

**CRANFIELD UNIVERSITY**

**HANNAH NOKE**

**THE CREATION OF A NEW PRODUCT  
DEVELOPMENT CAPABILITY IN UK  
MANUFACTURING SMALL AND MEDIUM-SIZED  
ENTERPRISES (SMEs)**

**SCHOOL OF MANAGEMENT**

06

**PhD THESIS**

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CRANFIELD UNIVERSITY

SCHOOL OF MANAGEMENT

PhD THESIS

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HANNAH NOKE

THE CREATION OF A NEW PRODUCT DEVELOPMENT CAPABILITY IN UK  
MANUFACTURING SMALL AND MEDIUM SIZED FIRMS

SUPERVISORS: PROFESSOR JOHN BESSANT AND DR ZOE RADNOR

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## **ABSTRACT**

This is a study of how manufacturing small and medium-sized enterprises (SMEs) create a new product development (NPD) capability in the UK. The UK's innovative and productive performance remains a subject of considerable concern, not least because of its increasing productivity gap, but also because of concerns relating to the manufacturing industry's reliance on gaining process efficiencies. Indeed it is believed that to remain competitive a move up the value chain is a necessity, through the likes of new product development.

This exploratory research has adopted a qualitative approach, through interpretative means, allowing a rich and in-depth understanding to be gained. The study incorporates four detailed case studies on UK based manufacturing SMEs. A number of research methods were employed to aid triangulation of the data, including unstructured and semi-structured interviews, observation and documentation, such as company brochures and website material.

The thesis makes two contributions to new knowledge and understanding. Firstly, the strategies that are employed and found to enable the creation of a NPD capability are identified; these include external involvement with other organisations to access resources and skills not possessed by the firms themselves. These outward facing strategies incorporate the use of strategic alliances, licensing of technology and ideas, and outsourcing elements of the NPD process. In addition, an internal, in-house development process was utilised. This offered the firms control of the process and the opportunity to capitalise on their own unique knowledge and skills which provided them with a competitive advantage. Secondly, this study provides a unique insight into the factors that are required for SMEs to create a NPD capability. Interestingly, this research indicates that these factors are not created simultaneously; rather, they occur at different rates and as such were categorised as 'enablers', i.e. those factors already enabling the creation of a NPD capability. The second group of factors, 'qualifiers', were found to be important to the creation of a NPD capability, but were not fully developed and were not enabling the process. However, the research identified the potential of 'qualifiers' to become enablers over time.

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The empirical section of this thesis forms a strong element of this research. Without the help of John Christopher from the Manufacturing Advisory Service East (MAS-East) who supported and understood this research, and was passionate in helping me source case studies, finding the firms would have been so much more difficult. Further thanks go to the case firms, for providing me with vital access to the people within the firm and for allowing me to explore the journey that they were embarking on – their time was invaluable to this research.

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## **PUBLICATIONS**

### **Submitted Journal Article**

Noke H., J. Bessant and Z.J. Radnor "Moving Up the Value Chain: The Transition Process For Manufacturing SMEs To Create a New Product Development Capability" requested to submit to **International Journal of Manufacturing Management** after presentation at 12<sup>th</sup> European Operations Management Association (EurOMA), Budapest 2005 – (submitted 31<sup>st</sup> October 2005).

### **Conference Papers**

Noke H., J. Bessant and Z.J. Radnor "Moving Up the Value Chain: The Transition Process For Manufacturing SMEs To Create a NPD Capability" **CINET (Continuous Innovation Network)**, Brighton 2005.

Noke H., J. Bessant and Z.J. Radnor "Moving Up the Value Chain: The Transition Process For Manufacturing SMEs To Create a NPD Capability" **12<sup>th</sup> European Operations Management Association (EurOMA)**, Budapest 2005.

Noke H. and Z.J. Radnor "New Product Development During Times of Survival: Characterising Organisational Behaviour" **10<sup>th</sup> International Product Development Management Conference**, Brussels, Belgium June 2003.

Noke H. "The relationship between New Product Development and Organisational Survival" **Euroma PhD Seminar**, Lake Como June 2003.

Noke H. and Z.J. Radnor "New Product Development During Times of Survival: Innovative or Conservative Characteristics" **R&D Management Conference**, Manchester, July 2003.

Noke H. "The relationship between New Product Development and Organisational Survival" **Euroma PhD Seminar**, Copenhagen, June 2002 .

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## GLOSSARY

For the purpose of this research, definitions are provided of the key terms that will be used throughout this thesis. The intention is to provide clarity as to what is meant by these key terms and how they have been used within this research study.

**Innovation:** This study will adopt the definition provided by the DTI; “the successful exploitation of new ideas” (DTI, 2005).

**New Product Development (NPD):** This study will use a definition which builds on the above definition of innovation provided by the Product Development Management Association (PDMA) “the overall process of strategy, organisation, concept generation, product and marketing plan creation and evaluation, and commercialisation of a new product. Also NPD is frequently referred to just as ‘product development.’” (PDMA, 2006).

**Construct and sub-constructs:** Specifically construct relates to the theme that was identified from the research findings. A sub-construct is a category within the overall theme that was identified in the research findings.

**Determinants and success factors of new product development:** These terms are used to describe the variables/constructs/factors that have been identified in the literature as relating to 'best practice'. These determinants or factors are considered to determine the success of an NPD project, yet there is little agreement on a final list.

**Enabler:** This relates specifically to the findings from the case studies. The term enabler was given to a construct or sub-construct that was found to 'enable' and aid the firms to create a NPD capability. Enablers were found to already be making a positive contribution to the firms in their bid to move up the value chain.

**Qualifier:** This relates to the findings from the case studies that were deemed important by the case studies in aiding the creation of a NPD capability. However, they were not yet fully developed, and were not truly aiding in creating a NPD capability, but there was potential with further development for the 'qualifiers' to become 'enablers'.

Capability: Leonard-Barton (1992) views capabilities as being core if they differentiate a company strategically, arguing that *“the concept is not new.”* Various authors have called them distinctive competences (Snow and Hrebiniak, 1980; Hitt and Ireland, 1985), core or organisational competencies (Prahalad and Hamel, 1990; Hayes, Wheelwright and Clark, 1988), firm specific competence (Pavitt, 1991), resource deployments (Hofer and Schendel, 1978) and invisible assets (Itami with Roehl, 1987). For the purpose of this research the definition that will be used is adopted from Leonard-Barton (1992) *“as the knowledge set that distinguishes and provides a competitive advantage.”*

New Product Development (NPD) capability: The ability of a firm to create and develop a new product and take the product to market.

Value chain: Refers to the process of how a product gains value (and costs) as it passes through the vertical stream of production within the firm (design, production, marketing, delivery, service). When the created value exceeds costs a profit is generated.

## CHAPTER ONE - INTRODUCTION

*This chapter presents the genesis for the research presented in this thesis and the research question guiding the study. Introducing the emergent and growing need to focus research on a dilemma facing manufacturing in the UK provides a rationale as to why it is important to concentrate on SMEs within this research framework. The chapter closes with a summary of the thesis structure.*

### 1.1 GENESIS FOR RESEARCH – VALUE OF MANUFACTURING

It can be argued that manufacturing is no longer simply a business of the transformation of inputs into outputs, through the use of standard equipment and techniques (Bessant et al., 2003). The role of manufacturing is a changing one. A recently published report by the UK's Department of Trade and Industry (DTI), the Innovation Report (2003), highlighted the increasing nature of competition for the UK manufacturing sector. The competitive threat to manufacturing businesses is no longer predominantly from countries with low labour costs, but from those countries with low labour costs which in addition have a well-educated labour force (DTI, 2003). Therefore the question that is raised is how can manufacturers in the UK create a competitive advantage?

The simple statistics (DTI, 2005) below demonstrate the importance of manufacturing to the UK economy and highlight the importance of research into how manufacturing can remain competitive:

- The manufacturing sector makes up a sixth of the UK economy;
- Manufacturing is responsible for around two-thirds of all UK exports;
- Manufacturing generates 3.5 million jobs directly and millions more through associated supply chains and related services;
- The manufacturing sector is responsible for around 75% of all business research and development;
- Manufacturing is a key generator of productivity in the wider economy through the introduction of new products and processes.

Any downturn in manufacturing within the UK could have a significant impact on the economy, thus the difficult challenges facing manufacturing become ever more pressing. In 2002 the 'Manufacturing Strategy' was produced by the DTI (2002), followed by an update of the strategy in 2004, which stressed the importance of the manufacturing sector and outlined what the Government views as the key challenges for manufacturing firms. *"Manufacturing nevertheless will continue to play a vital role in our economy in the future. But in the face of increasing low-cost competition, firms will need to move up the value-added chain and embrace knowledge-intensive, high-skilled manufacturing to compete more on quality and less on price"* (DTI, 2004).

The conclusion that can be drawn from the position that manufacturing faces is that to improve its competitiveness manufacturing firms will be required to *"earn a decent rate of return on investment"* (Porter and Ketels, 2003). However, in order to benefit from a decent return the answer is not simply a matter of *"cutting costs, but on continually creating goods and services that people want to buy"* (DTI, 2004). Bessant et al. (2003) argue that such sustainable growth depends on the ability to master the knowledge content in production, and this can only be achieved by developing the capacity to learn along the whole spectrum of economic activities. Appropriate practice is thus not a one-off 'hit', but rather, building a capacity to change.

## 1.2 VALUE CHAIN AND INNOVATION

Advancement up the value chain is one such possible approach to gain a competitive advantage. The idea of a value chain was first suggested by Michael Porter (1985) as a way of presenting the building of value along the chain of the activities, which go to make up the final offering to the end customer. Hegert and Morris (1986) state that *"the fundamental notion in the value chain analysis is that a product gains value (and costs) as it passes through the vertical stream of production within the firm (design, production, marketing, delivery, service). When created value exceeds costs a profit is generated."* The concept of the 'value' of a product or a service is associated with products and services being viewed as a 'bundle' of attributes (Lancaster, 1975). The creation of this 'bundle' can result from a number of configurations of the value chain so that a particular firm's configuration and resulting bundle of offerings to its customers will be unique. This forms the basic concept of competitive advantage (Armistead and Clark, 1993). Manufacturing subcontractors like the

firms to be studied in this research are limited in the value they can add to the overall value chain. Simply due to the nature of their involvement, two problems are created; 1) the revenue they generate is limited, and 2) low cost competition can undercut their position. Debatably these are contributing factors to the current situation UK manufacturers are facing, and why a move up the chain is advocated.

Arguably different models to create value are feasible. Both the UK Government's Manufacturing Report (DTI, 2002) and the scholarly literature argue innovation as one of the means for climbing the value chain. Specifically, within the innovation literature it is advocated that innovation can be mobilised creating a competitive advantage in order to survive - 'innovate or die' (Peters, 1990, Peters, 1991, Wah, 1989, Kiernan, 1996, Taylor, 1990, Garvin, 1992). The word 'innovation' originally comes from the Latin *innovare* meaning 'to make something new', but it helps to think of it, not only in terms of 'invention' – creating something new, but also of its development and take-up in practice (Bessant, 2003). Tidd et al. (2005) present a number of different aspects to innovation as illustrated in Figure 1-1, which is replicated in the definition offered by Freeman (1982) "*the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment*". Perhaps the most succinct definition is offered by the Innovation Unit of the UK Department of Trade and Industry, which sees it simply as "*the successful exploitation of new ideas*". The explicit focus of this research is concerned with one element of innovation – the development of new products (a detailed review of the new product development (NPD) literature will be presented in Chapter Two).



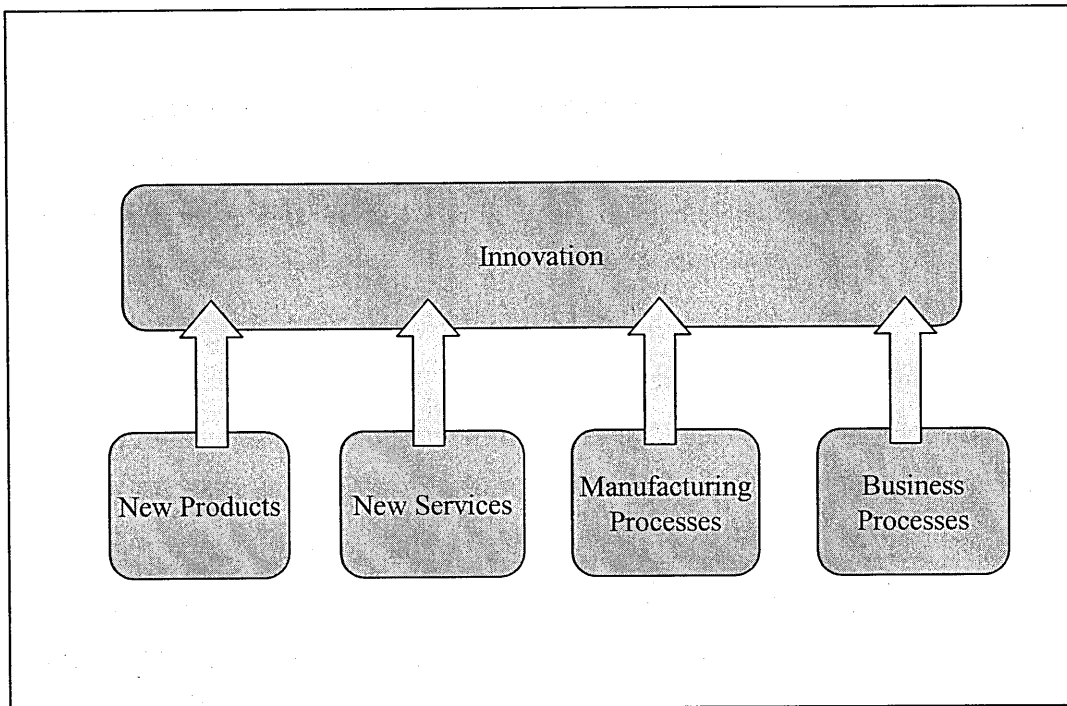


Figure 1-1 Types of innovation (adapted from Tidd et al. 2005)

It has been suggested that through the development of new products, organisations can obtain closeness to their market, as well as attempting to satisfy and retain customers in order to survive even within everyday operations (Dougherty, 1992). Scholars have observed that the ever changing, dynamic business environment has created a need for continual organisational transformation. New Product Development (NPD) has been advocated as a primary means to achieve corporate renewal and as an “*engine of renewal*” in response to the rapidly changing environment (Dougherty, 1992, D’Aveni, 1989, Dougherty and Cohen, 1995, Slack and Lewis, 2002, Bowen et al., 1994). The importance of NPD during times of uncertainty is further argued by Eisenhardt and Brown (1998) who state that NPD is “*among the essential processes for success, survival and renewal of organisations, particularly for firms in either fast-paced or competitive markets.*” Thus through the implementation of NPD firms can maintain or build market share in both mature and new businesses (Kerin et al., 1990).

### 1.3 MANUFACTURING AND INNOVATION

The UK Government (DTI, 2002, DTI, 2003, DTI, 2004) highlights that innovation and product development can be part of the way forward for UK manufacturing to reduce the productivity gap:

*“Innovation is the successful exploitation of ideas and a catalyst for growth. It is key to our economic success and critical to UK manufacturing because it can help to deliver higher value-added products; new cleaner and more efficient production processes and improved business models” (DTI, 2003).*

Many manufacturers in the UK have mastered process innovation, which has provided efficiency benefits. However, these benefits are becoming ever more difficult to build upon and improve in the light of low cost competition from foreign competitors. There is a growing realisation from the firms, as well as government policy makers (DTI, 2003), that manufacturing cannot simply seek continuous process innovation and improvement in operational efficiencies. Instead the response from manufacturers needs to be far more wide reaching. Firms must develop the ability to learn new capabilities, and integrate and reconfigure existing capabilities to continue their long-term survival. Thus it can be argued that there is a need for manufacturing to move up the value chain using product development.

#### **1.4 SMES, MANUFACTURING AND THE UK ECONOMY**

This research has taken the deliberate decision to focus specifically on manufacturing SMEs and how they can create a NPD capability. A number of reasons account for this decision, as this section and the subsequent section will highlight. In summary, the rationale for focusing specifically on SMEs was 1) the importance of SMEs to the UK economy and, 2) the lack of empirical research into the way that SMEs develop new products, despite the belief that there is a distinct nature of SMEs, including their approach to innovation.

It is important to clarify what is meant by SMEs, and this research adopts the classification criteria used by the UK Government, highlighted in Table 1-1. It is worth noting that for statistical purposes, the DTI makes a distinction between micro and small firms, usually based on the number of employees, also highlighted in Table 1-1. The rationale for choosing to specifically investigate how manufacturing SMEs move up the value chain is because of the important role that SMEs play, both within the wider economy and the manufacturing sector. There has also been an increasing focus from policy makers on SMEs, with the European Commission arguing that the 18.5 million SMEs in the EU are the foundation of economic strength and are crucial to the process of enhancing Europe’s competitiveness and growth. For over a decade SMEs, especially smaller firms, have been seen as the main source

of future employment (Hart, 1999) demonstrating their importance to the economic structure. According to the Small Business Service, at the start of 2004 small and medium-sized enterprises accounted for more than half of the employment (58.5 per cent) and turnover (51.3 per cent) in the UK, as illustrated in Figure 1-3. Even when this is compared to large organisations (Figure 1-3) the combined contribution of small and medium sized firms has a powerful impact on the UK economy.

	Turnover	Balance Sheet	Employees
Micro			Not more than 9 employees
Small	Not more than £2.8 million	Not more than £1.4 million	Not more than 50 employees
Medium	Not more than £11.2 million	Not more than £5.6 million	Not more than 250 employees

Table 1-1 Distinction between small and medium sized firms (DTI, 2005)

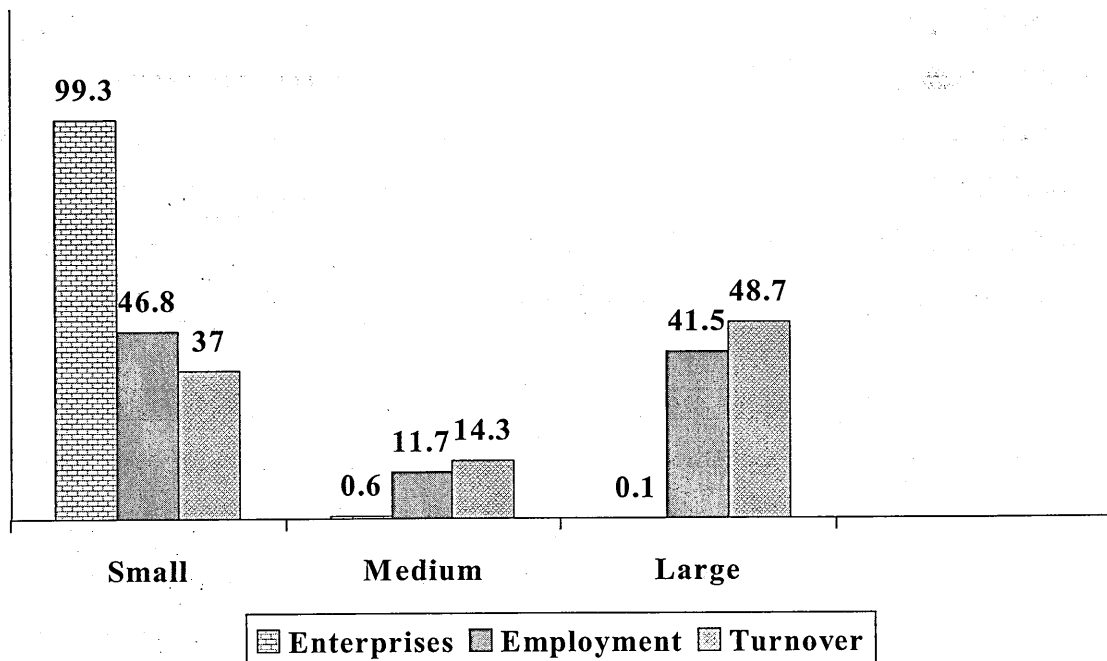
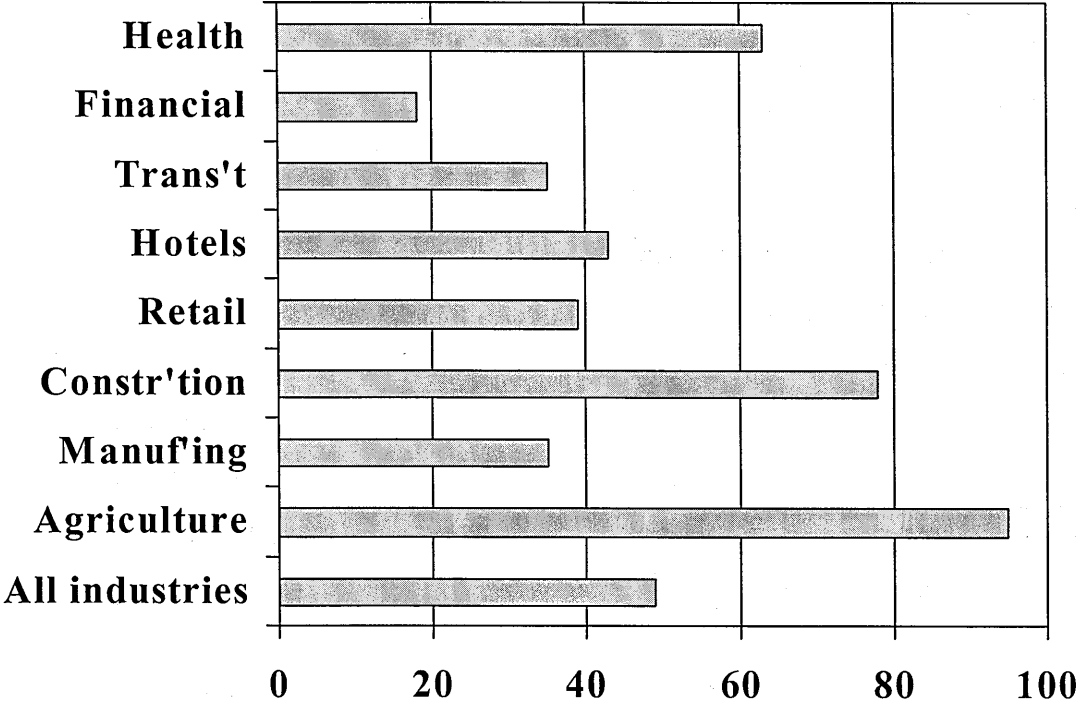


Figure 1-2 Share of enterprises, employment and turnover by size of business 2004 (Small-Business-Service, 2005)

To further justify the decision to focus on SMEs within manufacturing, it is important to examine the breakdown of SMEs by industry sector. The data in Figure 1-3 illustrates the share of employment in small enterprises (1-49 employees) by industry sector during 2003 (Small-Business-Service, 2004d). This only provides data on small firms rather than SMEs combined, but it does illustrate the importance of SMEs within the manufacturing sector. The importance of this segment of the economy is potentially huge, especially given that the number of SMEs is growing. Whilst this data includes all industrial sectors and is not specific to manufacturing, it does demonstrate the importance of SMEs to the UK economy.



