is definitely.....we have done some great things here, not me some of the engineers some of the stuff they have come up with, for people in NY to say that’s what we are looking at and the more I got it is doing the presentation in Israel, we had 12 Israeli’s up and we had to wait for the Germans to finish their system and I got up cracked a joke because I had been in Israel before about something else and feeling, I feel great here I am in front of the Israeli, they've got Germans in Italians, Americans they are the best of the best and I feel really good that we are going to nail this contract and I wouldn’t’ be able to be that without saying this is what we have done and what we have done is being a result from what the guys have taken on as projects and to be honest if I asked the again this year between now and Christmas to put in another super human effort, right guys the orders are in now, it didn't make a difference up to now it doesn't matter because we didn't have the orders in. The orders are now coming in and I’m asking you to really push it from now to Christmas and make it viable again. And yeah they've been great, very innovative the guys are very....

B: Do ye do any in-house skills training or anything else?

P: Trying to, it’s something that has been on the job and everything else and even today when talking about our new software guy, he would bring knowledge in. We need to be bringing people in who...I now have a training ground with enterprise Ireland, I am
doing it but not so much for R&D, I’m doing it for soldier training and bringing other people in and part of the lean is the idea of people generating ideas as well and what I’ve told them that if there is any course that they feel will improve their productivity then find the course and we’ll see what we can do you know. Don’t send anybody on MBA’s though.

P Notes: B2B very much more clear cut, they do it this way because it’s a product, we do it this, this this our difference is this you know that kind of thing. I think ours is very more opportunistic, come back from a trade show customer says this.......a lot of things aren't even us being clever it’s our customer saying do it or else I’ll get someone who will, take it or leave it. Impact of reputation and branding....reference points........Panasonic no marketing dept.......two products that you bought over the last year...ipod holder for car that will play music through car stereo it was my cousin from America I say it from him, I would never have bought it if I hadn't heard from somebody I really trust and the same thing somebody give me driver etc......trust thing but at the time the name of the brand meant nothing, I didn't buy because of the brand but because somebody recommended it to me, it would be good for you. I think the reputation bit has more to do in an environment that you don't know anything about, so these signs we do, it’s not something that they know about...not like a television and then price comes into it and you throw in something else but definitely I think when there is a risk element i.e. there's a risk element in that we don't know who you are, from where??......what have you done? can you stand over it can you prove it and id the risk going to be taken that if I go through down over project and at completion your signs aren't there or not working ,give me the comfort, that’s what I think it is about anyway, what promises are you making out of it.... TOUR OF FACTORY FLOOR

Company D

B: Can you tell me about your business:

D: Well it was founded in 2000 the company. I had previously worked for Pepsi as a buyer of fruit juice, and I began to see a shift away from carbonated drinks and the move towards healthier options. This enabled me to spot a gap in the marketplace for a healthy alternative to carbonated drinks and thus Company D was formed. Company D are currently supplying the Irish market with a range of fruit juices and smoothies and production began in Hospital, County Limerick in April 2001 and I employ 8 full-time staff.

B: Can you tell me about our NPD process?

D: We are currently not developing new products and have decided on a short-term strategy of growing distribution channels for the next 12 months. At the moment we are distributing other products for external companies (for example Iskha water) and growing this value creation activity is now the main activity.
B: In relation to previous products that you have developed can you tell me about the process? Where do the ideas come from? Is there a formal process?

D: Well there is no formal NPD process. Idea creation for example comes from anywhere, me, other staff members, customers, family, friends…anywhere. I suppose our most recent products were developed in 2006, 2 new products were developed and launched – both of which have now been delisted and production upon which has stopped. At the time we were looking to differentiate ourselves from others in the market and create something new and we developed and launched 2 new types of smoothies, an organic version and a functional version (with added Omega). Both products were developed “off the cuff” and very little market research was done, which I suppose may have added to their failure. It was all very much let’s make it and see will it sell development. I suppose at the time I believed that these products added benefits and functionality.

B: Why do you think they failed?