*Figure 1-3 Share of employment in small enterprises by sector during 2003 - (Small-Business-Service, 2004d)*

Despite the importance of manufacturing SMEs, Hoffman et al. (1998) argue that in the SME literature there is a bias towards research into a fairly narrow set of technology-intensive and new technology based sectors. Most notably the areas of interest are biotechnology, and to a lesser extent, IT. As a result we now have a significant knowledge and understanding about the approach of firms in these sectors towards R&D and technology management, but researchers have not fully explored other sectors. Though it would appear that there is a lack

of empirical data surrounding mature manufacturing SMEs, which is central to this research, this illustrates the need to focus on this set of firms to redress the balance.

### **1.5 SMALL AND MEDIUM-SIZED ENTERPRISES (SMES) AND NEW PRODUCT DEVELOPMENT (NPD)**

Whilst the UK Government has focused a lot of attention on small and medium-sized enterprises (SMEs) and their ability to innovate, recognising, *“new entrants and growth businesses enhance competition by challenging incumbent businesses; and they are an important source of innovation and new ways of doing things. The vitality of the small business sector is therefore critical to the government’s objective to raise the rate of UK productivity growth and narrow the productivity gap with the US, France and Germany”* (Small-Business-Service, 2004c). During the early post-war period it was widely believed that large firms were the main source of innovative activity. This can be traced to Schumpeter (1950) who advocates that innovation capability increases with firm size. However, since the early 1980s a wave of empirical studies have shown that SMEs are important contributors to the overall process of innovation (Kalantaridis and Pheby, 1999, Bound et al., 1984, Pavitt et al., 1987, Rothwell and Zegveld, 1982). A recent survey for 2003 by the Small Business Service (2004a) found that two in every five small employers had introduced some kind of new product or service. This provides evidence that smaller firms are involved in innovation, particularly NPD. It also demonstrates that even though there is a lack of research into the NPD processes which SMEs adopt, the importance of NPD is still understood and valued by SMEs. This is further illustrated by the survey results presented by the Small Business Service (Figure 1-4), where 65 per cent of the respondents agreed that product innovation was either very important or important to the success of their firm. SMEs clearly recognise the need for innovation if they are to succeed and survive.

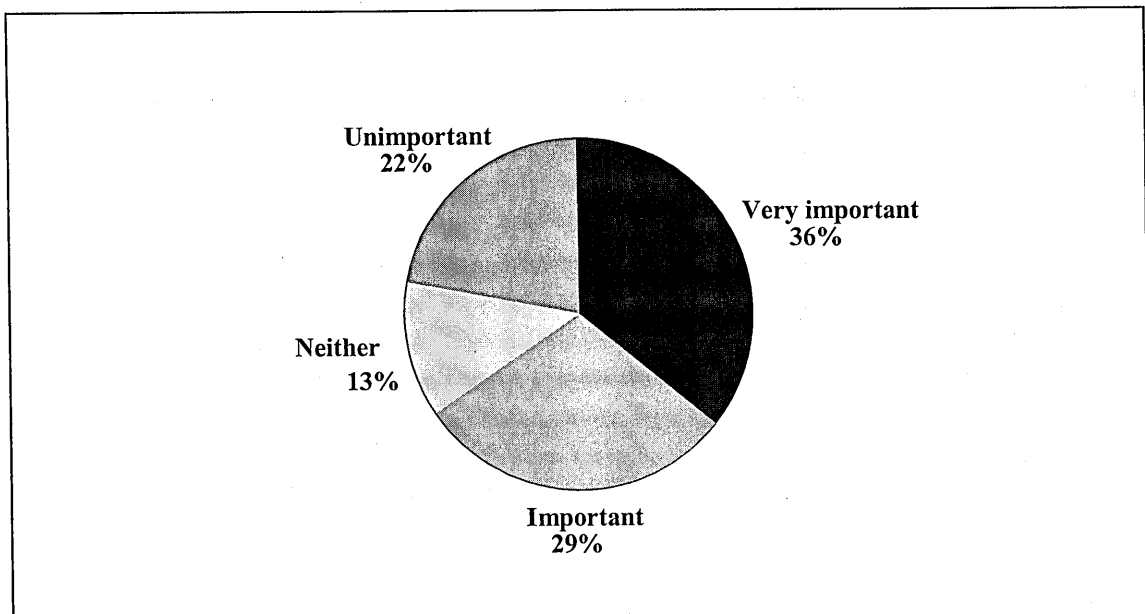


Figure 1- 4 SMEs' view of the importance of innovation (Small-Business-Service, 2004b)

Yet to date much of the research has focused on the practices of large product development leaders such as 3M and Hewlett Packard. Therefore empirical evidence of how SMEs develop new products is argued to be restricted and advances still required (Acs and Audretsch, 1988, Berry and Taggart, 1998, Hoffman et al., 1998, March et al., 2002, Ledwith, 2004). It could be argued that the many studies on NPD that have built and contributed to the body of knowledge regarding 'best practice' of NPD (Adler, 1989, Cooper and Kleinschmidt, 1995, Song et al., 1997a) may not be indicative of the process SMEs adopt. Hoffman et al. (1998) argues that "SMEs do not necessarily innovate in formally recognised ways" – in other words they are different and require a different research approach. Arguably there are still a number of unanswered questions that we know little about, as Hoffman et al. (1998) highlights. For example, we know little about the volume of SMEs involved in innovative activity, nor about the nature of that activity.

What we do know about the innovative activities of SMEs highlights that they have a behavioural advantage over large firms, which have material advantages (Rothwell and Dodgson, 1994). Leading SMEs have a higher R&D productivity, largely due to their ability to innovate by exploiting knowledge created outside the firm (Audretsch and Vivarelli, 1996). The tendency to be more innovative is often related to highly innovative industries where the use of skilled labour is relatively important (Acs and Audretsch, 1991). Arguably it is the intangible factors (Grant, 1991a), such as structural and organisational change (Feigenbaum and Karnani, 1991), human resource management (Bacon et al., 1996), and

innovation and technology (Hitt et al., 1990) that enable SMEs to achieve a sustainable competitive advantage (Barney, 1991). Since SMEs do not necessarily innovate in formally recognised ways it is likely that they make much more extensive use of external linkages (Hoffman et al., 1998). In fact it is argued that SMEs with a low commitment to formal R&D activities provide a significant proportion of innovative output - although in most cases they introduce incremental rather than radical innovations (Piergiovanni et al., 1995). SMEs are noted for their flexibility because of the simplicity of their internal organisation, being faster at adapting and responding to changes (Aragon-Sanchez and Sanchez-Martin, 2005).

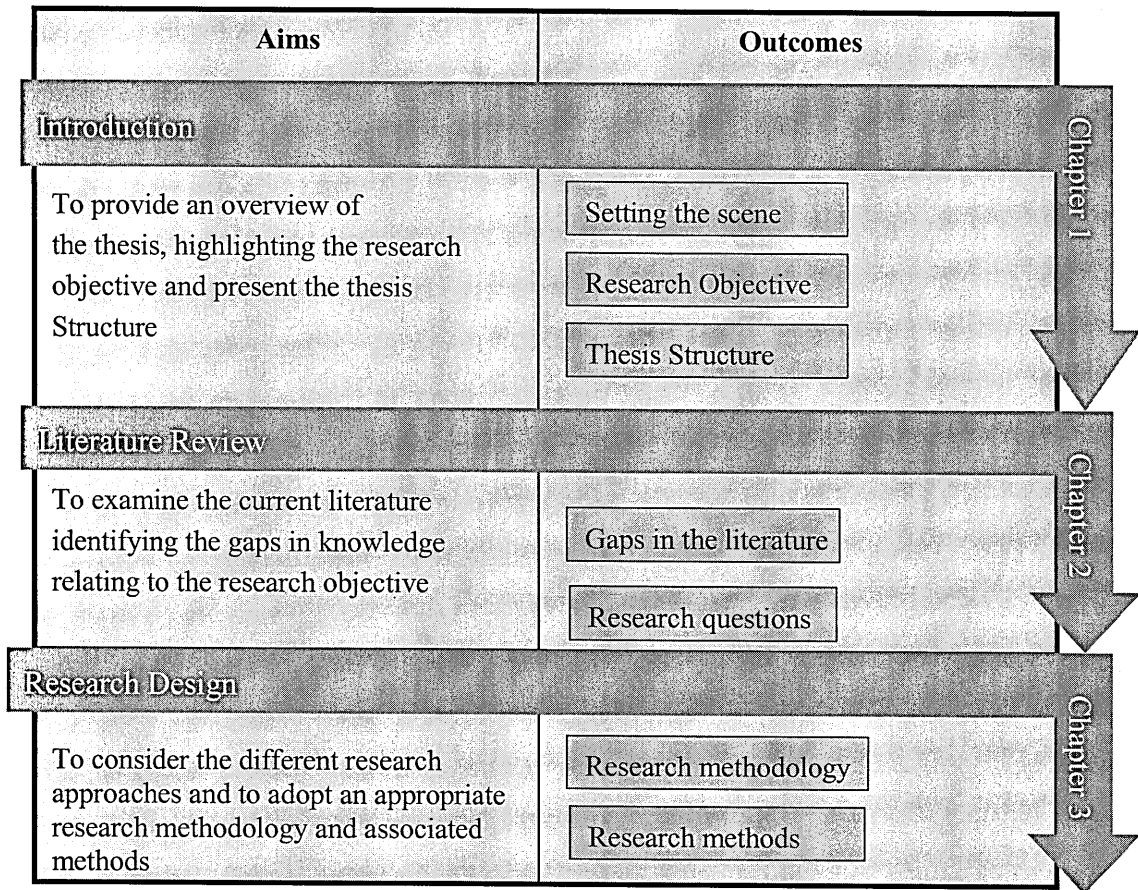
## **1.6 SUMMARY AND RESEARCH AIM**

Through providing the genesis for this research it is possible to observe the importance of understanding how SME manufacturers can remain competitive. Furthermore, it was the intention of this chapter to highlight the dichotomy that still remains between the rhetoric and actual practice. As has been suggested, both the UK government and the scholarly literature do provide a solution, by moving up the value chain, specifically through creating a NPD capability. Yet despite this sound advice little has been done to address *how* manufacturers can or indeed *are* creating a NPD capability to enable them to move up the value chain. Thus this research proposes to investigate the following research question:

**How do UK manufacturing small and medium-sized enterprises create a new product development capability to enable a move up the value chain?**

## 1.7 OVERVIEW OF THE THESIS

An overview of the thesis structure is illustrated in Figure 1-5 to provide the reader with a view of how this research will be presented.



*(Continued over page)*



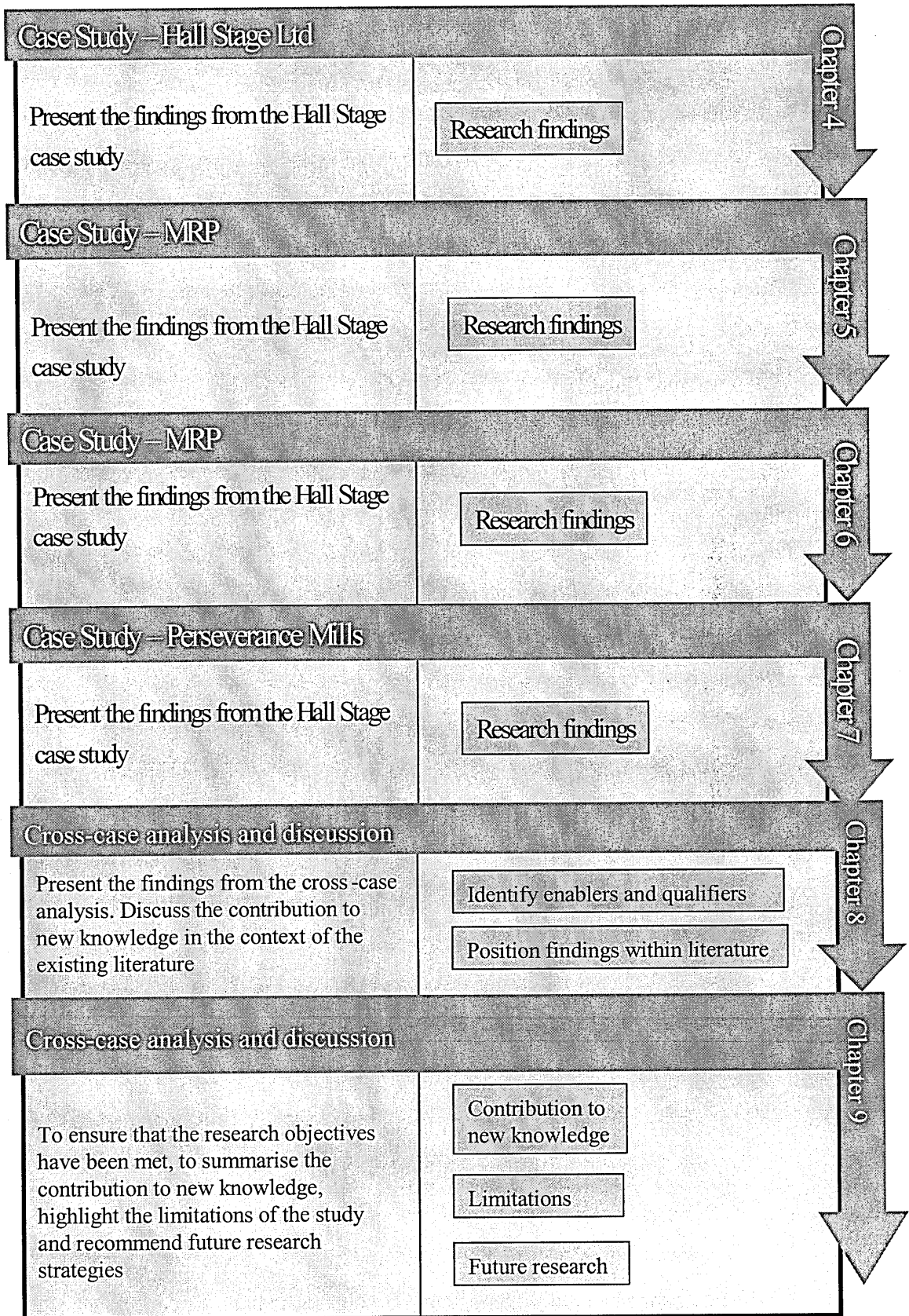


Figure 1-5 Overview of thesis

## CHAPTER TWO - LITERATURE REVIEW

*The purpose of this chapter is to present a review of the literature relevant to this research study by providing the context of this research study. Reviewing the literature helps to identify the novelty of this research, and positions its contribution by demonstrating the gaps in knowledge*

### 2.1 INTRODUCTION

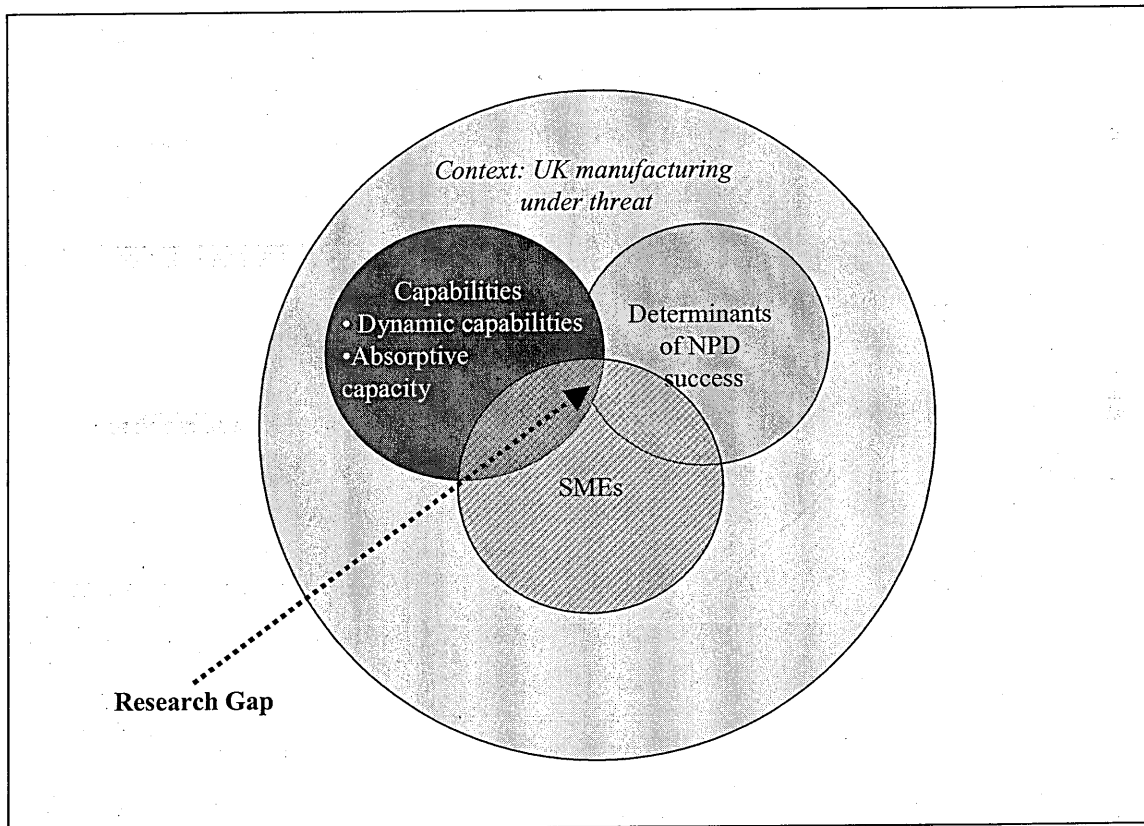
A literature review was conducted at the onset of this investigation; its purpose was to clarify the current literature and its relation to this study, generating a thorough understanding of the field. The review assisted in identifying gaps in knowledge and providing researchable questions. The intention of this literature review, therefore, is to introduce the three key strands of literature (summarised below and in Figure 2-1), to identify the novelty of the work, and to position its contribution by demonstrating the gaps in knowledge that this thesis will address, relating to the research objective posed in Chapter One:

*How do UK manufacturing SMEs create a new product development (NPD) capability?*

It has been identified that there are three themes of literature which are represented in Figure 2-1, that are relevant to the research creating the research gap:

- How can a manufacturing SME create a capability? Firstly an understanding of capabilities and how these capabilities can change is required. This draws on the dynamic capabilities literature, which provides the foundation for this research by providing a theory in which to underpin this research as it sets out that firms can reconfigure their resources to gain a competitive advantage, which is prominent to this research context. Absorptive capacity is also used to understand how the existing manufacturing capability can aid in learning and in developing an innovative capability.

- What is a NPD capability? This research draws from the NPD literature, which is wide and varied, with studies taking many different approaches. This study will concentrate on the area of success factors or, as they are alternatively referred to, determinants, in order to gain an understanding of what a NPD capability is.
- Why are SMEs different in the way they develop new products? Section 1.5 highlighted some of the differences that are believed to make SMEs different in the way they approach NPD and innovation. However, specifically section in the literature review will highlight any research that specifically relates to SMEs and their differences.



*Figure 2-1 Research Gap*

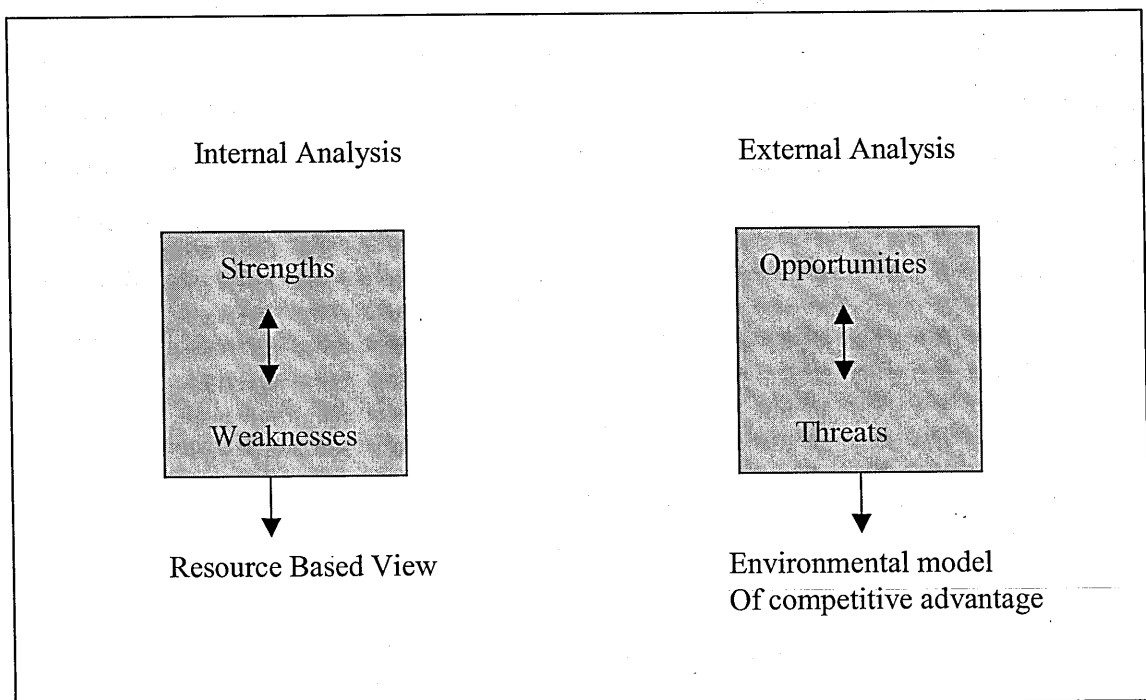
## 2.2 DYNAMIC CAPABILITIES

This section sets out to briefly summarise the history of dynamic capabilities to aid in situating the theory. Then this section will proceed to examine the specific processes

associated with dynamic capabilities, before finally reviewing the literature that pertains to new product development as a dynamic capability.

### 2.2.1 Background to Dynamic Capabilities

Since the 1960s there has been an evolving body of literature that has sought to understand the sources of sustained competitive advantage. These can be separated into two differing perspectives – external and internal. In understanding these sources it is possible to structure much of the strategic management research into the framework presented in Figure 2-2 (Barney, 1991). The external perspective suggests that firms obtain sustained competitive advantage by implementing strategies that exploit their internal strengths, through responding to environmental opportunities and defusing external threats by avoiding internal weaknesses. Much of this research has focused on isolating a firm's opportunities and threats (Porter, 1985, Lamb, 1984) and describing its strengths and weaknesses (Hofer and Schendel, 1978, Strinchcombe, 1965).



*Figure 2-2 The external and internal perspectives of sustained competitive advantage*

Alternatively, the internal perspective is referred to as the resource based view (RBV). It is a theory which has taken a different stand point on how competitive

advantage is achieved within firms and how that advantage could be sustained over time (Eisenhardt and Martin, 2000, Penrose, 1959, Prahalad and Hamel, 1990, Schumpeter, 1950, Teece et al., 1997). *The Theory of the Growth of the Firm* by Edith Penrose (1959) is widely recognised as the pioneering work for the resource based view. Opposing the traditional environmental models, Penrose's work departed from the traditional economic analysis, which focused on "*the advantages and disadvantages of being a particular firm size*" (Penrose, 1959). Rather than explaining the move from one size to another, instead Penrose emphasised "*the internal resources of a firm*", viewing firms as a "*collection of resources bound together in an administrative framework*" (Penrose, 1959). Thus the underlying assumptions of the resource based view are somewhat different, considering competitive advantage by examining the link between a firm's internal characteristics and performance (Barney, 1991). The resource based view assumes; firstly, that firms within an industry (or group) may be heterogeneous with respect to the strategic resources they control, and secondly, that these resources may not be perfectly mobile across firms and thus heterogeneity can be long standing (Barney, 1991). In particular RBV assumes that firms can be conceptualised as bundles of resources, that those resources are heterogeneously distributed across firms, and that resource differences persist over time (see Eisenhardt and Martin 2000). It is firms that possess resources that are considered valuable, rare and inimitable and non-substitutable (so called VRIN attributes), usually in the form of superior systems and structures, that can achieve sustainable competitive advantage (Eisenhardt and Martin, 2000, Teece et al., 1997).

From the resource based view of the firm emerged dynamic capabilities, mainly due to the criticism levelled at RBV – such as being vague and capable of demonstrating only a tautological relationship between resources and sustained competitive advantage (Priem and Butler, 2001). Therefore RBV has been extended to incorporate dynamic markets – and hence dynamic capabilities. In particular, the work on dynamic capabilities has been extended through the likes of Teece et al (1997) and Eisenhardt and Martin (2000). The extension of RBV to include dynamic capabilities was due to the fact that RBV did not adequately explain how and why certain firms have a competitive advantage in situations of rapid and unpredictable change. Furthermore, RBV "*does not attempt to explain the nature of the isolating*

*mechanisms that enable entrepreneurial rents and competitive advantage to be sustained” (Teece et al 1997).*

Dynamic capabilities are the organisational strategic routines which managers can utilise to alter their resource base; acquiring and shedding resources, integrating them together and recombining them to generate new value-creating strategies (Grant, 1996, Pisano, 1994). The definition for dynamic capabilities adopted by Leonard-Barton (1992), Teece et al (1997) and Eisenhardt and Martin (2000) explains that it is *“the firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organisation’s ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions” (Eisenhardt and Martin, 2000)*

Teece et al (1997) argue that *“only recently have researchers begun to focus on the specifics of how some organisations first develop firm-specific capabilities and how they renew competences to respond to shifts in the business environment.”* In their seminal paper Eisenhardt and Martin (2000) make several observations regarding dynamic capabilities, namely that dynamic capabilities consist of specific strategic and organisational processes such as product development, alliancing and strategic decision making which create value for firms within dynamic markets by manipulating resources into new value creating strategies.

### **2.2.2 Dynamic capabilities as specific processes within the firm**

Eisenhardt and Martin (2000) argue that dynamic capabilities consist of well known processes of identifiable and specific routines that have often been the subject of extensive research in their own right, outside of the realms of dynamic capabilities:

- Product development routines
- Strategic decision making
- Alliance and acquisition routines
- Resource allocation
- Knowledge creation routines, and
- Exit routines

As previously stated in Section 2.2.1, RBV has been described as tautological, endlessly recursive and non-operational (Mosakowski and McKelvey, 1997, Priem and Butler, 2001, Williamson, 1999). However, through linking dynamic capabilities to a larger body of empirical research and defining them in terms of their functional relationship to resource manipulation, their value is defined independent of firm performance (Eisenhardt and Martin 2000). This helps to move dynamic capabilities away from the earlier criticisms, and “*as a result, dynamic capabilities can be seen as an emerging and potentially integrative approach to understanding the newer sources of competitive advantage*” (Eisenhardt and Martin, 2000).

### **2.2.3 Dynamic Capabilities and New Product Development (NPD)**

As the specific focus of this research is the area of new product development, this section examines the area of knowledge pertaining new product development as a dynamic capability. As this thesis has already shown, dynamic capabilities have been described as “*identifiable and specific routines*”, of which NPD has been established as one such routine by scholars (Eisenhardt and Martin, 2000, Danneels, 2002), due to its capacity to integrate skills through managers combining their varied skills and functional backgrounds to create revenue producing products or services (Eisenhardt and Martin, 2000). Furthermore, if new product development is considered as a key mechanism for organisational growth and renewal, innovation is implicitly central to the theory of dynamic capabilities (Lawson and Samson, 2001).

Why is NPD as a dynamic capability relevant to this study? The firms that will form part of this study will have identified the need to create a NPD capability, recognising the need for renewal if survival is to prevail. Organisational renewal involves the building and expansion of organisational competences over time, often involving changes in the organisation’s product market domain (Floyd and Lane, 2000). A theory of strategic renewal must in turn recognise that maintaining adaptiveness requires both the exploitation of existing competencies and the exploration of new ones, since the notion of ‘dynamic capabilities’ (Teece et al., 1997) calls attention to the need for the renewal of firms’ competences in changing environments. RBV scholars have started to focus much more on the dynamic nature of capabilities, asking how capabilities and resources evolve over time (Helfat 2000) in a bid to

understand how firms maintain a competitive advantage. If, as it is argued by Eisenhardt and Martin (2000), product development has the ability to alter the resource configuration of the firm, NPD is considered a necessary capability for a firm that is attempting to renew itself. According to Eisenhardt and Martin (2000), explicating the link between the resource based view and NPD will inform the resource based view and strengthen its empirical grounding. Helfat and Raubitschek's (2000) work firmly positions new product activity within the field of dynamic capabilities, arguing that organisational capabilities and products co-evolve over time, working towards sustaining a competitive advantage.

In summary, the theory of dynamic capabilities provides the underlying theory for this research, providing a platform that underpins our understanding that organisations that do recognise the need for change can utilise NPD in a bid to renew themselves through creating, integrating and shedding existing resources to enable change. This research concentrates how a firm creates such a capability from a position of little previous experience. The literature in this area of creating a dynamic capability has been elusive. However, Section 2.4 seeks to examine the existing literature relating to NPD to provide a genesis to our understanding of what forms the basis of a NPD capability.

### **2.3 ABSORPTIVE CAPACITY**

Absorptive capacity goes some way to explaining the 'how' aspect of creating a NPD capability. First introduced by Cohen and Levinthal (1990), the basis of absorptive capacity is that of prior knowledge used to assimilate and incorporate new knowledge. Cohen and Levinthal (1990) argue that absorptive capacity is essentially concerned with "*prior related knowledge (which) confers an ability to recognise the value of new information, assimilate it and apply it to commercial ends.*" Essentially it is the learning of new related knowledge that can itself lead to a set of learning skills – as a consequence, experience or performance of one learning task may influence and improve performance on some subsequent task (Ellis, 1965). It is argued by Cohen and Levinthal (1990) that this progressive improvement in the performance of learning tasks is a form of knowledge transfer that has been referred



to as 'learning to learn' (Ellis, 1965, Estes, 1970); questionably, a process that firms attempting to move up the value chain through creating a NPD capability will face.

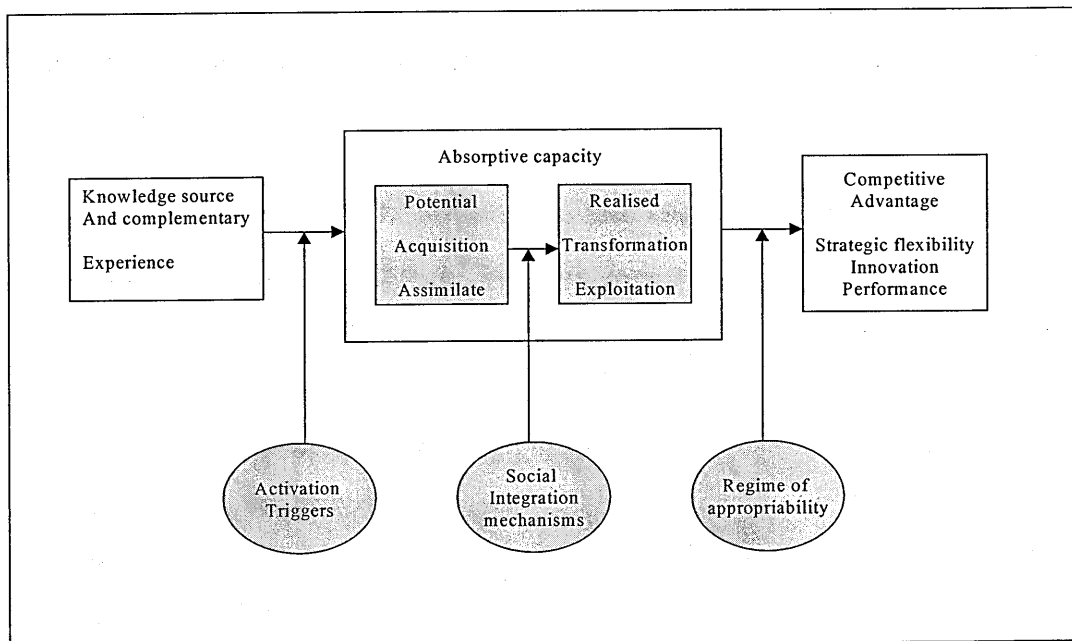
Zahra and George (2002) begin to provide some insight as to how through absorptive capacity firms can create a NPD capability. They define absorptive capacity as a set of organisational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organisational capability. It is the association between transformation and exploitation of capabilities and knowledge recognised by both absorptive capacity and dynamic capabilities that is likely to influence firm performance through product and process innovation (Zahra and George, 2002). In other words, it is the ability to 'acquire, assimilate, transform and exploit knowledge' that will enable a firm to renew its capabilities and knowledge base – the process involved in creating a NPD.

Viewing absorptive capacity as a dynamic capability also makes it amenable to change through managerial actions that effectively redefine and deploy the firm's knowledge-based assets (Floyd and Lane, 2000). Viewing absorptive capacity as a set of routines and strategic processes suggests a multidirectional and fluid path, rather than a patterned trajectory of knowledge acquisition and exploitation, as was previously thought by the likes of Cohen and Levinthal (1990). The broadening of the theoretical interpretation as a dynamic capability by Zahra and George (2002) suggests that it influences the creation of other organisational competences and provides the firm with multiple sources of competitive advantage (Barney, 1991).

Past research on absorptive capacity indicates an implicit consensus of the role and outcomes of absorptive capacity as a set of firm abilities to manage knowledge, definitions, components and antecedents of this construct vary widely (Zahra and George, 2002). These issues highlight a need for greater clarity about the domain and operationalisation of this construct (Matusik and Heeley, 2001, Joglekar et al., 1997), hence in their review and reconceptualisation of absorptive capacity Zahra and George (2002) propose it as a dynamic capability pertaining to knowledge creation and utilisation that enhance a firm's ability to gain and sustain a competitive advantage. It is this capability to create and utilise knowledge that is required of the firm intending to renew its resource base and create a NPD capability.

The model developed by Zahra and George (2002) connects the antecedents, moderators and outcomes of absorptive capacity (see Figure 2-2). The model highlights external sources of knowledge and experience as key precursors, with certain triggers activating absorptive capacity. Zahra and George (2002) go on to make a marked distinction between potential absorptive capacity and realised absorptive capacity. Potential absorptive capacity refers to the firm's receptiveness to acquiring and assimilating external knowledge (Lane and Lubatkin, 1999). Importantly it captures Cohen and Levinthal's (1990) description of a firm's ability to value and acquire external knowledge, but does not guarantee the exploitation of this knowledge. Realised absorptive capacity, on the other hand, is a function of the transformation and exploitation capabilities of the firm, which denotes its capability to develop and refine the routines that facilitate the combining of existing knowledge and newly acquired knowledge. Zahra and George (2002) argue that both potential and realised absorptive capacity differentially contribute to competitive advantage.

Thus, viewing absorptive capacity as a dynamic capability suggests that it can assist a firm in reconfiguring existing capabilities and learning new ones through having the ability to acquire, assimilate, exploit and transform knowledge. It is this ability to utilise and exploit knowledge that can influence the creation of another dynamic organisational capability – in this case the creation of a NPD capability.



*Figure 2-3 Model of absorptive capacity (Zahra and George, 2002)*

## 2.4 DETERMINANTS OF NPD SUCCESS

The literature has extensively examined the determinants of new product development success (Cooper and Kleinschmidt, 1995, Cooper and Kleinschmidt, 1986, Ernst, 2002, John and Snelson, 1988, Montoya-Weiss and Calantone, 1994), with many models linking NPD/innovation success with NPD management practices (Cooper and Kleinschmidt, 1987, Brown and Eisenhardt, 1995, Song et al., 1997b), providing a comprehensive list of possible variables/determinants leading to new product success. This extensive and often varied list is perhaps not surprising, because as Wolfe (1994) points out, the only consistency within this vein of research is the agreement of inconsistency, further impeded by the wide variety of methodologies employed (Wolfe, 1994).

It is not the aim of this study to produce an exhaustive list of determinants of NPD success. Rather, the aim is to use the existing literature to explore and understand the determinants that lead to NPD success and those associated with a NPD capability. The rationale is that research has not looked at how firms create a NPD capability from a position of relatively little experience, therefore to act as guide for this exploratory study, a starting point in the literature is required. As the focus of this thesis is on the creation of a NPD capability in SMEs, it will endeavour to highlight

any references to small firms, but it is worth noting that the literature in this area is regarded as scarce (March et al., 2002, Berry and Taggart, 1998, Ledwith, 2004, Mosey, 2005).

The numerous studies investigating NPD success and failure have proved invaluable, as they have provided a myriad of 'success factors' and 'determinants', which creates difficulties when attempting to draw the literature together. An extensive review of the literature revealed two widely cited studies; Montoya-Weiss and Calantone (1994) and Cooper and Klienschmidt (1995), and these two comprehensive studies are summarised in Figure 2-3. The purpose of Figure 2-3 is to illustrate the commonalities that were drawn from the studies; the arrows indicate the areas where the studies concur. The bold arrows indicate an overlap of the headings, whereas the broken arrows indicate an overlap between the content of each overarching determinant, which has been used to guide the review of this study. Whilst it is evident that the headings are not necessarily the same, the content is found to overlap, which is what has driven this research. From the review five main headings were established (see below). These headings will be used to structure the categories discussed in this section of the literature review:

- Development process
- Strategic and market environment
- Organisational
- Culture
- Role and commitment of senior management

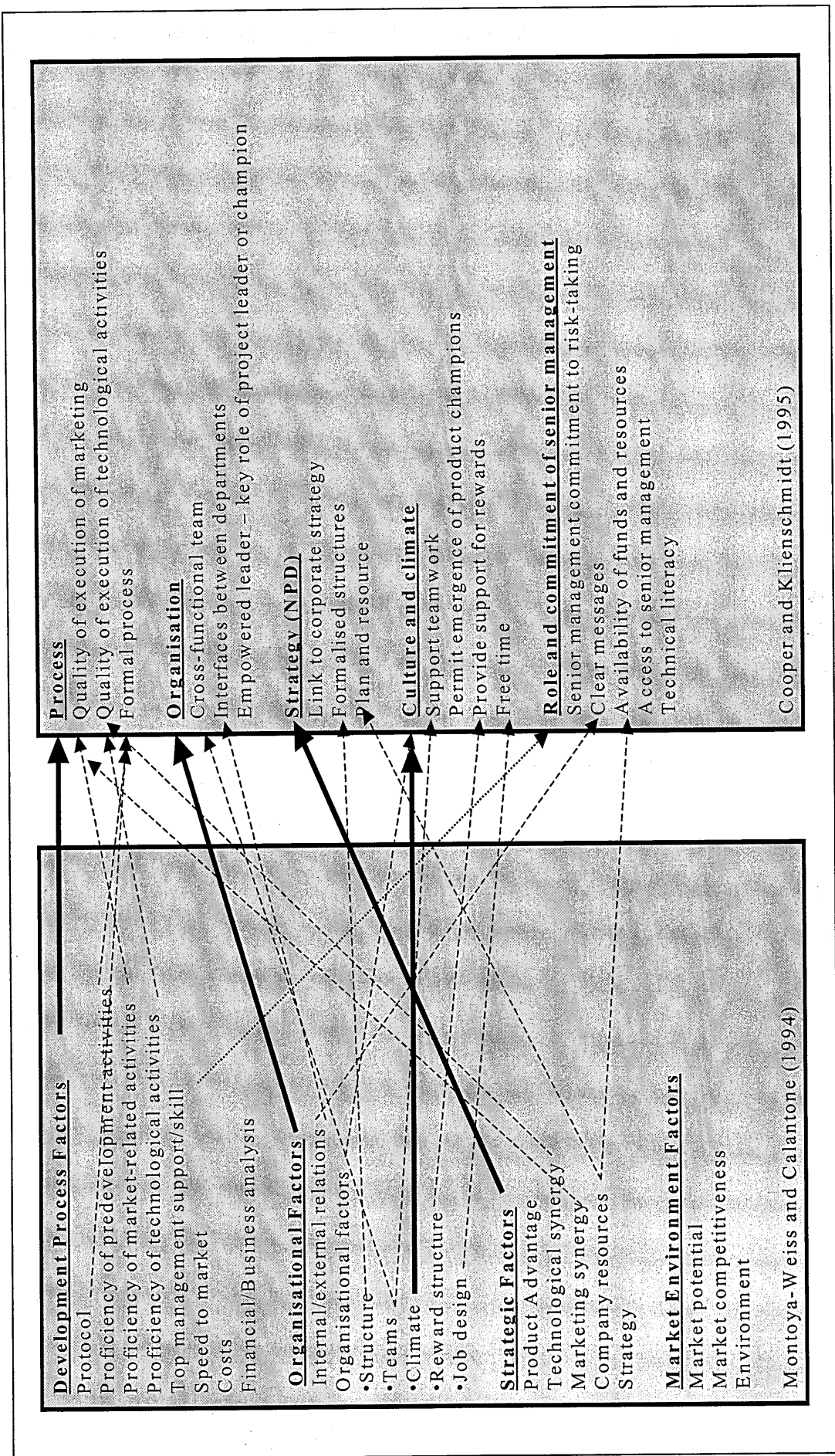


Figure 2-4 Summary and comparison of NPD determinants

## **2.5 DEVELOPMENT PROCESS**

One of the first studies to indicate that the new product process was key to successful new product performance were Booz, Allen, and Hamilton (1982). The importance of the actual new product development process on project outcomes has been revealed in numerous success and failure studies at the project level (Cooper and Kleinschmidt, 1995). Typically, the process of new product development is concerned with generating and developing ideas, and resourcing and implementing those ideas to form a new product. Within the literature there are a plethora of models which aim to describe the process of product development, such as the development funnel (Clark and Wheelwright, 1995); product innovation process (Crawford, 1994), stage gate model (Cooper, 1996), and the phase review model (Hughes and Chafin, 1996).

The activities that comprise the new product development process - whether done or not - and their quality of execution are strongly associated with project outcomes (Cooper 1995). The literature review identified a consensus of opinion that the three elements associated with the new product development process were associated positively with project outcomes:

1. Predevelopment activities
2. Proficiency of market-related activities and technological activities
3. Formal new product development process

### **2.5.1 Predevelopment activities**

The intention of the preliminary investigation is to simply gather more information in the relevant areas, so that the information at the evaluation stage is considerably better than at the initial screening. It is the information gathered at this stage that allows management to make fully informed decisions, determining whether the product is worth pursuing further. Predevelopment activities incorporate a number of different activities that aid the success of a product (Cooper and Kleinschmidt, 1995, Zirger and Maidique, 1990, Calantone et al., 1997). Preparatory work in the early phases of the process, such as initial screening, and preliminary market and technical assessment have been

identified as decisive for the success of new products (Montoya-Weiss and Calantone, 1994, Cooper, 1990, Cooper and Klienschmidt, 1987, Johne and Snelson, 1988, Veryzer, 1998). Cooper (1988) identified that typically three significant activities are performed during this stage:

- Preliminary market assessment – identify customer needs, wants and preferences
- Preliminary technical assessment – determine the product specifications and requirements
- Preliminary evaluation – creating a business case through conducting preliminary business and financial analysis

The main aim of predevelopment work is to try and ensure that resources are utilised on projects that will reap the required benefit for the firm. Therefore, in addition to conducting the above activities, Cooper (1988) also argues that it is vital that expenditure at this stage be limited, as the full development is still only a possibility.

### **2.5.2 Proficiency of market-related activities and technological activities**

Related to the success of NPD is the ability of a firm to conduct market related activities as well as technological activities (Calantone et al., 1997, Cooper and Kleinschmidt, 1995, Barczak, 1995). A strong market orientation is essential and is achieved by undertaking marketing tasks in a quality fashion. Further benefits are gained when marketing produces a sharp early product definition prior to product development (Cooper and Kleinschmidt, 1995, Maidique and Zirger, 1984, Rothwell et al., 1974). Two studies that have explained the failure of new products Cooper (1975) and Hopkins (1981) have identified that the principal causes for failure is ineffective product marketing and poor market research. The studies also identified other marketing problems such as inadequate assessment of market potential, poor understanding of competitors' strengths and weaknesses, and inaccurate product pricing.

Through the work of Cooper and Kleinschmidt (1996) it is acknowledged that successful new products arise from the recognition of a need of one sort or another. In the industrial

marketplace the customer is frequently the main source of innovative ideas (von Hippel, 1978), implying that idea generation should be rooted in the assessment of the market needs. Cooper (1988) advocates utilising knowledge from the sales and service groups that have regular contact with the customer and their problems, thereby identifying potential new opportunities. To improve practice at the launch stage it is important to have heavy marketing input, primarily because marketing will guide the implementation plan. Orienting the NPD process towards the needs of the market is regarded as particularly important (Atuahene-Gima, 1995, Souder et al., 1997, Cooper and Kleinschmidt, 1995).

Technology push is concerned with the recognition of a new technology development (Tauber, 1974, Maidique and Zirger, 1984). Similarly, the quality of execution of technological activities has been associated with the success of new products, which include activities such as the actual physical development and testing of the product, and trial production start-up (Cooper and Kleinschmidt, 1995). In a study of the telecommunications industry Barczak (1995) found that firms that were first-to-market rely more on R&D teams to develop new products than either fast followers or delayed entrants, suggesting that to gain an early competitive advantage, a strong technological orientation relies on innovation and R&D.

Important to the NPD process are the links between marketing and technology; Barczak (1995) iterates the importance of a connection between marketing and technology, as her study revealed that the first-to-market firms relied on technological input, but they also recognised the importance of market activities. The emphasis on concept definition and testing and customer prototype testing suggests that these firms recognise that technology alone is insufficient for success. Rather, they seem to understand that technology must fit customer needs and requirements.

### **2.5.3 Formal new product development process**

The existence of a formal new product development process has been found to yield positive results (Cooper and Kleinschmidt, 1995, Rochford and Rudelius, 1997, Bessant



and Francis, 1997), particularly when the process is comprehensive and characterised by professionalism (Ernst, 2002). Early studies concentrated on the stages involved in the NPD process. These first generation models, as referred to by Wolfe (1994), decompose innovation into a series of sequential stages or phases that unfold over time. By focusing on the sequential nature of the process, the clear delimiters or milestones required before the preceding stage should be undertaken are represented. A criticism levelled at the models is the incompleteness in describing the essential dynamics of innovation (Wolfe, 1994, Radnor and Noke, 2002, Tang, 1998, Schroeder et al., 1989). Arguably, the acceptance of these models can be attributed to their simplicity. As these models have been specifically designed to capture and improve the process of new product development which “*manifest the motive of organisations to make product development repeatable, predictable and controllable*” (Tang, 1998).