D: After the product launch we had a group of students conduct some focus groups where it was identified that there was only “slight” interest in the functional smoothie product. The focus groups were beneficial in that they identified that customers were both really interested in this type of product however, people wanted their smoothies to be natural and it was seen as a natural substitute and additives were at odds with this viewpoint.

B: Where did the idea for that product come from?

D: The idea for this product first came from family and friends who I casually spoke to about such as product and who were all very positive, which in itself can be a drawback. Other than this method of informal talks no other forms of research was conducted. On another occasion I looked at extending its product range by introducing a 330ml version of our existing products. The products currently come in 250ml sizes only. Again no consumer based analysis was conducted. But the factory at its current capacity could not extend itself to produce the product. It would have required a substantial capital investment and this was just outside our capabilities and was a non-starter.

B: And who makes these decisions?

D: I do. In relation to new product ideas, the decision not to follow through on many of them was based on “experience” or “a cost” basis. For example we also considered developing a smaller kids size smoothie (150ml). But the cost associated with this development was too great and we had to abandon the idea. The smaller bottle could not have been produced at a significantly lower price than the current 250ml bottle. This would mean that there would be no significant price difference between the 250ml and the 150ml products. We also looked into developing tetrapak cartons and distributing our product in these but resources to purchase a new packaging machine were unavailable.

B: So these we all product extension ideas?
D: Yeah but we did look at entering a new market. We considered manufacturing a branded yogurt because the manufacture would not be that large an extra step away from our current process. I suppose I discounted that idea was discounted on the fact that the yogurt market is already too competitive.

B: Can you tell me about your competitors?

D: Innocent smoothies is the only other main competitor in the smoothie market. They are based in the United Kingdom (London) import all their produce into the Irish market. They really are our most direct competitor.

B: How aware are you of their actions?

D: Very much. I try to keep an eye on what they are doing quite frequently and I receive email alerts when innocent are mentioned online, its provided by Google.

B: Can you tell me about your customers?

D: I have two kinds of customer, the shops I sell into and the people that buy my products. It’s simple although our products are consumer based, the retailers are equally important. If your product is there people will buy it….so the most important thing is to have your products on the shelves.

B: What is your products advantage?

D: The advantage to present in the products differs. For my end customers, users even, the advantages that their products offer is in perception and that is the most important advantage to present. Smoothies are seen as the healthy option by consumers, a way of getting a percentage intake of their recommended daily allowance, a taste indulgence but healthy with the fruit benefit and that’s what we have to sell. I suppose also price, our products are impulse buy but in today’s market environment consumers are price sensitive. Smoothies are different it’s is not possible to say that our smoothies are better than Innocent smoothies – it is individual taste.

In relation to retailers the most important advantage is to provide added benefits that help retailers “survive” and margins are generally the most important. Things that add benefits, that make the retailer better off like (10cent on something). What I can do to bring someone into the store is the way I sell it to retailers. Added value that can allow them to save, improve or differentiate. In relation to smoothie sales most of the volume is currently coming from large supermarkets like Tesco and in 1 litre tetrapaks and multipacks.

B: How do you find out what they want?

D: Talking to them, asking them what they want, we have sales representatives, who are constantly in contact with the customer.

B: Do you measure new product performance?

D: Yeah we look at sales volume and margins a lot.
B: Any customer related performance measures?

D: Like what?

B: Customer satisfaction?

D: No not really, no……we talk to retailers alright.

B: Do you have formal NPD processes?

D: There is no formal new product development processes.

B: Is there anyone solely engaged in R&D?

D: No employee is solely engaged in new product development.

B: Can you tell me about your market?

D: Our market is everyone. But at the moment marketing is not seen as the core activity to be engaged in at the moment. We have embarked on a low cost social media marketing campaign – facilitated by a UCC student intern. Our website has been redeveloped to make it more user-friendly and a facebook page has been set up. I reckon I might currently spend 30min per day updating the site. So I suppose at the moment our marketing activities at the moment are “very low key”. Most of our resources and activities are currently engaged in production.