Despite the criticisms levelled at these models, they do help to provide a structure, and it is believed that products are more likely to be successful if they are well planned and implemented (Zirger and Maidique, 1990). Product success has been linked to consistent adherence to a new product development process (Cooper and Kleinschmidt, 1986); one that includes market studies, initial screening and preliminary market assessment. The four-year study by Zirger and Maidique (1990) further established that project planning should include all phases of the development process. Essentially, organisations have to manage four different phases in the process of turning ideas into successful reality (Tidd et al., 2005). Primarily by providing managers with a game plan or blueprint for action, this aids in improving the effectiveness and time efficiency of the NPD process. Bessant (2003) summarises the phases within the development process:

- Scan and search their environment (internal and external) to pick up and process signals about potential innovation;
- Strategically select from this set of potential triggers for innovation those things which the organisation will commit resources to doing;

- Resource and develop; having the chosen the option, the organisation needs to resource it – providing (either by creating through R&D or acquiring through technology transfer) the resources to exploit it;
- Implement the innovation; growing it from an idea through various stages of development to final launch – as a new product or service in the external market place or a new process or method within the organisation;
- Reflect – although regarded as optional, it allows the firm the opportunity to reflect upon the previous phases and review the experience of success and failure.

The models of the NPD process attempt to support cross-functional coordination to the NPD process; this is briefly reviewed here, but further analysis of the concept is provided in Section 2.3.3. Cross-functional coordination is advocated through Zirger and Maidque's (1990) research, in which they found that functional groups should interact and coordinate their activities during the development process. Disparaging the fact that development should be a linear process, Takeuchi and Nonaka (1986) argue that many phases of the process can overlap and personnel can move with the product to smooth the transition and communicate learning. Particularly important are the links between R&D and the other functional groups, marketing and manufacturing. As previously stated, a critical reason for a strong link with marketing is to ensure that the firm understands user needs and effectively translates these needs into solutions for the customer. It is recommended that the process should also be regularly and formally monitored throughout the life of the project (Cooper and Kleinschmidt, 1987).

## **2.6 ORGANISATION**

The organisational setting of the new product development activities has become increasingly important. Peters (1987) noted that 75 per cent of time slippage is a result of the way in which projects are organised, as a result of siloing and sequential problem solving. Montoya-Weiss and Calantone (1994) present organisational factors to include the organisational structure of the firm, specifically with respect to the new product

project (e.g. teams). Further evidence of organisational factors impacting on NPD, identified in Cooper and Kleinschmidt's (1995) work, recognised aspects such as:

- Cross-functional NPD team;
- A strong and responsible project leader;
- A NPD team with responsibility for the entire project;
- The commitment of the project leader and the team members to the NPD project;
- Intensive communication among team members during the course of the NPD process.

Ernst's (2002) detailed review of the literature highlighted the fact that other authors that have examined the organisation of new product development have veered little from the work of Cooper and Kleinschmidt (1995) - as examined above, their work has highlighted the factors that have been identified in the literature as determining NPD success - will be expanded and critically reviewed within the following sub-sections. The additional factor of external involvement is examined, as this is deemed to be of particular importance to SMEs (Hoffman et al., 1998), and methods of organisation are added to Cooper's list, as the debate regarding informal and formal management of the organisation is often discussed in the literature:

- Internal communication
- External involvement
- Cross-functional teams
- Project leadership
- Autonomy – reasonability for the entire project
- Commitment to new product development
- Project organisation

### **2.6.1 Internal Communication**

Coordination and cooperation within the firm can form part of the internal communication. In their landmark study of 567 product and process innovations, Myers and Marquis (1969) highlighted the importance of organisational communication, both

internally and externally. This was further substantiated by Griffin and Hauser (1996), who found that communication strongly correlates to project success. According to Myers and Marquis's (1969) study, information that is generated and diffused internally represents a major portion of the information required to develop innovations. This finding suggests the need for strong internal interfaces between the functional groups, and particularly R&D and marketing.

Internally there can often be an imbalance of power and prestige between R&D and marketing, stemming from differences in decision-making procedures, budgetary powers, and discretionary spending authorities (Souder, 1981a). When the disharmony is severe, the result is disruptive to the organisation, requiring time and energy to restore harmony. Despite the recognition of the importance of cross-functional integration Gupta et al., (1985) report that high technology firms frequently lack a systematic approach to this problem. The main barrier to cross-functionality is a lack of communication (Thamhain, 1990, Johne and Snelson, 1988). Johne and Snelson (1988) also argue that the importance of cross-functional communication is important throughout the whole process of product development, when it is critical during the development phase, as cooperation is required on a daily basis. Internal communication is paramount, providing stimulus from other people, enabling creativity as well as interest and knowledge, which are essential for successful product development (Ebadi and Utterback, 1984). Contact and communication with others might be the stimulation for an actual innovation, or else merely helpful, fighting the cause of the innovation (Chakrabarti and O'Keefe, 1977). As changes are often common, the communication of these changes allows an updated mental log to be kept current.

In addition to the actual communication and who the communication is between, the frequency with which that communication occurs has also been determined to impact upon NPD success (Ebadi and Utterback, 1984). Using discriminant analysis, Balachandra (1984) established that fewer meetings and less frequent communication was evident in unsuccessful projects. But the research also led to the understanding that the project leader was less likely to be involved in the termination decision than that

concerning the continuation decision. Importantly, it is not just the frequency of communication in the actual organisation, but the formation of interactive relationships that involve the sharing of information and project meetings among members of the NPD team (Balachandra et al., 1996). Thus it would appear that the nature of the communication appears to differ in relation to unsuccessful and successful projects.

### **2.6.2 External Involvement**

The involvement of external organisations has been linked to the success of project success (Cormican and O'Sullivan, 2004, Ancona and Caldwell, 1992, Mendelson and Pillai, 1999). External involvement can occur in many forms; the three identified as relevant to this research are:

- Searching external information
- Involvement with suppliers
- Networking

Studies have found that the presence of a gatekeeper or someone who scans the organisation's boundaries, brings in information to the organisations and disperses it to those inside is vital for product innovation (Griffin and Hauser, 1996, Crawford, 1994). It is the ability to have knowledge of the external environment that enables the success of new products; a premise central to absorptive capacity, as discussed in Section 2.3. In their study on communication, Ebadi and Utterback (1984) found communication with external agents to be important. Particularly, communication with different organisations was required during the different stages of the NPD process. For example, organisations such as government departments might be contacted during the idea generation phase, whereas universities would be likely to provide knowledge during the research and design phase of the new product development process.

Significant to the success of the project is early (Huang and Mak, 2000, Griffin and Hauser, 1996, Gupta and Wilemon, 1990) and extensive (Clark and Fujimoto, 1991, Imai et al., 1985) supplier involvement. Through extensive supplier involvement in the product design phase, the complexity of the design can be minimised, creating a faster

and more productive product development process. Increasing uncertainty, associated with changing technology and global competition, has encouraged many firms (and, indeed, many nations) to concentrate on fewer and fewer core competencies, relying upon trade, or cooperation, for others (Archibugi et al., 1999).

A consensus has emerged which holds that “. . . *interactive learning and collective entrepreneurship are fundamental to the process of innovation*” (Lundvall, 1995). Since innovation involves the cumulative or path dependent creation of new knowledge, or novel recombination of existing knowledge, innovation is essentially concerned with learning. Learning, in turn, is largely regarded as a social process—most especially in the context of the transfer and accumulation of tacit knowledge (Polanyi, 1966, Howells, 1995) and is likely to involve considerably more than two actors (Freel, 2003). The dominant network theory of innovation, in its many incarnations (Håkansson, 1987, Maillat, 1995, Oughton, 1997, Florida, 1995, Cooke and Morgan, 1998, Baptista and Swann, 1998), holds that individual firms are seldom capable of innovating independently, and never innovate in a vacuum.

Despite the strong link between networking and innovation, studies have found evidence that contradicts such links. Freel (2003) did not establish strong links between the level of innovation and networking in his study of 597 small and medium-sized manufacturing firms. Rather, his study found that firms appeared to have successfully innovated without requiring ad hoc collaboration or association with any other organisations. Instead it has been found that R&D expenditure and technical employment were positively associated with successful novel product and process introduction at the firm level (Rothwell and Dodgson, 1991, Freel, 2003). There can be little doubt that internal resources frequently act to complement, and more occasionally substitute for, extramurally sourced technology (Oerlemans et al., 1998). Somewhat substantiating this finding is the work of Song et al. (1997a), who identified from their investigation of the influences of internal and external forces on cross-functional cooperation that involvement with external sources did not have a part to play in NPD success. However, Song et al. (1997) do argue that the external environment “*typically impacts the firm at the strategic decision-making*

*level and upper echelons*” and it is the management, and not the environment that is a driver for cooperation during the NPD process. The assumption that was made was that senior management derives its strategic direction from – among other things – the nature of the external environment, and then provides strategic and operational directives to the NPD team and project manager – creating an external link.

### **2.6.3 Cross-Functional Teams**

Cross-functional teams refers to the interdependency and information sharing between the various organisational units (Song et al., 1997a). A number of works verify that the project team should comprise of members from several areas of expertise who can make substantial contributions to the development of a new product (Griffin, 1997, Crawford and Benedetto, 2002). One particular managerial challenge of a successful new product development consists of building such a unified, multifunctional team committed to innovation. The formation of a cross-functional team can be seen as an instrument to overcoming organisational interfaces (Johns and Snelson, 1988), therefore cross-functional integration should be sufficiently supported within the organisation (Benedetto, 1999).

In promoting cross-functional teams, success is fostered in terms of inter-functional communication and co-operation (Maidique and Zirger, 1984). Confirming this finding, Cooper (1983) states that the new product development process should be a vehicle for multifunctional cooperation and coordination, involving many functional specialists, which provides the diversity of inputs required for creativity in the NPD process. It is the diversity and richness of experience that can aid cross-functional commitment. A further benefit of incorporating cross-functional teams has been the reduction in the time needed to launch high quality products (Griffin, 1992, Gupta et al., 1986, Gupta and Wilemon, 1988).

Past research has concentrated on grouping all technical tasks under the banner of R&D, and proceeding to examine the R&D and marketing interface. In truth some of the technical activities that fall under the R&D functional jurisdiction, such as preliminary

technical assessment and product development, clearly fall within the sphere of manufacturing. Therefore, according to Song et al. (1997a), an accurate representation of cross-functional relationships in NPD must include all three functional perspectives: R&D, marketing and manufacturing. Zirger and Maidique (1990) go further to explain why the links between R&D, marketing and manufacturing are so important – they argue that a critical reason for a strong link with marketing is to ensure that the firm understands user needs and effectively translates these needs into solutions for the customer. Furthermore, the connection with manufacturing is emphasised because of the increasing importance of efficient and effective operations; a goal that cannot be reached unless design for manufacturing is part of the product's development objectives. Crawford and Benedetto (2002) take the idea of involving different functions one step further by insisting that in addition to manufacturing, R&D and marketing – design and the service arms should also be included to ensure that a positive link is achieved between customer requirements and the end product.

Studies that discuss the integration of functions across the organisation assume that it has positive connotations throughout the whole process, at all stages. Song et al. (1998) question this assumption, as they found that having all functions involved in all stages could be counter-productive. The explanation presented is that conflicts are more probable when all functions are involved. Also, the time and cost associated in organising all three functions to meet and reach a consensus may outweigh the benefits (Song et al 1998).

#### **2.6.4 Project Leadership**

The project leader is viewed as playing a pivotal role within the development process (Brown and Eisenhardt, 1995, Clark et al., 1987, Clark and Fujimoto, 1991, Cooper and Kleinschmidt, 1995, Swink, 2000, Barczak and Wilemon, 2003). Consistent with the communication and problem-solving perspective, Brown and Eisenhardt (1995) and The Harvard Auto Study (Clark et al., 1987, Clark and Fujimoto, 1991) highlight the role of project leader as the bridge with dual roles – on one hand they coordinate the activities of the product development team, and on the other hand work with senior management to



create an overarching product concept. Therefore it is argued that the role the project leader plays affects the process performance (i.e. speed and productivity of the development process) and the effectiveness of the product (Brown and Eisenhardt, 1995, Barczak and Wilemon, 2003).

One significant characteristic of the project leader is referred to as 'power'. The concept of power is based on those project leaders that have significant decision-making responsibility, and organisation-wide authority at a high hierarchical level (Brown and Eisenhardt, 1995). The literature concurs that having such power improves the NPD process performance. In addition, such leaders are highly effective in obtaining resources, such as more personnel and larger budgets for the project team (Clark and Fujimoto, 1991). This idea is advanced by Jassawalla and Sashittal (2002) who state that leaders with power often overcome functional differentiation, foster collaborative decision-making and organise NPD workflow concurrently. Furthermore, so-called power enables the project leader to protect the team's autonomy, breaking down traditional department-specific loyalties, which enables a unified focus on product innovation to be created (Jassawalla and Sashittal, 2002). Another significant characteristic of the project leader is 'vision' (Brown and Eisenhardt, 1995). The concept of vision involves the cognitive ability to mesh a variety of factors together to create an effective, holistic view, and to communicate it to others. In the case of product development it is bringing together firm competences and strategies with the needs of the market (Brown and Eisenhardt, 1995).

A fundamental part of the project leader's role is their ability to create a social environment in which the team dynamics come to resemble less a battleground with turf protection behaviours (Jassawalla and Sashittal, 2002). It is through creating a social environment conducive to innovation that a sanctuary can develop, in which people with divergent orientations and talents can share hidden agendas; particularly, an environment where there is a sense of freedom to ask for help, take risks and develop collaborative relationships with others. Through building trust and fostering openness, the project

leader can create highly creative products, which are developed faster and cheaper (Jassawalla and Sashittal, 2002).

### **2.6.5 Autonomy - Responsibility of the Entire NPD Process**

Some studies have shown that autonomy within the NPD team has a positive effect on team performance, and ultimately, on the success of the NPD project (Gerwin and Moffat, 1997, Thamhain, 1990). However, Gerwin and Moffat (1997) explain that during the process of NPD, delegation is often counteracted by the withdrawal of some the team's autonomy or responsibility. By withdrawing the teams' autonomy, a lack of understanding of the development process and environmental changes, and furthermore, a lack of managerial 'buy-in' results. In order to benefit from the positive aspects of team autonomy, a well communicated model of the development process is required; design revisions and policies that encourage management to support the team rather than interfere (Gerwin and Moffat, 1997). The team should bear the responsibility for the entire NPD process, and not just parts of it (Cooper and Kleinschmidt, 1995).

### **2.6.6 Commitment to New Product Development**

Commitment of the project leader and the members of the NPD team have been found to influence success (Thamhain, 1990), which includes the acceptance of change at all levels (Rickards, 1985, Souder, 1981b). With this comes a warning from Ernst (2002) that within the context of NPD, it is notable that the influence of project related incentive systems on the success of new products has not yet been studied. Arguably these incentives could have an effect on team commitment, and hence NPD success. Furthermore, Thamhain (1990) suggests that managers should attempt to determine any lack of commitment early in the life of the project and work towards changing possible negative views as quickly as possible. It is suggested that the project leader should take control and resolve issues affecting commitment as speedily as possible (Thamhain, 1990).

### 2.6.7 Project Organisation

Organising for innovation involves creating, building and maintaining the organisation – a mechanism that transforms strategy into output (Tushman and Nadler, 1986). The type of coordination and control suited for achieving integration during the process of NPD has long been debated (Johns and Snelson, 1988). Central to the debate is the tension between the necessity to formalise the process to maintain efficiency and the advantages of keeping the process open and flexible to promote creativity (Calantone et al., 1995). By its very nature it is argued that the process of innovation is not conducive to prescribed, formal procedures and controls (Quinn, 1985, Rickards, 1985). Many authors maintain that creativity is stifled within the innovation process by formal mechanisms of control, as well as the trial-and-error experimentation that is often required (Song et al., 1993, Gupta et al., 1985). Alternatively, leaving the process to meander its own course could lead to over expenditure and long development times, missing the vital launch to market slot. Thus, there are positive outcomes for improving integration in certain cases by reducing role conflicts and clearly defining the desires of top management (Song et al., 1993). The informal organisation must “*bolster and complement*” the formal system - in other words, both informal and formal mechanisms are required (Tushman and Nadler, 1986).

Related to the debate surrounding the question of formalisation is how to organise the NPD project. A number of ways are suggested, ranging from the pure project organisation to the functional organisation, with a hybrid in-between (Yap et al., 1998). Five different project management structures (see Table 2-1) been identified by Larson and Gobeli (1988), who in which their research reported that the matrix structure was still the most popular approach to managing development projects.

Structure	Description
Functional	The project is divided into segments and assigned to relevant functional areas. The project is coordinated by functional and upper levels of management.
Functional matrix	A project manager with limited authority is designated to coordinate the project across the different functional areas. The functional managers retain responsibility and authority

	for their specific segments of the project.
Balanced matrix	A project manager is assigned to oversee the project and shares the responsibility and authority for completing the project. Project and functional managers work jointly to direct many work-flow segments and jointly approve many decisions.
Project matrix	A project manager is assigned to oversee the project and has primary responsibility and authority for completing the project. Functional managers assign personnel as needed and provide technical expertise.
Project team	A project manager is put in charge of a project team composed of a core group of personnel from several functional areas assigned on a full-time basis. The functional managers have no formal involvement.

*Table 2-1 Project management structures, adapted from Larson and Gobeli (1988)*

The project team, project matrix and balance matrix all shared equal success rates; however a warning is raised in terms of whether the firm can afford the luxury of establishing independent teams. Larson and Gobeli (1988) also found that the functional organisation and the functional matrix structures were less effective, lagging behind in terms of cost, objectives of schedule, and technical performance. However, other studies have indicated a contingent perspective in that a functional-based form of structure is effective for routine, non-radical and line extension types of projects, whilst a project-based form of structure is appropriate for more uncertain, radical types of projects (Yap et al., 1998).

## **2.7 CULTURE**

The literature demonstrates that the culture adopted by the organisation impacts the approach taken to NPD. Cultures that leans towards an innovation-friendly climate, together with risk-taking behaviour, have occasionally been identified (Voss, 1985) as having the ability to influence an organisation's propensity to be innovative. Specifically

Booz et al. (1982) describe how successful innovative firms have an operating philosophy that incorporates a commitment to growth through NPD. It is noted that culture can be both an enabler and a barrier to sharing or reusing knowledge, and thus innovation (Cormican and O'Sullivan, 2004, Kanter, 1988, Martins and Terblanche, 2003). According to Johannessen et al. (1999), innovative organisations are noted for (a) being proactive (b) taking risks (c) creating commitment (d) initiating change. It is a positive cultural character that can provide an organisation with the necessary ingredients to innovate (Ahmed, 1998, Tidd et al., 2001, Banks, 1999).

The characteristics or ingredients of culture are still largely not truly known. As the extensive review of the literature carried out by Ernst (2002) highlights, there has been little analysis of the influence on the success of new products; a point that is further expressed by Hauschildt and Pearson (1994) and Wind and Mahajan (1997). One influential author on the subject of culture defines it as "*a pattern of basic assumptions invented, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration that has worked well enough to be considered valid and therefore to be taught to new members as the correct way to perceive, think and feel in relation to those problems*" (Schein, 1985).

Jassawalla and Sashittal (2002) advocate this definition through crediting culture in the setting of product innovation as the social and cognitive environment, the shared view of reality and the collective belief and value systems reflected in a consistent pattern of behaviours among participants. Importantly, culture is not a single belief, value or assumption; instead it is a combination of many of these facets (Schein, 1991).

The cultural characteristics that have been identified from the literature that relate to successful innovation will be discussed in more detail in the following sections:

- Core values and norms
- Freedom and openness
- Risk
- Critical roles

### **2.7.1 Core Values and Norms**

It is the core values and norms that are at the heart of culture, according to Schein (1985), who presents organisational culture as embracing 'values', 'perceptions' and 'assumptions' of the members in the organisation. In part these form the core values of an organisation and influence decisions and behaviour. Essentially core values are beliefs about what is good or bad, right or wrong in a particular firm (Tushman and Nadler, 1986). Through the conversion of core values into norms the core values are elaborated; specifically, they are expected behaviours, and determine how things are done within the organisation – hence the common phrase 'the ways things are done around here.' Therefore if the core values of a firm incorporate the concept of NPD, then this is more likely to have a positive impact on NPD success.

### **2.7.2 Freedom and Openness**

In recent work by Cooper and Kleinschmidt (1995) the construct 'entrepreneurial climate' has been defined to include (1) the possibility for employees, and particularly those in R&D to use a set portion of their work day for independent work, and (2) support for work on unofficial projects which may already have been stopped by management. Organisations such as 3M and Hewlett Packard are often prominent examples of these aspects of organisational culture. Whilst freedom for individuals to work independently has been identified as leading to success of a new product, research also suggests certain barriers to freedom. There are certain organisational cultural conditions which act to suppress creativity, and thus innovation (Amabile, 1998, Perel, 2002). Bureaucracy, restricted resources, restricted freedom and confused goals can all inhibit creative behaviour, and therefore suppress innovation (Perel, 2002, Puhmann and Gouy, 1999, Freel, 2003). A climate that allows freedom is one that provides slack within the organisation, providing the opportunity for experimentation (Radnor and Noke, 2002). In recent research, resources, clear goals and a participant management style encourage innovation through the fostering of creativity (Oliver, 2002).

An organisation that is supportive, open and trusting, and which in turn creates fertile conditions for innovation (Kanter, 1988) as opposed to a bureaucratic and controlling

firm is more likely to produce innovative products (Ahmed, 1998, Jassawalla and Sashittal, 2002, DeSalvo, 1999). Furthermore, this argument is expanded by Burns and Stalker (1966), who suggest an organic rather than a mechanistic organisation to foster innovation. With freedom there is the possibility that people within the organisation are allowed to be more open in their activities. Many studies have demonstrated that an innovation culture is fostered by an openness and interchange between different units and functions operating at all levels of the organisation (Takeuchi and Nonaka, 1986, Tushman and Nadler, 1986) – much the same as was presented in the discussion on cross-functional teams in Section 2.4.1 and 2.4.2.

### **2.7.3 Risk**

The aversion to risk is largely associated with the organisational culture. The adherence to a process pushes towards low risk incremental innovation (Dougherty and Heller, 1994). It is argued that innovation is driven through personal curiosity of individuals, rather than being market led (Humble and Jones, 1989), thereby creating what feels like “*an unnatural act*” in most operating businesses, because the uncertainty is too high, the time horizon too long, and the investment too large, given the risks (McLaughlin et al., 2004). New small firms are often associated with a more entrepreneurial spirit, which the literature would suggest is often lost in mature firms as the mechanisms that allow them to be successful become inhibitors to innovation (Leonard-Barton, 1992, Dougherty and Heller, 1994, Leifer et al., 2000, Leifer et al., 2001). Arguably this is due to the bureaucracy that is put in place to manage a larger working environment.

### **2.7.4 Critical Roles**

Many authors have explored the idea of several critical roles being important to the NPD process (Tushman and Nadler, 1986, Rothwell et al., 1974). As innovation is multi-disciplined and requires in-depth expertise, critically different roles are needed to perform at different phases of the NPD process. The roles described in the literature fall predominantly into the categories of creativity and development, as outlined in Table 2-2.

Author	Creativity	Development
Tushman and Nadler	Idea generators	Gatekeepers or boundary
	Champion/internal entrepreneurs	spanners
		Sponsors, coaches or mentors
Rothwell et al.	Technical innovator	Business innovator
	Product champion	

*Table 2-2 The different required roles within the NPD process.*

Referring to Table 2-2, the creativity roles are those that either generate the ideas themselves, such as Tushman and Nadler's (1986) idea generators, who are the key individuals who creatively link diverse ideas. Otherwise the creativity role act as internal champions and see new approaches to linking technologies to markets, and products to new processes. As well as creative roles, developmental roles have been identified, including gatekeepers, who actively link local colleagues to external information sources, through acquiring, translating and distributing the external information (Cormican and O'Sullivan, 2004). The role of the gatekeeper has already been discussed in Section 2.4.2, 'external involvement' as having a positive effect on NPD projects. Finally, the business innovator or sponsor should be at senior management level and provide the project with formal support, access to resources, but importantly, also provide protection as the new products emerge.

Of all the roles identified in this review, the literature is conclusive that the product champion is the most influential to a successful new product, and as a result has been given the most research attention (Rothwell et al., 1974, Chakrabarti and O'Keefe, 1977, Maidique and Zirger, 1984, Song et al., 1997a, Barczak, 1995). It is the commitment of an individual within the organisation who believes in the new idea that will advance it through the organisation with great personal commitment. Product champions actively take or support ideas (that may or may not be their own), bring the ideas to life, and take the idea through the project's critical stages. Tushman and Nadler (Tushman and Nadler, 1986) state that champions have the aggressive, energetic and risk-taking personalities to



actively champion the cause. This is a dynamic role that Takeuchi and Nonaka (1986) argue is not static, and the firm should reassign individuals who have been key agents of change in previous developments to new projects. This dynamic nature of the product champion highlights the diverse experience and expertise required, which also changes throughout the life of a project. However, it should be noted that Cooper and Klienschmidt (1995) argue that the success of a product champion depends on the culture within the company, which will allow them to flourish and to find support.

## **2.8 ROLE AND COMMITMENT OF TOP MANAGEMENT**

The issue of the senior management's role within the NPD process has been identified as critical to the successful product development (Cooper, 1988). Importantly it has been found that with increased support and commitment from senior management, the probability that the project will be terminated decreases (Balachandra, 1984). Interestingly, Maidique and Zirger's (1984) study of product innovation success and failure revealed that general managers did not perceive their support as being important to the success of innovation projects. However, in the same study functional line managers stressed the significance of top management backing. Rothwell et al. (1974), identified from project SAPPHO<sup>1</sup>, that unless the chief executive was also the business innovator, the role they played was far less important. Importantly, Crawford (1987) observed that *"many new product failures have been attributed to a lackadaisical attitude on the part of top management"* (p 497).

The following key aspects of senior management involvement will examine top management support and top management style

### **2.8.1 Top Management Support**

Brown and Eisenhardt (1995) argue that the need for support from the top management team encompasses both financial and political resources. The underlying reasoning is

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<sup>1</sup> Scientific Activity Predictor from Patterns with Heuristic Origins

that this support is essential for obtaining the resources necessary to attract team members to the project, to gain project approval to proceed, and to provide the funding necessary to foster the development effort. Thus, senior management support is essential for fast and productive product development.

Maidique and Zirger (1984) found that top management support was essential in overcoming internal obstacles, and for the necessary adjustment required for a new product. There was a suggested link between the product's anticipated profitability (margin) and the willingness of the 'key constituencies' within the firm to release resources and enable the new project to overcome internal and external obstacles. Interestingly, research by Maidique and Zirger (1984) shows that the role of product champion is secondary to top management support during incremental and significant innovations. A further element that relates to resources is the degree of availability and ease of access that senior managers make of (Cooper and Kleinschmidt, 1995), in other words, access to managers is necessary if NPD success is to be realised. In addition, if development personnel can sense the enthusiasm of senior management commitment and the priority placed on the project, it is thought that they are more likely to become interested in the project themselves, as well as take greater ownership and be more willing to take risks (Swink, 2000).

Studies have found that accountability of senior management has a positive effect on the success of new products (Cooper and Kleinschmidt, 1995). In order to support NPD top management must play the part of champion for the project, in addition to providing strategic direction through creating policies and procedures (such as reward systems), and particularly, through guiding the policies that foster the internal culture of cross-functional cooperation. Top management's role in innovation would also appear to centre on endorsing an acceptance of change within the organisation and determining the strategic direction for change, and then openly promoting and encouraging the efforts of the change agents (Maidique, 1980). The support of risk-taking and toleration of mistakes is also required. Indeed, as Tushman and Nadler (1986) showed, the top management's role in the innovation process should be one of envisioning, energising

and enabling the innovation programme (Tushman and Nadler, 1986). However, Swink (2000) and Tacheuchi and Nonaka (1986) give a warning that there is a stage where top management support can turn into interference and this can be especially detrimental in high technology, innovative projects.

### **2.8.2 Top Management Style**

In order to encourage middle management to be effective at product innovation, Rothwell (1992) argues that senior management should adopt an open, imaginative and creative style. Yap and Souder (1994) further discuss management style and suggest that a non-participative, authoritative management styles correlates positively with project success, whereas Rothwell (1992) remarks that success in innovation is 'people centred', where formal management techniques will enhance the performance of competent managers, but that there is no substitute for able managers. From the problem solving perspective, the ability of senior management to provide what is referred to as 'subtle control' is also deemed important to both superior process performance and effective products (Imai et al., 1985). The concept of 'subtle control' involves having the vision necessary to develop and communicate a distinctive, coherent product concept. At the same time, 'subtle control' also involves the ability to delegate such tasks as creativity, which arguably motivates team members and is likely to yield a better development process. Also discussed in the literature is management style, which should also include the ability to clearly communicate messages from senior management about the role and importance of new product development (Cooper and Kleinschmidt, 1995). This involves the clear communication of the goals for the product development team.

## **2.9 STRATEGIC DECISIONS**

The importance of strategy has been identified as a critical success factor to enable effective product innovation management (Englund and Graham, 1999, Lynn et al., 1996, Clark and Wheelwright, 1995). This section also touches on the market environment as management decisions relating to the market environment for new products are often considered to be strategic (Ledwith, 2004). Therefore this section merges two of the

categories presented by Montoya-Weiss and Calantone (1994) identified in their discriminant analysis (see Figure 2-4). This section will discuss strategic decisions in relation to:

- NPD strategy
- Market environment
- Resources

### **2.9.1 NPD Strategy**

A product strategy should define the aims and objectives of the product innovation effort in relation to the organisation's overall strategy (Cormican and O'Sullivan, 2004). Regardless of the type of innovation that the organisation is undertaking, many writers have emphasised the importance of directly linking the NPD strategy/goals to those of the corporate strategy (Ayal and Rothberg, 1986, Crawford, 1994). A study of new product development conducted by Booz et al. (1982) revealed that successful businesses explicitly link the corporate strategy to the plan for the whole product development programme. Further research demonstrates that successful organisations develop 'innovation charters', as described by Crawford (1994), which provide the individual sections with direction in their product development activities.

The NPD programme should have a strategic focus, which gives an overall direction to the individual NPD projects (Cooper and Kleinschmidt, 1995). The empirical study by Meyer and Roberts (1986) illustrates an observable relationship between the strategic focus (which was technological newness) and corporate economic performance (which was measured in sales growth rate). Zirger and Maidique (1990) and Peters and Waterman (1982) refer to this as "*sticking to the knitting*". However, Zirger and Maidique (1990) are keen to emphasise that without occasional ventures in new directions, the firm will exhaust its technical potential. Thereby it can be argued that a balanced strategy is required, as Cooper (1984) found that most successful new product strategies are technology-oriented, but also ensure a high degree of product fit and focus through involvement in potential markets. In summary, NPD strategy has been identified as the second most important factor for success in Cooper and Kleinschmidt's study

(1995), and although Ernst (2002) states that establishing the importance of a NPD strategy to product development success, further research is required.

### **2.9.2 Market Environment**

Several aspects of the market into which new products are launched have been considered vital to success. For the first time Cooper and Klienschmidt (1987) identified that market conditions, such as the market segment's potential size and growth, were positively related to successful product development. These findings have since been confirmed Zirger and Maidique (1990) and Montoya-Weiss and Calantone (1994).

In their meta-analysis, Montoya-Weiss and Calantone (1994) found that the market environment comprised three significant aspects:

- Market potential. This is measure of market (and demand) size and growth, as well as an indication of level of customer need for the product type. In addition it considers the importance of the product to the customer.
- Market competitiveness. This reflects the intensity of competition in the marketplace in general with respect to price, quality, service or the sales force/distribution system.
- Environment. This refers to the general operating environment faced by the firm, and includes risk or uncertainty and the regulatory environment.

### **2.9.3 Resources**

The availability and quality of resources as a determinant of NPD success has not been studied to any great extent (Ledwith, 2004). The technological resources of the firm and their utilisation have a direct bearing on new product strategy. Research has identified that adequate resources must be allocated (Cooper, 1999), there should be good external sources of communication to disseminate the information throughout the organisation, (Stringer, 2000, Oakey et al., 1988) robust mechanisms or processes must be in place to review, continue or kill projects at the appropriate stages (Cooper, 1988) and sufficient skills must be available to the organisation (Roper, 1998).

Particularly, with reference to the NPD process during the screening process, the decision should be viewed as an initial and tentative one, and at this stage Cooper (1988) argues

that the resourcing of the product is important. The importance lies in the commitment, which should initially be limited with embryonic projects. This is paramount to the success of new products as it allows the project's viability and potential to be assessed, and enables risk to be kept to a minimum to ensure that resources are used wisely. The issue of allocating time for innovation is included within the resourcing debate, and is defined by Cooper and Kleinschmidt (1995) as the 'entrepreneurial climate', which they measured through four variables: (1) the possibility for employees, particularly those in R&D, to use a set portion of their work day for independent work developing their own ideas; (2) support for work on unofficial projects which may have already been stopped by management; (3) the availability of internal 'venture capital' to assist the realisation of creative ideas, and (4) a new product idea suggestion scheme for employees.

## **2.10 SUMMARY OF LITERATURE REVIEW**

The literature is summarised in Table 2-3, and illustrates the contribution of the various authors reviewed. This summary illustrates the key findings from the literature and provides a comprehensive list of the key determinants for NPD success within the key categories identified at the beginning of this section:

- Development process
- Organisation
- Culture
- Role and commitment of senior management
- Strategic and market environment

Success factors	Contributors	Comments
Development process	(Booz et al., 1982, Cooper and Kleinschmidt, 1995, Clark and Wheelwright, 1995, Crawford, 1994, Hughes and Chafin, 1996)	Link between NPD success and a formal development process, with different models describing the process.
	(Hoffman et al., 1998, Roper, 1997)	Distinction between large and small firms, with small firms tending to be more informal in their approach.
Protocol/understanding the market	(Cooper and Kleinschmidt, 1986, Montoya-Weiss and Calantone, 1994, Calantone et al., 1997, Cooper and Kleinschmidt, 1995, Zirger and Maidique, 1990)	Preparatory and predevelopment work to assess whether the product has a commercial application; includes initial screening, preliminary market and technical assessment, which are decisive for the success of new products.
Proficiency of market-related activities and technological activities	(Johns and Snelson, 1988, Veryzer, 1998, Cooper, 1988, Montoya-Weiss and Calantone, 1994, Cooper, 1990, Cooper and Kleinschmidt, 1987)	Preliminary market and technical investigation; critical stage including three activities: preliminary market assessment, preliminary technical assessment and preliminary evaluation. Aim to gather information to enable a decision regarding full development.
	(Cooper, 1988)	Vital that expenditure is monitored closely at this stage.

<p>Formal new product process</p>	<p>(Cooper and Kleinschmidt, 1995, Rochford and Rudelius, 1997, Bessant and Francis, 1997, Ernst, 2002, Zirger and Maidique, 1990)</p> <p>(Wolfe, 1994, Radnor and Noke, 2002, Tang, 1998, Schroeder et al., 1989)</p> <p>(Zirger and Maidique, 1990, Takeuchi and Nonaka, 1986)</p> <p>(Cooper and Kleinschmidt, 1987, Cooper and Kleinschmidt, 1986, Zirger and Maidique, 1990)</p>	<p>Formal process has a positive effect on NPD.</p> <p>Simplicity of NPD models has been criticised, creating risk aversion.</p> <p>Enables efficiencies to be gained, generating creative problem solving. Concurrent or simultaneous engineering to aid faster development whilst retaining cross-functional involvement.</p> <p>Essential for planning to be incorporated into the NPD process.</p>
<p>Organisation</p>	<p>Peter and Waterman (1988) (Montoya-Weiss and Calantone, 1994, Cooper and Kleinschmidt, 1995)</p>	<p>Organisation is important to NPD, particular reference has been made to teams.</p>



Internal communication	(Myers and Marquis, 1969, Griffin and Hauser, 1996, John and Snelson, 1988)	The requirement for internal and external communication to aid NPD, as well as aiding interfaces between cross-functional groups.
	(Gupta et al., 1985, Thamhain, 1990, John and Snelson, 1988)	Often the approach to internal communication can lack a systematic approach, thereby causing a barrier to cross-functional integration.
	(Chakrabarti and O'Keefe, 1977, Ebadi and Utterback, 1984)	Provides stimulus for innovation.
	(Ebadi and Utterback, 1984, 1984)	The effectiveness of communication is dependent on the frequency.
Involvement of external organisation	(Cormican and O'Sullivan, 2004, Ancona and Caldwell, 1992, Mendelson and Pillai, 1999).	Linking with external organisations can help to aid NPD success.
	(Griffin and Hauser, 1996, Crawford, 1994, Ebadi and Utterback, 1984, 1984)	Searching external information.
	(Huang and Mak, 2000, Griffin and Hauser, 1996, Gupta and Wilemon, 1990, Clark and Fujimoto, 1991, Imai et al., 1985)	Sufficiently extensive involvement with suppliers early in the process has been found to aid the process of NPD.
	(Polanyi, 1966, Howells, 1995, Freel, 2003, Håkansson, 1987, Maillat, 1995, Oughton, 1997, Florida, 1995, Cooke and Morgan, 1998, Baptista and Swann, 1998, Rothwell and Dodgson, 1991, Oerlemans et al., 1998)	Networking can provide external stimulus for innovation.

<p>Cross-functional teams</p>	<p>(Griffin, 1997, Benedetto, 1999, John and Snelson, 1988, Song et al., 1997a, Crawford and Benedetto, 2002)</p> <p>(Maidique and Zirger, 1984, Cooper, 1983, Griffin, 1992, Gupta et al., 1986, Gupta and Wilemon, 1988)</p>	<p>Cross-functional teams make a substantial contribution to NPD, bringing various aspects of the organisation together.</p> <p>Clearer communication, which has been found in some cases to aid the launch time for a new product.</p>
<p>Project leadership</p>	<p>(Brown and Eisenhardt, 1995, Clark et al., 1987, Clark and Fujimoto, 1991, Cooper and Kleinschmidt, 1995, Swink, 2000, Barczak and Wilemon, 2003)</p> <p>(Brown and Eisenhardt, 1995, Jassawalla and Sashittal, 2002).</p> <p>(Jassawalla and Sashittal, 2002).</p>	<p>Viewed as a pivotal role within the NPD process that can bridge the gap between senior management and the development team.</p> <p>If project leaders are given 'power' within their teams, then this allows a more effective development process to occur.</p> <p>Part of the role of the project leader is to create a social environment for the project team, which helps to stimulate ideas.</p>
<p>Responsibility of the NPD team for the entire process - autonomy</p>	<p>(Gerwin and Moffat, 1997, Thamhain, 1990, Cooper and Kleinschmidt, 1995)</p>	<p>Creates a sense of ownership of the project, as well as buy-in.</p>
<p>Commitment</p>	<p>(Thamhain, 1990, Rickards, 1985, Souder, 1981b, Ernst, 2002)</p>	<p>Commitment to a NPD project aids its success, especially from the project leader and the project team.</p>

Project organisation	(Tushman and Nadler, 1986, Johne and Snelson, 1988, Calantone et al., 1995, Quinn, 1985, Rickards, 1985, Song et al., 1993, Gupta et al., 1985)	Debate around formalisation of NPD projects and whether formalised projects are more effective and efficient.
	(Yap et al., 1998, Larson and Gobeli, 1988)	Various ways of organising a NPD project have been suggested.
Culture	(Booz et al., 1982, Voss, 1985, Cormican and O'Sullivan, 2004, Kanter, 1988, Martins and Terblanche, 2003)	Creating an innovation-friendly climate is essential for innovation to occur, creating both a barrier and enabler for innovation.
Core values and norms	(Schein, 1985, Tushman and Nadler, 1986)	Values, perceptions within a company that relate to NPD and innovation.
Freedom and openness	(Cooper and Kleinschmidt, 1995, Amabile, 1998, Perel, 2002) (Perel, 2002, Puhlmann and Gouy, 1999, Freel, 2003, Oliver, 2002). (Kanter, 1988, Ahmed, 1998, Jassawalla and Sashittal, 2002, DeSalvo, 1999, Takeuchi and Nonaka, 1986, Tushman and Nadler, 1986)	Entrepreneurial climate which supports innovation even in an unofficial capacity. Openness within the organisation is required to enhance innovation, and create a sense of freedom.
Risk	(Dougherty and Heller, 1994, McLaughlin et al., 2004, Leonard-Barton, 1992, Leifer et al., 2000, Leifer et al., 2001)	Associated with NPD in larger organisations.

Critical roles	(Tang, 1998, Cormican and O'Sullivan, 2004, Rothwell et al., 1974, Chakrabarti and O'Keefe, 1977, Maidique and Zirger, 1984, Cooper and Kleinschmidt, 1995, Tushman and Nadler, 1986, Song et al., 1997a, Barczak, 1995)	Many different roles have been associated with successful NPD, with the role of product champion being supported conclusively within the literature.
Role and commitment of senior management	(Balachandra, 1984, Hoffman et al., 1998, Maidique and Zirger, 1984, Rothwell et al., 1974, Cooper, 1988)	Increased support from the senior management has been shown to aid the success of NPD and is considered a critical success factor.
Management support	(Brown and Eisenhardt, 1995, Maidique and Zirger, 1984, Cooper and Kleinschmidt, 1995, Swink, 2000)	Senior management support includes helping the team to receive the necessary resources required to complete the project.
Management style	(Rothwell, 1992, Yap and Souder, 1994, Imai et al., 1985, Rubenstein, 1994, Quinn, 1985, Takeuchi and Nonaka, 1986)  (Maidique, 1980, Tushman and Nadler, 1986, Swink, 2000)	Non-participating, authoritative management style, demonstrating subtle control of projects was found to be most effective.  Can have a positive effect by providing support and guidance, fostering an innovative culture.
Strategic decisions	(Englund and Graham, 1999, Lynn et al., 1996, Clark and Wheelwright, 1995, Ledwith, 2004)	Positively effects NPD success, and the literature concludes that it includes NPD strategy, market environment and resources.
NPD strategy	(Cormican and O'Sullivan, 2004, Cooper and Kleinschmidt, 1995, Ernst, 2002, Ayal and Rothberg, 1986, Crawford, 1994, Booz et al., 1982)	Requirement to link to corporate strategy.

Market environment	(Montoya-Weiss and Calantone, 1994, Zirger and Maidique, 1990, Cooper and Kleinschmidt, 1987)	Includes market potential, market competitiveness, market environment.
	(Cooper, 1999) (Stringer, 2000) (Ledwith, 2004) (Cooper and Kleinschmidt, 1995)	Required to enable NPD success.

*Table 2-3 Summary of the literature review*

## 2.11 SME LITERATURE

The preceding section summarised the literature on new product development and revealed what is often regarded as 'best practice'. Despite providing an overview of the NPD literature its value to this study is limited as previously stated many of these studies have focused on larger organisations. Therefore this section will be dedicated to highlighting the different characteristics that are considered to influence the way that SMEs approach innovation and NPD. It is acknowledged in the literature that the difficulties concerning innovation are greater for SMEs because their economies of scale and their resources are less than those of larger firms. However, what compensates for these weaknesses is the fact that SMEs may enjoy greater flexibility because of the simplicity of their internal organisation, being faster at adapting and responding to changes (Aragon-Sanchez and Sanchez-Martin, 2005).

### 2.11.1 Development Process and Organisation

With reference to the development process, the literature does point to a distinction between large and small firms. Roper (1997) found that in small UK and Irish manufacturing firms R&D tended to be informal, often in response to market opportunities, supported by Hoffman et al. (1998), who established that R&D activities "*tend to be more ad-hoc or project driven in smaller SMEs.*" Further evidence of informal practices in SMEs was found by Santarelli and Sterlacchini (1990) who reported "*informal R&D is an important part of the total R&D performed by small and medium sized firms.*" Also Santarelli and Sterlacchini (1990) reported that this form of informal practice was less effective than the systematic R&D undertaken by larger firms that adopt structured R&D programmes.

The concept of cross-functional is strongly advocated in the NPD literature as highlighted in Section 2.6.3 relating to larger organisations. However, the difference between large firms and SMEs is emphasised by Raymond et al. (1998) who states cross-functionality occurs naturally within SMEs, whereas large firms have to create these conditions. Within SMEs very often, employees occupy different positions at the same time (Garengo et al., 2005) hence the organisations tend to be flat and cross functional involvement occurs naturally.

At the level of SMEs, investments on intangible resources and the creation of capabilities are quite problematic because of the necessity to increase the efficiency scale or size, in addition to the difficulties related to the internal and external growth through fusions or acquisitions (Pil and Holweg, 2003). However, alliances and cooperation may allow SMEs to reach sufficient dimensions to obtain the advantages of being large and, at the same time, keep the advantages of SMEs in terms of specialisation, reduction of costs and flexibility (Aragon-Sanchez and Sanchez-Martin, 2005, Pil and Holweg, 2003). Freel's (2003) evidence that strong links were not apparent between innovation and networking in SMEs appears to receive little support. With further research indicating that apart from a small group of very innovative companies with high technical expertise in a market niche, SMEs in general usually depend on the collaboration with external know-how experts (Kailer and Scheff, 1999) because of their limited personnel and know-how capacities. In order to achieve improved innovativeness and higher profitability of SME, collaborating with experts external to the firm is considerably important (Kailer and Scheff, 1999).

### **2.11.2 Top Management**

The literature defines leadership and top management support as being paramount to all organisations seeking to develop innovation (Tidd et al., 2005). In SMEs developing innovation, leadership is especially vital for success for a number of reasons (McAdam et al., 2004), in particular, there 'is little disagreement that the most powerful executive position is that of CEO' Daily et al. (2002). This is particularly true in the case of small firms where the CEO tends to occupy a position of unique influence, serving as the locus of control and decision-making (O'Regan et al., 2006). Arguably the role of the Chief Executive in the smaller firm is more significant as they are the controlling influence with regard to decisions and strategy. Substantiating this thought is the premise that the owner manager's skills and support is of particular importance in small firms (Hoffman et al., 1998) and often has a larger influence or effect when compared with large organisations (Hale and Cragg, 1996). This can be linked to the findings of Ghobadian and Galleary (1997) and Culkin and Smith (2000) who stress that SMEs with leaders close to the action can act as the main innovative catalysts for change, and a determining factor in the effective management of the new technology adoption process (Voss, 1998).

Arguably it is the leader's vision and drive that focuses the organisations attention on innovation through what Davenport and Bidy (1999) refer to as "*entrepreneurial dynamism*". This has the effect that leaders of SMEs can instil in the behaviours of others in the organisation. Resulting in a dynamic innovative culture being supported by the top management of the enterprise, aiding rapid decisions can take place (Voss, 1998) through the support of innovation by top management. Importantly, top management has the role of providing a clear strategic direction, which includes an adequate management of technology and innovation (March et al., 2002). Indeed, Wilderom and van den Berg, (1997) in their empirical study of small firms derived, tested and validated four main leadership styles: transformational, transaction, human resources and laissez faire styles.

A criticism of SME management is that little attention is given to the formalisation of processes. One of the main barriers to organisational development in SMEs is the lack of a managerial system and formalised management of the processes. Furthermore, since knowledge is mainly tacit and context-specific, the information required to implement is difficult to gather (Jennings and Beaver, 1997, Garengo et al., 2005) . However, further evidence of this is highlighted in the informality of the development process – often informality is concerned to be beneficial with large organisations wishing to emulate SMEs through becoming an ambidextrous organisation (Tushman and O'Reily, 1996)

### **2.11.3 Culture and Individuals**

Culture is not a new phenomenon in SMEs and is well established within the literature (O'Regan et al., 2006). Indeed, Curran and Blackburn, (2000) argue that most managers will be aware of the enterprise culture that has become well established in the UK over the past two decades. Culture is often seen as the means through which management can influence the firm (Harris and Ogbonna, 1999). Conversely, it is also argued that organisational culture can be a major obstacle in the implementation of new ideas, processes and systems (Morgan, 1989). Such that determination of new initiatives by leaders based on control rather than empowerment results in a 'cultural bypass' and has an adverse impact on the motivation and loyalty of employees Cooke and Szumal (2000)



SMEs are renowned for their creativity and new product development, in particular SMEs have the ability to innovate effectively and develop new products more rapidly than larger firms (Vossen, 1998). Indeed, there is little doubt that SMEs are capable of effective innovation. However, many SMEs still fail to see the opportunities and advantages that are open to them, such as the flexibility of customising products to the requirements of the consumer, an advantage adopted by larger firms (O'Regan et al., 2006). Clearly, the capability to innovate quickly is a key factor in the sustainable competitive advantage of any firm. Stoica and Schindehutte (1999) confirm that adaptability is one of the key factors for SMEs in0 their study they analyzed the relationship between adaptability and performance using an information processing approach. In which they identified a positive relationship between organisational culture and adaptability.

Throughout the innovation literature the central role of people and the ensuing culture this creates are continually identified as being the key to innovation (e.g. Voss, 1998). This is confirmed by Ghobadhian and Gallear (1997) who state that "*SMEs are more likely to be people-orientated than system-orientated.*" However, Macadam et al. (2004) warn this is an area SMEs must weigh up their basic lack of people resources against their increased flexibility and response. This is where the importance of the leadership where top management must go beyond autocratic control and facilitate empowerment among the SME workforce (Davenport and Bidy, 1999) and achieve two-way communications (Ghobadhian and Gallear, 1996).

#### **2.11.4 Strategic Decisions**

In addition to the lack of resources, it is considered that SMEs experience an overall lack of resource strategies and action plans (McAdam et al., 2004), compounded by what Gunasekaran et al.(1996) state as a lack of productivity and quality improvement strategies. Further confirmation of resource scarcity is offered by Page (1993) who discovered in his survey, 39.2 per cent of firms stated resources as being an obstacle to success. In relation to small firms, a lack of resources is often cited as a barrier or constraint to NPD, with the main barriers to NPD being financial and human resources (Hoffman et al., 1998, Roper, 1997). Therefore it is important that resources are carefully monitored to ensure that the most is made of them to secure subsequent success.

SMEs are characterised as having a reactive approach, and considered to have a poor strategic planning and their decision making processes are not formalized. The lack of explicit strategies and methodologies to support the control process promotes both a short-term orientation and a reactive approach to managing the company's activities (Brouthers et al., 1998). Often technical excellence in products and operational processes is perceived as the only key critical factor in SMEs and often a managerial culture is lacking in these companies and therefore managerial tools and techniques are perceived as being of little benefit to the company.

## **2.12 ADDRESSING GAPS IN KNOWLEDGE**

Within the body of literature that has been reviewed in this chapter it is apparent that the literature on innovation and new product development has evolved to capture a number of important ideas with particular reference to small firms:

1. Small firms should develop compatible products, adopt core technology and avoid diversification.
2. The NPD process in small firms tends to be informal, and is generally viewed as positive by large organisations often wishing to emulate the closeness and connection between the different departments in smaller firms.
3. The relationships between R&D and marketing are important, in addition to other functions within the organisation, such as manufacturing and the service departments.
4. Top management support and project management are linked to NPD success, and are necessary in providing the necessary resources and inspiration.
5. The ability of an organisation to use external firms and to create relationships has been questioned, especially in smaller firms. Those that do argue the benefits state that it brings a different perspective to the firm and creates a stimulating environment.
6. A description of factors that lead to NPD success has been proposed, yet there is little consensus on the determinants of NPD provided in the literature.

Despite the growing base of research into the topic, problems remain regarding definition and clarity of the theory. At the onset of this research there were, among

others, three important gaps in knowledge, to which it was decided that this thesis would be dedicated:

- A clear understanding of how manufacturing firms create a NPD capability was elusive in the literature;
- A coherent unified framework of enablers for how manufacturing SMEs create a NPD capability has yet to be defined, and
- The research in the field was positivistic and involved leading edge organisations; losing the benefits of qualitative understanding and discounting the experience of smaller firms. The literature therefore assumes a previous NPD capability, disregarding the firms attempting to create a NPD capability from a position of little experience. This demonstrates a gap in academic knowledge, and an even wider gulf in practitioner understanding regarding the application of the theory.

This research will attempt to reduce these gaps in current knowledge, addressing the following aims and objectives that will guide this research study. The overarching aim of this research is:

*To explore how manufacturing SMEs create a new product development capability.*

In order to answer the above research aim, it was deemed necessary to explore the two research objectives:

1. To understand the specific strategies that manufacturing SMEs utilised that enabled the firms to create a NPD capability.
2. To identify the key enablers that aided the firms in the process of creating the capability to develop new products.

The next chapter, which presents the research methodology, will demonstrate that systematic consideration has been given to the main issues of research design in order to address these objectives.

## CHAPTER THREE – RESEARCH DESIGN

*The objective of this chapter is to demonstrate that systematic consideration was given to the main issues of research design. It is the intention of this chapter to demonstrate that the decisions which informed the research design were conducted in a rigorous manner, in full awareness of the options available. The chosen research methodology was designed in order to satisfy the research aim presented in Chapter One and the research objectives in Chapter Two, taking into account the exploratory nature of this research study.*

### 3.1 PHILOSOPHICAL ASSUMPTIONS

The philosophical standpoint a researcher adopts is fundamental as “*they (philosophies) are central to the notion of research design*” (Easterby-Smith et al., 2002). The understanding of philosophical issues offers clarification to the research design, not only by guiding the kind of evidence required, but also the way in which it is to be gathered and interpreted. Within the field of social research there are considered to be two main research paradigms; positivist and phenomenological. However, there are numerous alternative terms that can and are used interchangeably (see Table 3-1), and it is widely accepted that there is blurring between the two paradigms. Ideally they should be viewed on a continuum, in which as you move along the continuum the features and assumptions of one paradigm are gradually relaxed and replaced by those of another (Collis and Hussey, 2003).

<b>Positivistic paradigm</b>	<b>Phenomenological paradigm</b>
Quantitative	Qualitative
Objectivist	Subjectivist
Scientific	Humanistic
Experimentalist	Interpretivist
Traditionalist	

*Table 3-1 Alternative terms for the main research paradigms*

*(Hussey and Hussey, 1997)*

Each of the two paradigms adopts a different stance with regard to the key assumptions that guide the way in which social research is conducted. It is therefore appropriate to reflect on these and the way that they drive research. Firstly, ontology's are theories of being or reality; essentially they involve a set of assumptions of what can be taken to really exist (Collis and Hussey, 2003). In other words, does the researcher believe that reality can be objectively considered, or is reality subjective and dependant on the participant? As Collis and Hussey (2003) advise, depending on one's research paradigm, researchers must distinguish between a positivist or phenomenological ontology. From a positivist point of view, the world is objective and external to the researcher. Alternatively, the phenomenological perspective is that the world is socially constructed and only understood by examining the perceptions of the human actors.

<b>Assumption</b>	<b>Question</b>	<b>Positivist</b>	<b>Phenomenological</b>
Ontological	What is the nature of reality?	Reality is objective and singular, apart from the researcher.	Reality is subjective and multiple as seen by participants in a study.
Epistemological	What is the relationship of the researcher to that being researched?	Researcher is independent from that being researched.	Researcher interacts with that being researched.

*Table 3-2 Summary of ontology and epistemology theories (Hussey and Hussey, 1997)*

Secondly, as with the theory of ontology, epistemology theory also differs according to the researchers' paradigm. Epistemology theory is concerned with the relationship that the researcher has with the world around them. Typically the positivist standpoint is that the researcher is and should be independent from that which is being researched (Hussey and Hussey, 1997). Alternatively, the phenomenological stance is that the researcher interacts with the world around them. It is the belief of this researcher that it is the wealth of knowledge, opinions, attitudes and beliefs that guide a researcher's philosophical standpoint; the researcher cannot be detached from

them, and in turn takes them to all research surroundings. Thus, the view of this researcher aligns with the phenomenological perspective.

### 3.2 INTERPRETIVIST PERSPECTIVE

As the paradigm informing this research is phenomenological in nature, this is the main point of discussion. The consequence of adopting this approach will be made clear, highlighting the differences from the positivistic paradigm where appropriate. The phenomenological paradigm is the science of phenomena (Hussey and Hussey, 1997). A phenomenon is a fact or occurrence that appears or is perceived, especially one of which the cause is in question (Allen, 1990). Specifically, the phenomenological paradigm is concerned with understanding human behaviour from the participant's own frame of reference (Hussey and Hussey, 1997). A comparison between the positivistic and phenomenological standpoint is detailed in Table 3-3, which summaries the main features of the two paradigms. The phenomenological approach allows for the research topic to be more clearly understood and defined using a small sample. Alternatively, the positivistic approach would involve a large sample of quantitative data that may not have been easily accessible, and would produce results based on an artificial location.

<b>Positivist paradigm</b>	<b>Phenomenological paradigm</b>
Tends to produce quantitative data	Tends to produce qualitative data
Uses large samples	Uses small samples
Data is highly specific	Data is rich and subjective
The location artificial	The location is natural
Reliability is high	Reliability is low
Validity is low	Validity is high

*Table 3-3 Summaries of the positivistic and phenomenological paradigm.*

*(Adapted from Hussey and Hussey, 1997).*

The term paradigm refers to “*the progress of scientific practice based on people philosophies and assumptions about the world and the nature of knowledge*” (Collis

and Hussey, 2003); in short, how research should be conducted. The concept of paradigms originates from Kuhn (1962), who describes them as “*universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners.*” Within the phenomenological paradigm there are a number of philosophies that come under this umbrella, such as ethnography, hermeneutics, social constructivism and interpretivism. Whilst all have slightly different perspectives in the way they approach the ontological and epistemological assumptions, they all share the belief that methods of the natural sciences are inadequate for the study of social reality (Lee, 1993). Unlike atoms, molecules and electrons, people create and attach their own meanings to the world around them and to the behaviour that they manifest in that world (Lee, 1993). In other words, the same human action can have different meanings for different human subjects, as well as for the observing social scientist. The approach that this research aligns itself with, within the phenomenological paradigm, is that of interpretivism.

The interpretive paradigm shares the belief that reality is socially constructed, and subjectively viewed by the people who give it its meaning, encapsulating the subjectivity and the involvement of the researcher in the process, because “*for interpretivism, the social world is the world perceived and experienced by its members from the inside. Hence the task of the social scientist is to discover and describe this insider view, not to impose an outsider view on it*” (Blaikie, 1993). The researcher conducting this study agrees with Gill and Johnson (2002) that positivism ignores the subjective dimensions of human action, and the internal logic and interpretative processes by which action is created. It is my conviction that human behaviour is an important phenomenon within research, which contrasts with positivists’ concern to emulate natural science methodology, which thus necessitates a denial of the importance of human subjectivity (Gill and Johnson, 2002).

### **3.3 RESEARCH METHODOLOGY**

In line with the philosophical standpoint of this research, a qualitative methodology is used to “*provide a richness*” (Silverman, 1993). It is through adopting a qualitative approach that an understanding can be developed with regard to how manufacturing firms can create a NPD capability to gain a competitive advantage. Specifically, a

case study methodology has been assumed for this research as “*a case study is an extensive examination of a single instance of a phenomenon of interest and is an example of a phenomenological methodology*” (Collis and Hussey, 2003), which is in line with the objective of this research study. Despite some disagreement, it is generally thought that in-depth case studies are extremely powerful for inductive theory building (Zhao and Calantone, 2003), such as this research attempts.

As the literature review in Chapter Two highlighted, despite a large body of knowledge relating to how to achieve NPD success, including the key determinants, there is still a lack of understanding relating to how organisations attain the lofty heights of ‘NPD success’, especially from a position of relatively little experience. Robson (1993) argues that in addition to the objective of contributing to knowledge, there are three purposes to undertaking research; these are to *explore, describe* or *explain* events and/or situations (Table 3-4). Given the novelty and immaturity of the topic area, the primary purpose of this study is to explore. The principle aim is to understand how firms are beginning to create a NPD capability, which will lead to new insights of knowledge for firms that have little experience of creating and developing new products. All these characteristics of this research study align with Robson (1993), thus providing justification for exploratory research.

Furthermore, Eisenhardt (1989) extends the argument and refers to the case study as one that “*focuses on understanding the dynamics present within a single setting.*” Specifically, the researcher’s interest in case study based research aligns with Yin (1994), who describes a case study as “*an empirical inquiry that investigates a contemporary phenomenon within its real-life context*”, as far as using the case study as a “*research strategy comprises an all encompassing method – with the logic of design incorporating specific approaches to data collection and to data analysis*” (Yin, 1994). Importantly, using a case study strategy allows the research the opportunity to “*explore those situations in which the interventions being evaluated have no clear, single set of outcomes*” (Yin, 1994). The rationale for a case study approach is that its “*unique strength is its ability to deal with a full variety of evidence – documents, artefacts, interviews, and observations*” (Yin 1994). Within research there is often debate regarding the trade-off between rich, deep data which involves fewer cases, compared with data that is broader in nature, and which



contains larger number of cases. As this is an exploratory study, more than one case has been decided on, as the use of a multiple case study approach is proposed as it allows for a greater depth of understanding to be achieved.

Purpose	Key Characteristics
<b>Exploratory</b>	<ul style="list-style-type: none"> <li>• To find out what is happening</li> <li>• To seek new insights</li> <li>• To ask questions</li> <li>• To assess phenomena in a new light</li> <li>• Usually, but not necessarily qualitative</li> </ul>
<b>Descriptive</b>	<ul style="list-style-type: none"> <li>• To portray an accurate profile of persons, events or situations</li> <li>• Requires extensive previous knowledge of the situation etc. to be researched or described, so that you know the particular aspects on which to gather information.</li> <li>• May be qualitative and/or quantitative</li> </ul>
<b>Explanatory</b>	<ul style="list-style-type: none"> <li>• Seeks an explanation of a situation or problem, usually in the form of causal relationships</li> <li>• May be qualitative and/or quantitative</li> </ul>

*Table 3-4 The purpose of research – to explore, to describe, to explain  
(Robson, 1993:42)*

Eisenhardt's (1989) and Yin's (1994) seminal work offers guidelines for using case study based strategies, advice on data collection and analysis, and guidance for knowledge and theory building using such methods. Moreover, Eisenhardt's (1989) work proposes a nine stage process (Figure 3-1) that provides a structure in which a case study strategy can be employed for conceptual framework construction and theory building.

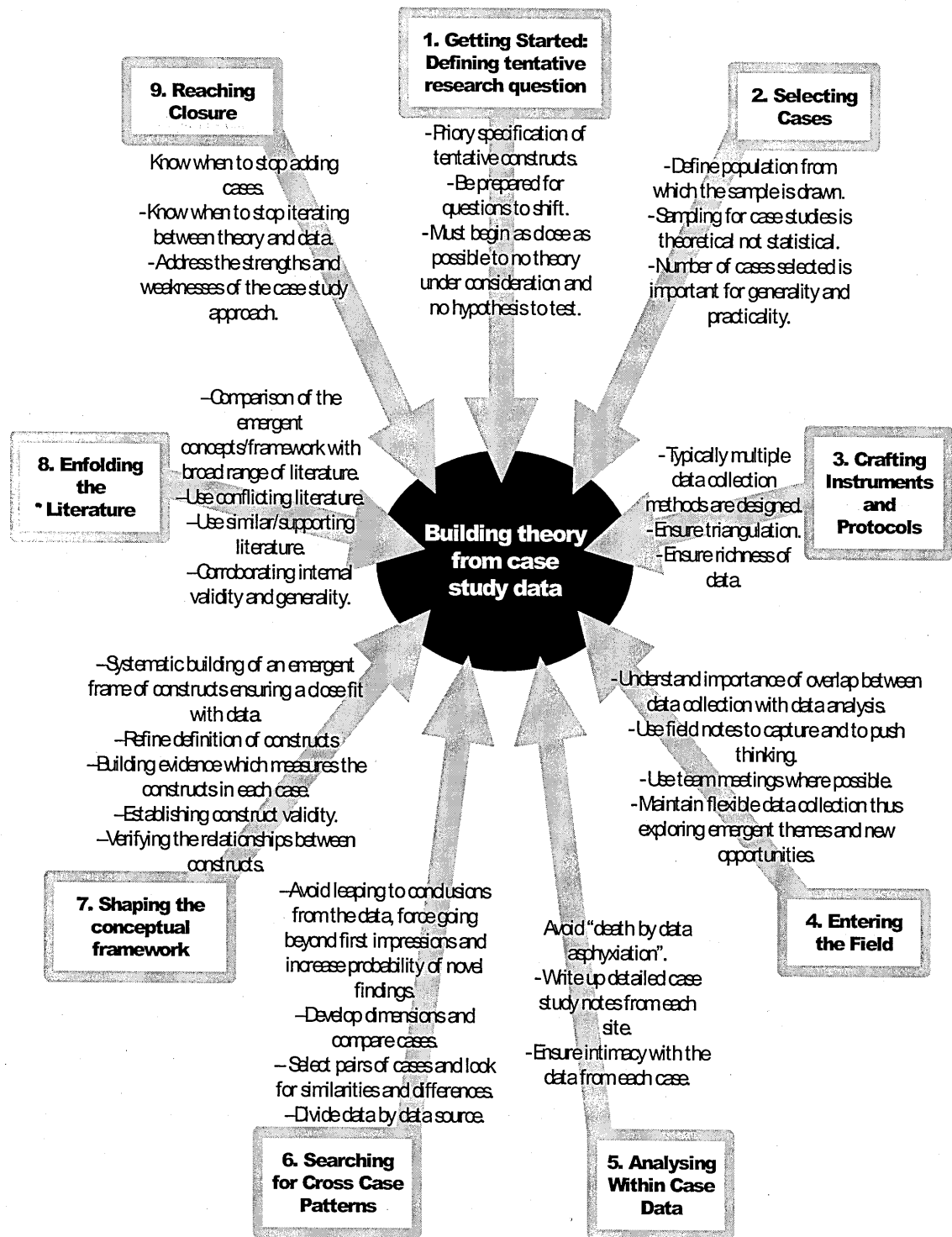


Figure 3-1 Eisenhardt's (1989) Building theory, (Thomond, 2004)

### 3.4 RESEARCH METHODS

Part of the case study design considers the sources of the data that is most appropriate to answer the research questions:

1. To understand the specific strategies that manufacturing SMEs utilised that enabled the firms to create a NPD capability.
2. To identify the key enablers that aided the firms in the process of creating the capability to develop new products.

Yin (1994) argues that it is not advisable to restrict the case study to one individual source of evidence. Rather, a major strength of the case study “*is the opportunity to use many different sources of evidence.*” The six main sources, according to Yin (1994), are documents, archival records, interviews, direct observations, participant-observation and physical artefacts. The benefit is that multiple sources of evidence allow the researcher to address a broader range of issues. Thus a triangulation of methods was planned.

#### 3.4.1 Unstructured and semi-structured interviews

In the first instance, a meeting was arranged with the case study company. This in a sense was an unstructured interview that was recorded, as important contextual information about the firm’s history and journey to create a NPD capability were discussed. The visits also allowed the researcher the opportunity to observe the firm in some detail, through a tour of their facilities. This first visit to the firm usually lasted half a day to a day. The knowledge gained from these first meetings was invaluable as it allowed the researcher to become familiar with the firm and their operation. This allowed the researcher to gain an understanding of any key phrases or terminology. As a result of this meeting the researcher had to spend less time in the semi-structured interviews learning key points, and time could be spent exploring new issues and confirming raised here and in other interviews. Rather than seeking to understand the business context. The interviews were conducted with key personnel identified by the case study champion and other interviewees. The interviews ranged from one to two hours and were loosely structured around the NPD determinants

identified in the literature review in Chapter Two (Table 2-3), as well as providing an insight into the strategies that the case studies were utilising to aid the creation of a NPD capability.

The rationale for using interviews was the acknowledgement of the flexibility and adaptability of finding things out (Robson, 2002). When the person being interviewed is asked to propose their own insights, then the role may be considered to be one of an “informant” rather than a respondent (Yin, 1994). The advantages of face-to-face interviews as carried out in this study include the possibility of modifying one’s line of enquiry, following up interesting responses, and investigating underlying motives in a way that postal and other self-administered questionnaires cannot (Robson, 2002). However, there are disadvantages to using interviews, which stem from the lack of standardisation, and which inevitably raise concerns about reliability, with biases difficult to rule out (Robson, 2002).

#### **3.4.2 Observation through factory visits**

Direct observations were incorporated into the case study by touring the firms’ facilities. The benefits of direct observations are summarised by Yin (1994) as being the ability to identify relevant behaviours or environmental conditions. Whilst this was not the main source of data it did provide additional information about the way that the firm approached new product development, as well as providing a useful context to how the firm operated as a business.

#### **3.4.3 Company literature**

A further method that was employed within the case studies was the use of company literature which included company newsletters, web material and product information. This information provides details of how the firms portray themselves to the external world, as well as internally. Yin (1994) warns about the usefulness of this type of documentation, mainly due to the lack of accuracy and bias. However, he does point out that they are good sources with which to “*corroborate and augment evidence from other sources*” and thus, they play an explicit role in any data collection in case studies.

### 3.5 OPERATIONALISATION OF THE RESEARCH DESIGN

The research design “*is the science (and art) of planning procedures for conducting studies so as to get the most valid findings*” (Vogt, 1993). The purpose of determining the research design provides a detailed plan which guides and focuses the researcher. This section determines how the research design will be operationalised; covering how the cases will be selected, how the interviews will be dealt with and the data recorded after they have been conducted, how the data analysis and interpretation will be conducted, whilst acknowledging issues such as validity and reliability.

#### 3.5.1 Case study selection

To ensure the validity of the findings, the selection of the case studies was a central decision to this research. Through the researcher’s employment at Cranfield University, contact had been established with MAS-East, a government sponsored organisation that offered advice to manufacturing firms on how to improve their operations through such practices ‘lean manufacturing’. Therefore, through their daily activities MAS-East came into contact with manufacturing firms, placing them in a prime position to identify potential case studies for this research. Through a conversation with one of their consultants, it was apparent that there was an interest in this research topic and their services were enlisted in helping to identify case studies. Without the help of MAS-East identifying relevant case studies would have been a much harder proposition, in addition the backing of MAS-East gave the research credibility in the eyes of the managers, making it easier to gain access.

To make certain that the case studies were identified a meeting between two MAS-East consultants and the researcher was conducted to brief them on the objectives of this research and the criteria for the case studies (see Table 3-5). This allowed the consultants to identify companies that they had dealt with in the past or new companies that they came into contact with. Through using the services of MAS-East this research used a purpose sample, being aware of the bias that they had used the services of MAS-East and were willing to undertake aid and advice from an external source. Although this allowed the researcher to gain access to companies that were undertaking such an initiative as moving up the value chain – which could otherwise have been a much more difficult proposition.

It is important to note at this stage that not all the firms that were identified were actually used in this research study. Two case studies that had been completed as part of the research but the decision was taken not to include these case studies, as the research developed and became more focused it was evident that these case studies were no longer appropriate. One of the case studies was using NPD to survive and move up the value chain – but they were a design consultant that chose to develop a manufacturing capability. Therefore they were not appropriate. The other case study that was not used was part of a large multinational organisation, whilst it would have been possible to argue that SBU (Strategic Business Unit) was an SME they were not a truly self-autonomous group therefore were not included.

Ultimately, the justification for a firm being considered and included in this research was based on the recognition that as an organisation they were actively attempting to change, and to create a NPD capability. From the firms that were identified by MAS-East, only the firms that had little involvement or no involvement with developing new products were selected as case studies. Furthermore, the firms had to fit the criteria of being classified as an SME, with accordance to the DTI's definition, which is that the firm employs fewer than 250 people, or that their turnover is less than £22.8 million (see Table 3-5).

- SME (DTI definition);
  - A turnover of not more than £22.8 million
  - A balance sheet total of not more than £11.4 million
  - Not more than 250 employees
- Manufacturer – has traditionally been a subcontractor, manufacturing products to other people's design
- Little or no previous experience of developing new products
- Struggling to survive or compete purely on manufacturing due to low-cost competition from abroad
- Currently, the company feels that in order to survive they have to attempt or have had to implement a strategy of new product development (NPD) – which they are starting to implement in order to develop a new dynamic capability

*Table 3-5 Case study criteria*

### 3.5.2 Case study interviews

The interviews were conducted on the firms' premises, usually in a dedicated interview room to provide privacy for the interviews to take place. The exception to this was Hall Stage, where the researcher visited people at their individual desks or offices. All the interviews were recorded on a digital recorder, which allowed easy storage and playback of the interviews. This section intends to present a summary (Table 3-6) of the interviews that were conducted for this study, allowing the reader to understand the number of interviews that were conducted, in addition to some of the characteristics of the firms involved in this study.

Company name	Size of company (Number of people)	No of people interviewed
Hall Stage	18	5
MRP	200	3
Magnet Application	26	6
Perseverance Mills	230	6

*Table 3-6 Summary of the interviews used within this study*

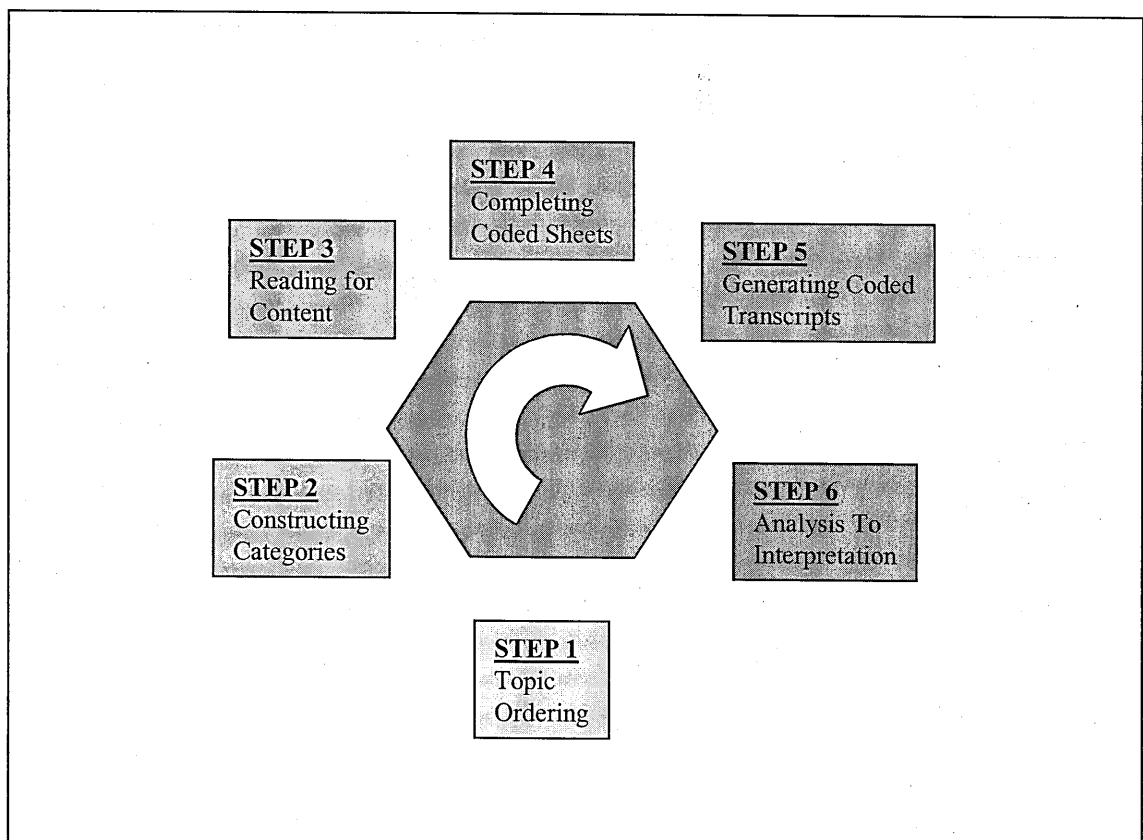
### 3.5.3 Interview transcription

All the interviews were taped and then fully transcribed by the researcher, the rationale being that this aided closeness to the data. Such closeness would have been harder to replicate had the skills of a professional transcriber been sought. During the process of the interview files being transcribed, the researcher had a Microsoft Word file open at the same time. This allowed for interpretation and points of understanding to be captured whilst being immersed in the words from the interview.

### 3.5.4 Data analysis and interpretation

In order to analyse the interview transcripts the case studies were analysed and interpreted using Radnor's (2002) six-stage technique, ensuring logical coding of data and marshalling of evidence, and avoiding the dangers of inaccuracy which might have arisen from an over-mechanistic approach. However, once the data was coded, the approach sought to maximise the degree and speed with which the data could be

analysed and reanalysed through the use of an integrated suite of Windows Office computer software and all the benefits this can bring to the data interpretation process. Working from a copy of a taped transcript as the database, Radnor (2002) advocates a six-step approach to data analysis, as summarised in Figure 3-2. Radnor's (2002) data analysis model was designed for researchers who needed to combine subtle coding enabling qualitative data linking, shaping and searching. Through using this method of analysis of qualitative data a level of sensitivity to detail and context was enabled, as well as accurate access to information. This method of analysis and interpretation enabled rigorous searching for patterns, building of theories or explanations and grounding them in data, displaying models and producing convincing reports. It is worth noting that this method shares similarities with more mainstream methods of analysis such as Nudist and Nvivo, but the researcher felt more comfortable with the flexibility that Radnor's model offered.



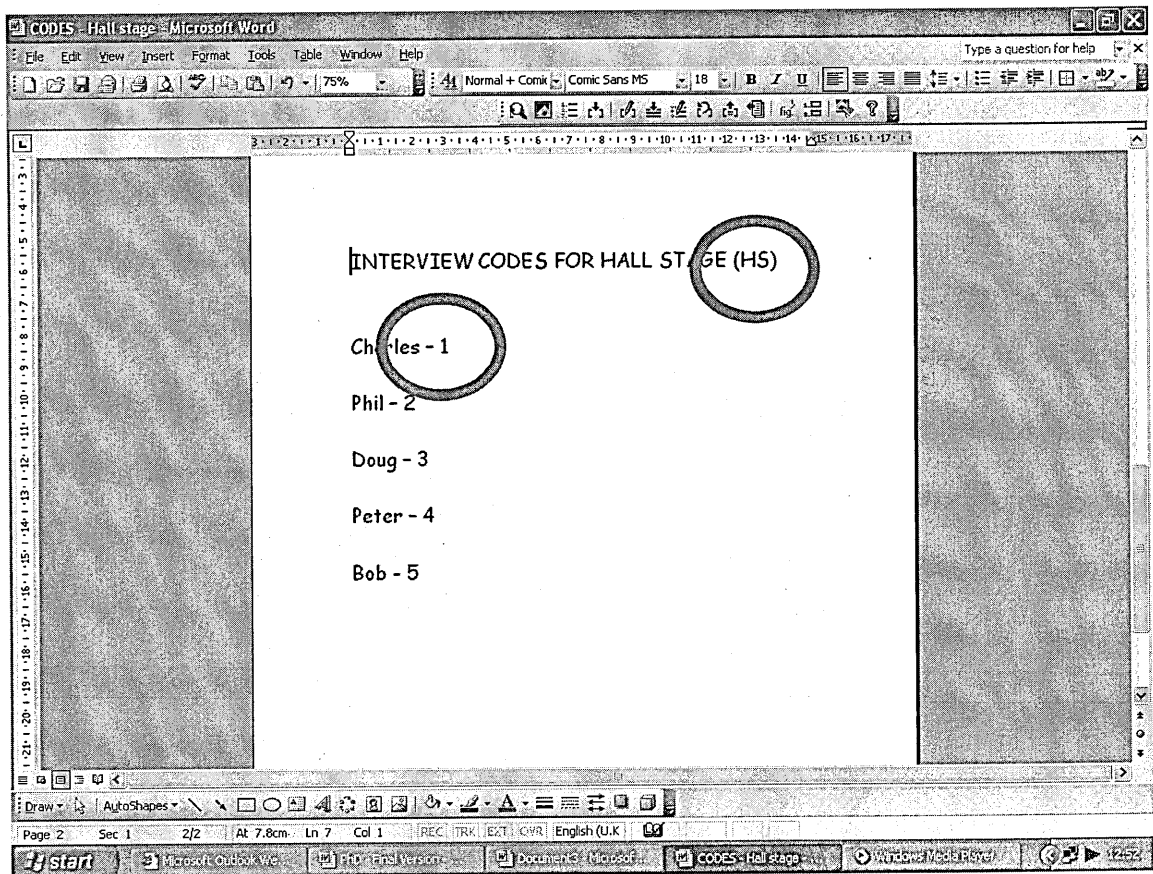
*Figure 3-2 Coding and classification (Radnor 2003)*



The following section will explain in detail the process that the researcher followed to code, classify and interpret the data (illustrated in Figure 3-2), to ensure that the method would be transparent and clear to the reader.

### 1) Code each interview

Each interview transcript was given its own unique code which was derived from the company code, e.g. Hall Stage was coded as HS. Then each interview transcript within the case study was given a number relating to the person interviewed e.g. Charles – 1, Pete – 2 ... Each interview transcript was kept as a separate document; a master copy was always kept, and this remained untouched. A master document recording the codes for each case study was kept, and is represented in Figure 3-3.



*Figure 3-3 Illustration of the master document for each case study*

### 2) Read each interview

This stage is extremely important to familiarise oneself with the interview data. As previously stated, the transcription of the interviews was beneficial in allowing the

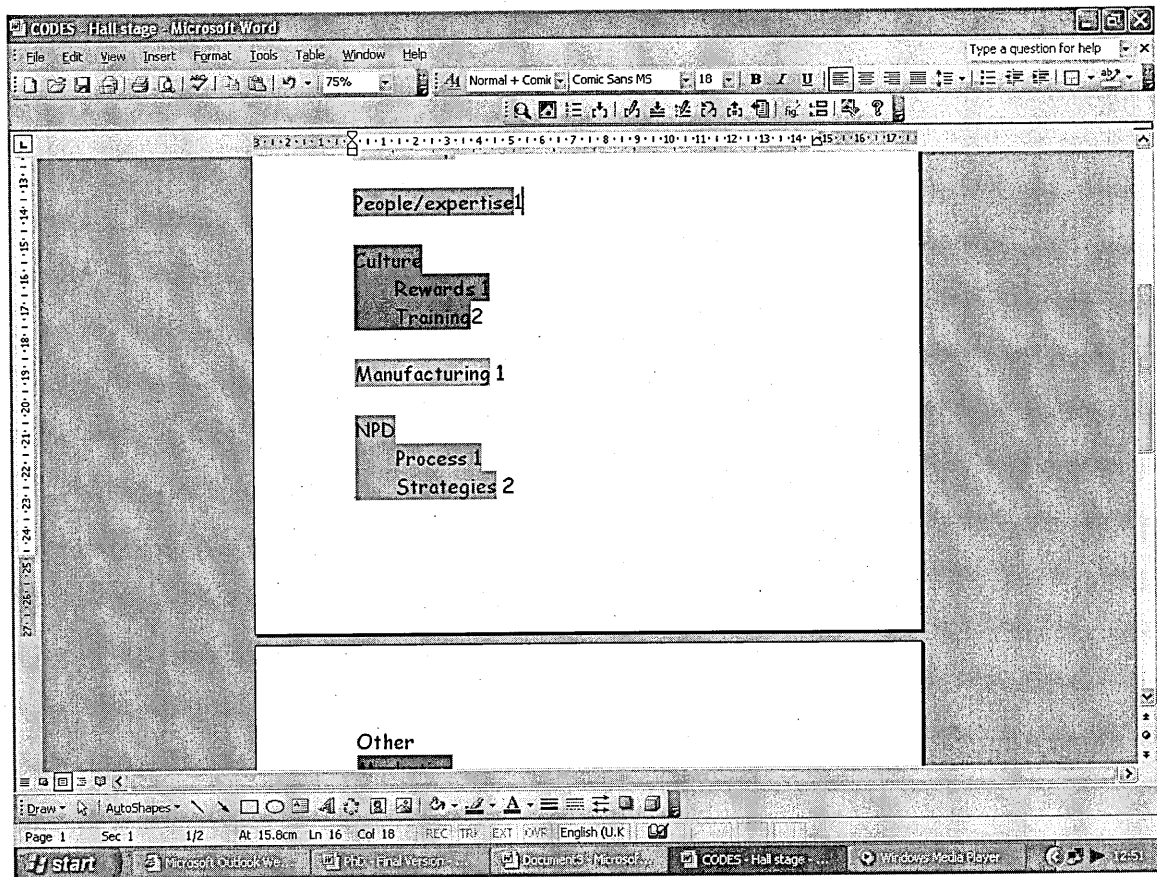
researcher to become acquainted with the data, and also allowed the researcher to go over notes which recorded any observations that the digital recorder could not capture. This could relate to company material to verify dates, or simply the actions and facial movements of an interviewee that helped to emphasize any key points that were made.

### 3) Topics and categories

The time that was taken to read the transcripts allowed the researcher to develop what is referred to as 'topics', which include 'categories'. When reading the interviews, notes were made on the different topics and categories as they were identified, as well as annotating the individual interview transcripts. After reading all the interviews it was then possible to identify the reoccurring topics and categories that were evident from the interview transcript.

Each topic required a code to aid easy identification; for example New Product Development was given a code of (NPD), and for easier identification each topic was assigned a colour, for example structure was assigned green (NPD). This was either done on the paper version of the interview transcript or using the highlight function in Microsoft Word. A record of the codes and colours was kept in a master document (see Figure 3-4 for an illustration).

Each category was then assigned a number, such as current capability (1), process (2). Again, this was so that each category could be easily identified (an illustration is shown in Figure 3-4).



*Figure 3-4 Illustration of how topics and categories were made easy to identify*

#### 4) Coding the transcripts

On a printed copy of the transcript, the code was placed at the top of the interview transcript, for example HS1 (referring to Hall Stage and Charles). When a piece of text was identified to be relevant to a topic and category, it was coded accordingly. using the topic e.g. NPD (topic code) 2 (process). This piece of text was also highlighted in the relevant colour to aid easy identification when reading through the transcripts. As NPD2 could be mentioned more than once in the same interview it was necessary to identify each piece of text separately. This was done by each coded topic and category being given its separate identification mark using a, b, c ... So a piece of text could be coded as NPD2a, NPD2b and so on, as illustrated in Figure 3-5.

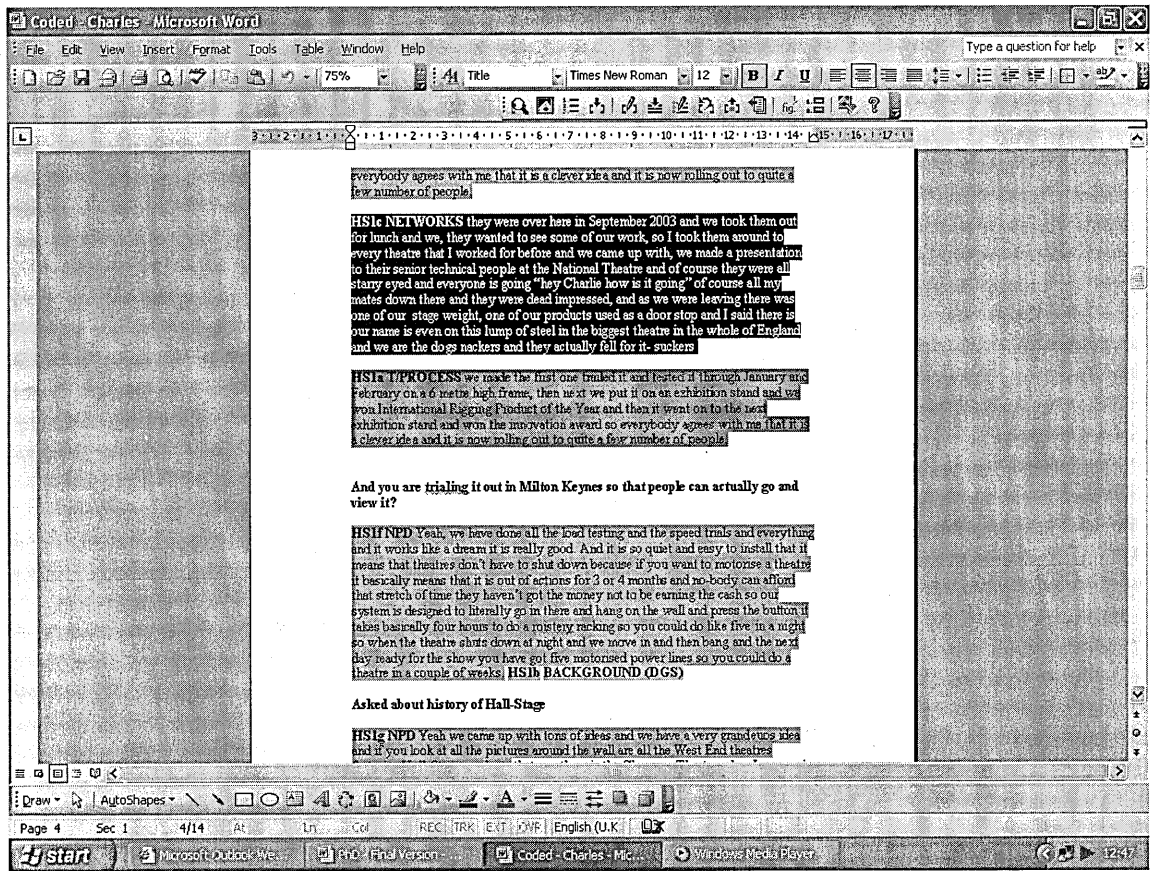


Figure 3-5 Illustration of coded scripts

## 5) Post coding

It was essential that all the data relating to a specific case study and topic could be easily found. Therefore a separate document was created for each topic, incorporating the categories within the topic. Within this document a table was used to collate all the quotes from all the interviews in a case study that related to a topic and the relevant categories (see Figure 3-6). Once the tables had been created it was then possible to copy and paste the data relating to each of the topics and categories into the relevant table, as indicated in Figure 3-6. To aid transparency of the data analysis at the beginning of each of the quotes the interviewee code, e.g. BP3, was entered, which allowed the researcher to identify where the text came from, should there be a need to go back to the original source.

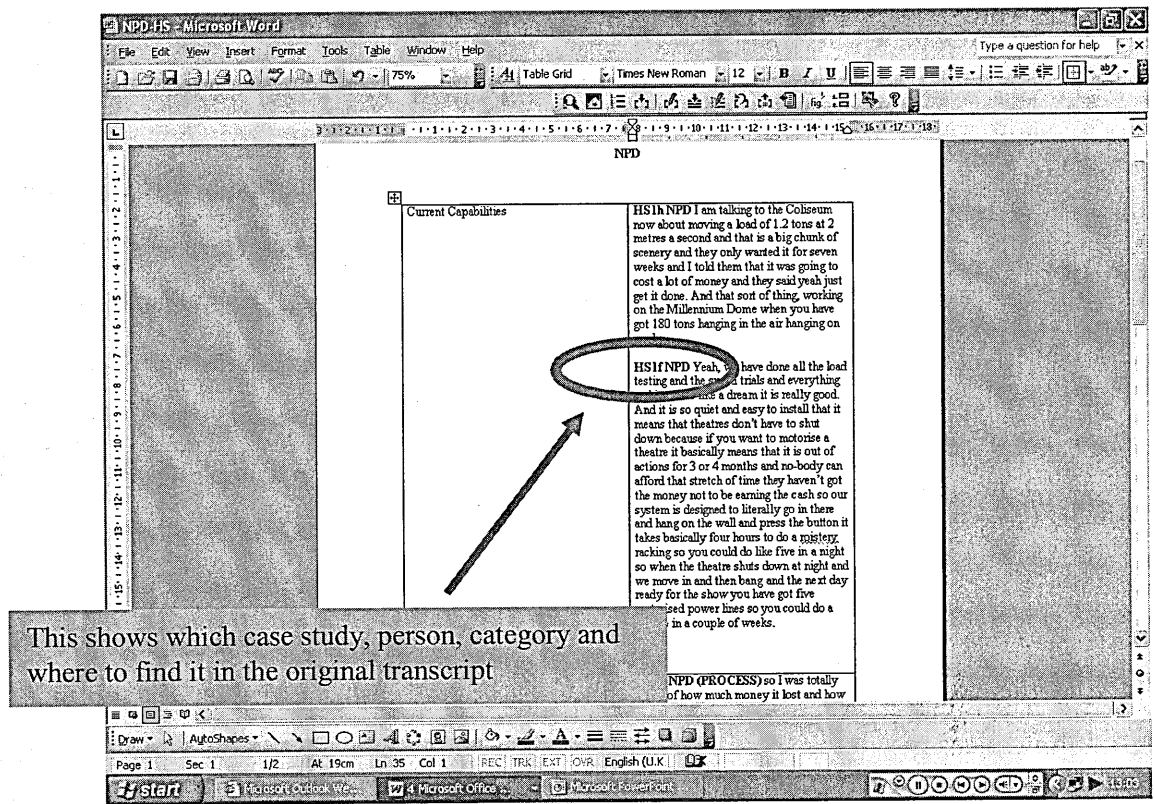


Figure 3-6 Illustration of summary table

## 6) Interpretation

At this stage it was necessary to interpret the data. This was done through sorting and amalgamating the quotes in the summary tables for each topic. This enabled the researcher to collate all the quotes that related to similar events or issues. Once all the quotes were collated it was possible to draw together and interpret the findings. Some of the quotes were used to summarise and justify the findings, as well as bringing the case study 'alive' through the words of the interviewees themselves.

## 7) Final report

As part of the validation process a final company report was produced and presented to each of the case studies. This was very useful for the interpretation process, as not only did it validate the findings and allow the researcher to have confidence in them, but also it provided a further discussion with the people from the case firms regarding the interpretation, which was most beneficial.

### **3.5.5 Validation and reliability**

The final stage of the case study process was to validate and interpret the results with the individual organisations. Validity is concerned with the extent to which the research findings accurately represent what is happening in the situation (Hussey and Hussey, 1997); in other words, whether it is a true picture of what is being studied from the data that has been collected. This was done by presenting the organisation with a company report, supplemented by a company presentation. This offered the organisation the time to refute or acknowledge the case study findings, and further, it allowed a confidence in the research findings that could otherwise be lacking. Further elements of validity were incorporated into the case studies through the research design itself. Through the triangulation of data methods (incorporating multiple sources of data collection) it was possible to develop “*converging lines of inquiry*” (Yin 1994). Part of the rationale for triangulating methods is that it helps to address ‘construct validity’ because the multiple sources of evidence essentially provide multiple measures of the same phenomenon (Yin 1994).

	Viewpoint		
	Positivist	Relativist	Constructionist
Validity	Do the measures correspond closely to reality?	Have a sufficient number of perspectives been included?	Does the study clearly gain access to the experiences of those in the research setting
Reliability	Will the measures yield the same results on other occasions?	Will similar observations be reached by other observers?	Is there transparency in how sense was made from the raw data?
Generalisability	To what extent does the study confirm or contradict existing findings in the same field?	What is the probability that patterns observed in the sample will be repeated in the general population?	Do the concepts and constructs derived from this study have any relevance to other settings?

*Table 3-7 Perspectives on validity, reliability and generalisability  
(Hussey and Hussey, 1997)*

The issue of reliability differs depending on which philosophical standpoint the researcher takes, *“positivist notions of reliability assume an underlying universe where inquiry could, quite logically be replicated. This assumption of an unchanging world is in direct contrast to the qualitative/interpretive assumption that the social world is always changing and the concept of replication is itself problematic”* (Johnson and Duberley, 2000). There has been reluctance to apply ideas of validity and reliability to interpretive research, possibly implying acceptance of one absolute (positivist) reality (Easterby-Smith et al., 2002). However as these qualitative methods becoming increasingly mainstream, there is a growing realisation of their importance, especially as there is the need to convince others that the results should be taken seriously. Therefore reliability here is not measured in terms of its replicability, but rather on whether the process of interpretation is transparent to others, can be understood, and whether the same process conducted on similar data would lead to the same results. Silverman (2000) suggests several principles to defend against ‘anecdotalism’, which this research attempted to apply.

- Constant comparison – follows the principles of grounded theory in looking for new cases and settings, which will stretch the current theory.
- Comprehensive data treatment – involves carrying out an initial analysis of all the data available before coming up with conclusions
- Tabulations – imply greater rigour in organising data, and accepting that it can be also be useful to add up the occurrence of phenomena sometimes.

*Figure 3-7 Silverman's (2000) principles used to defend against 'anecdotalism'*

### **3.6 SUMMARY**

This chapter has provided an overview of the research design that was used to guide and operationalise this research. By examining the philosophies available to researchers it was determined that this research would be guided through a phenomenological paradigm; specifically, that of interpretivism. It was the notion of the researcher being unable to disassociate from their own personal attitudes and perceptions, rather than being able to separate from their own attitudes and perceptions that drove this researcher to follow in this paradigm. It was the desire to allow the rich context of the phenomenon to be studied and interpreted which resulted in the adoption of qualitative methods, which took into account the exploratory nature of this research. Despite the exploratory approach taken with this research, the issue of validity and rigour were still important, and thus a systematic method of analysing and interpreting the data was employed.



## CHAPTER FOUR – HALL STAGE

*This chapter presents the findings from the first case study in this research, Hall Stage. A summary of the background of the theatre industry and history of the firm is provided to place the case study into context. Further detail is provided of the people interviewed, as well as the past experience of new product development within Hall Stage. The case findings are presented, highlighting the key constructs and sub-constructs. The chapter concludes with a summary table of the key findings.*

### 4.1 INTRODUCTION

This research was introduced to Hall Stage by John Christopher from MAS-East (Manufacturing Advisory Service East). After a series of emails and telephone conversations to establish Hall Stage's validity as a case study and to explain the research topic, a meeting was arranged. The first meeting was conducted with the Technical Director, where the history of Hall Stage was discussed, in addition to how Hall Stage was beginning to creating a new product development capability. The meeting concluded with a detailed tour of Hall Stage's facilities. From the meeting it was possible to identify the relevant people to be interviewed, which took place over two days (see Table 4-1).

<b>Interviewee</b>	<b>Position</b>
Charles	Managing Director
Phil	Technical Director
Pete	Engineer
Doug	Technician
Bob	Manufacturing Supervisor

*Table 4-1 People interviewed at Hall Stage*

## 4.2 BACKGROUND TO THE THEATRE INDUSTRY

The theatre industry is one that by its very nature has become ever more demanding, with audience expectations constantly increasing, thus creating demands on the technical abilities of those involved in piecing together productions. The inherent safety and precision involved in putting on productions is becoming increasingly important, especially *“where you have millimetre precision between scenery that weighs 8 – 12 tons and something else coming out of the roof that weighs another 2 tons being pulled by blokes on bits of rope.”* The challenges facing theatres extend further to include special effects capable of ‘wowing’ audiences, such as those found in the latest hit production to appear in London’s West End. *“Mary Poppins comes flying over the audience and nobody can see any wires now the wires are obviously there but the skill is how you make it”*, illustrating one of the many challenges facing the industry.

The nature of the theatre industry is regarded as unique. The knowledge and experience of the people at Hall Stage who had worked in the industry proved invaluable in understanding the requirements of the theatre world. *“If somebody comes up to me and says Charlie (Managing Director) I need this in a hurry and it needs to be on time, the show is in whenever or we have a film production that kicks off on this date therefore your stuff needs to be in for this date, I will make a commitment when I say yes we can do that.”*

It is this dedication and understanding of their customers’ requirements that has helped Hall Stage to become recognised within the theatre industry as a company *“that (Hall Stage) can do that sort of thing.”* This empathetic approach to its customers is the cause of their turning fortunes, as Hall Stage’s customers were using their services because they were not simply *“going to sell them something but because we come from the industry we have had the late nights, we have had the problems with the kit we know what it is like, we are going to help them sort them out and they will come back to us.”* The key was in recognising that the theatre industry was essentially a niche market requiring specific products to solve individual problems.

### 4.3 BACKGROUND TO HALL STAGE

Hall Stage was formed over a hundred years ago in 1895 and was the first company to start engineering and manufacturing for the theatre industry in the UK (a timeline of events is illustrated in Figure 4-1). In the beginning, Hall Stage developed a position where its reputation stretched worldwide, with business in Hong Kong, Sydney, Kuwait, becoming the world leader in theatre products. Today it is estimated that 95 per cent of theatres have used Hall Stage products at some time. Hall Stage boasts a product range that includes anything on the stage that involves stage machinery, such as counter-weight systems (systems used for moving scenery) stage weights, scenery braces and pulleys. In the early 1970s Hall Stage became involved in two large projects *“which went badly wrong and it (Hall Stage) lost money on that ... it (Hall Stage) went bankrupt in the 70s and then again in the early 80s.”* By the late 1980s, Hall Stage’s ownership passed to Harkness, and it became known as Harkness-Hall. Harkness were in the business of manufacturing the large cinema screens found in multiplex cinemas, and it took advantage of the high growth period around the late 1980s. The rationale for Harkness purchasing Hall Stage was for its manufacturing capabilities, and particularly the welding and painting facilities, which were used to manufacture the cinema screens in-house. Consequently, Harkness were not interested in the stage side of the business, and it was left to run down; a position that was considered by many in Hall Stage to be a mistake. *“The competition was really low level and really small. As we drifted from that market competitors came up and now there are really two or three competitors for us in this country and our influence world-wide dropped considerably. We still had some sales abroad but not very many, and it was really in decline in 1999.”*

It became apparent to the then Director of Stage and Audio Visual, Charles (now Managing Director as a consequence of a management-buyout) who joined Harkness Hall in 2000, that Harkness had neglected Hall Stage. *“It became clear that they had no real interest in Stage and Charles came from that background, a theatre background ... Charles thought it was a good idea to see if they would sell the company and approached me (Phil, Technical Director) to see whether I would get involved and we put in an offer and brought the company on March 31<sup>st</sup> 2003. With the company we got 19 staff and all the products that Hall Stage currently do, and*

*fairly antiquated machinery in terms of laths and mills and drills but a number of skilled employees.*” Whilst the image of Hall Stage remained positive due to its long standing reputation, there had been years of complacency, *“reluctantly dealing with the client base”*, with little thought for innovation and new products. The current management of Hall Stage, who initiated the MBO, could appreciate the fact that Hall Stage had been a market leader, and that there was *“the capacity to be a market leader again”* with the introduction of *“some innovation and some push, some investment.”* The most important objective was to regain peoples’ confidence that the company was not dying, and to emerge again from the shadows.

The change in management also brought with it a change in focus, which now centred on being *“product driven”*, pushing forward the concept of developing new products. With new management came a new location, which brought large changes for Hall Stage. The result was that the factory was no longer spread over *“four or five different units, which meant that if you were trying to manufacture an item you would go from one building to cut it, another building to spray it and another to pack it. It was a big site and you could spend literally 20 minutes to half an hour simply moving the product around the site.”* The changes radically simplified and improved efficiency of manufacturing. Further changes were witnessed, and under the current owners the management of the factory was altered by *“trying to get a lot of the waste out of the system.”* However, it was felt that this could be pushed further, especially where tolerances on the older products had slipped. One view was that the focus should be on the older products before introducing new products into the market.

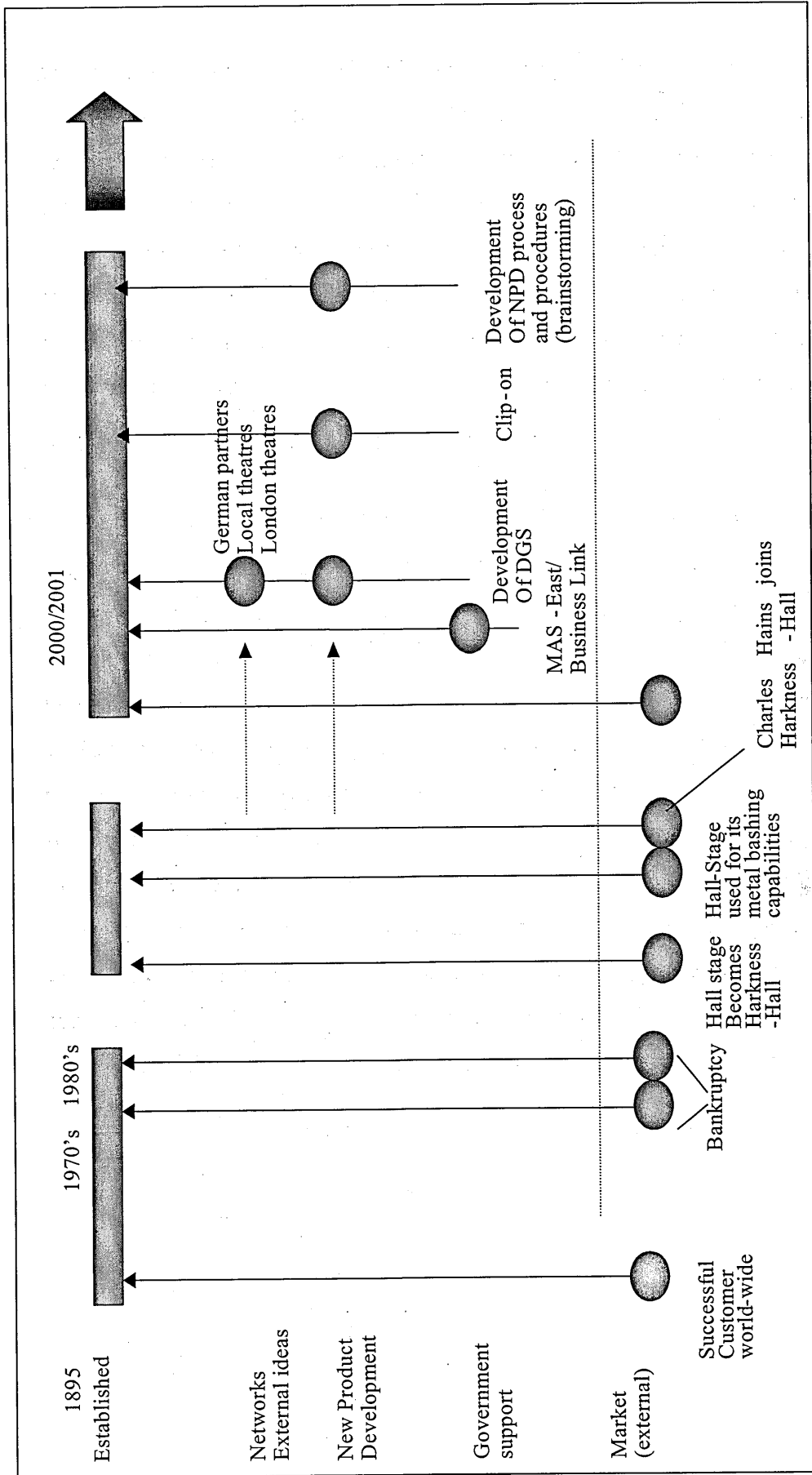


Figure 4-1 Timeline for Hall Stage

## 4.4 NEW PRODUCTS

Since the management buy-out Hall Stage had taken two new products to market, winning three innovation awards in their industry with DGS and HoldOn. DGS was a motorised counterweight system with the potential to modernise the industry through improving health and safety issues and reducing costs. The second product launched by Hall Stage, 'HoldOn', was a product already manufactured but not previously sold in the theatre industry. Its introduction and application to the theatre industry was very successful, winning Hall Stage an award for innovation.

### 4.4.1 DGS

The development of Hall Stage's first product was created through an understanding of the problems encountered in the industry with regard to the counter-weight systems found in theatres. It was through working in the industry that the initial idea for the product now known as 'DGS' was sparked (a timeline of DGS development is illustrated in Figure 4-2). *"I (Managing Director) was totally aware of how much money it lost (through people being off work through injury) and how pain it was and the whole thing was a pain (for the people who had to run the system), so it went round and round and round and basically came to twelve years ago I started thinking about a motor of some magic kind that you could attach to a counter-weight frame and press a button and have the motor do the work."* The total development time of DGS took several years before it reached the prototype stage. *"It was a complete pipedream ... DGS was like a piece of grit in an oyster where you say this is an idea that if you keep pushing away at it, pushing, and pushing and pushing away at it will be something worth having."*

DGS was finally launched in May 2005. The system was the result of an alliance between Hall Stage and ASM Steuerungstechnik GmbH, using the technology of ASM in Hall Stage's application. The two parties met at the Theatre Engineering and Architecture Conference, which saw ASM presenting their steel band carrier system. *"I knew right then that it provided the only workable solution to our counterweight drive idea."* During February 2005 two DGS systems were fitted in Milton Keynes theatre, primarily as a test bed and demo area giving potential customers the

opportunity “to play with them there.” Examples of DGS in place at Milton Keynes theatre is illustrated in Figure 4 –3.

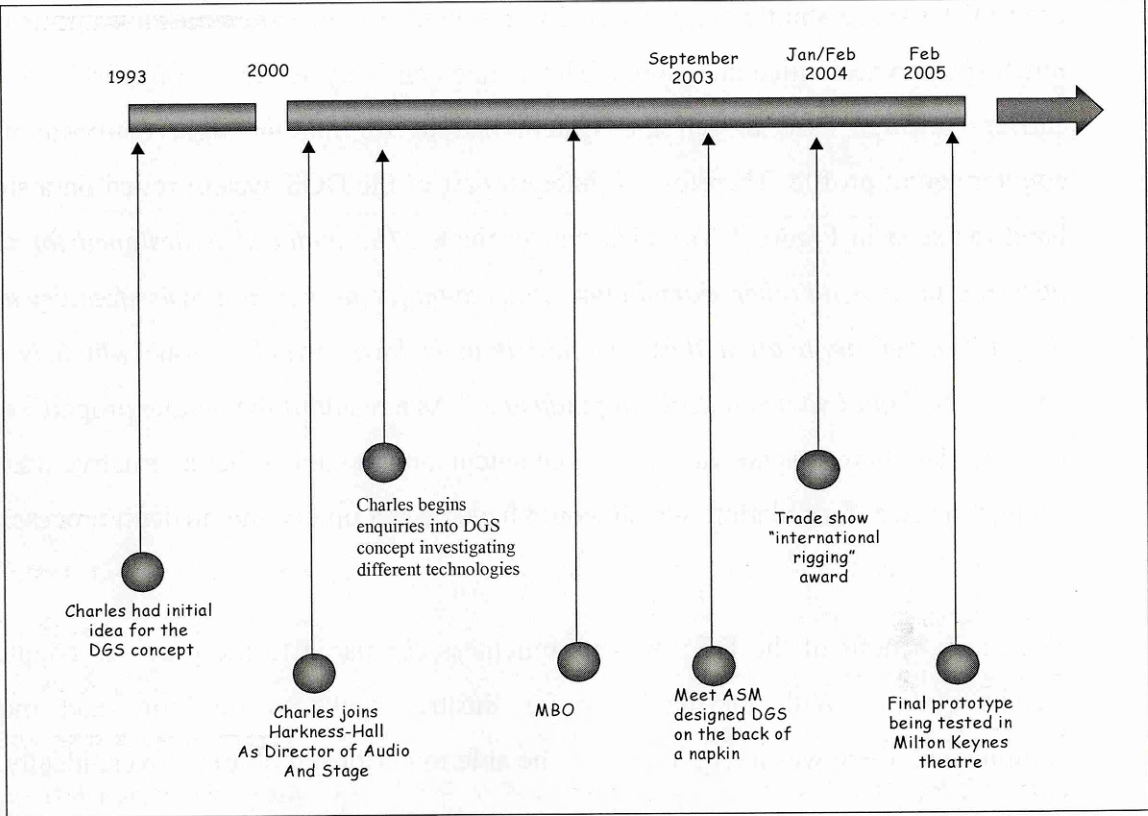


Figure 4-2 Timeline for DGS

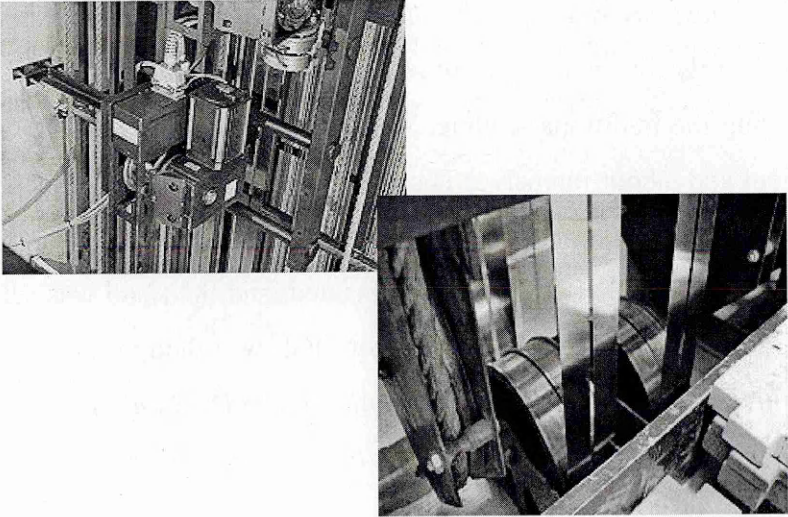


Figure 4-3 Illustrations of DGS installed at Milton Keynes Theatre

During the development of DGS, Hall Stage looked at various systems that could have acted as a carrier, such as steel cables, fibrous ropes, and even Kevlar straps, as used in the space shuttle cargo bays. The problem was that they all took up far too much space when coiled and stored. This created an issue as the motor/gearbox drive carrier cartridge used to run the system had to fit into the tight confines of a counterweight profile. Therefore an integral part of the DGS system relied on a steel band (as seen in Figure 4-3) which was critical. *“The material is designed for this purpose; there is no other manufacturer, this manufacturer is in a Swiss foundry and the only other application that you find it in is Swiss watches now, which is all completely digital so it is a declining industry.”* As a result of the unique properties of the material, there was no way around the patent, and the only other alternative was to change the steel formulation, which would have been a timely and difficult process.

The main benefit of the DGS was its quietness compared to the previous counterweight system. With the tendency for theatre shows to be more and more complicated, there was a requirement to be able to perform multiple moves, ideally at the press of a button; a capability DGS could offer. In addition the system *“is easy to install, that means that theatres don’t have to shut down ... so you could do five (lines) in a night so when the theatre shuts down at night, we move in and then – bang! - and the next day ready for the show you have got five motorised power lines so you could do a theatre in a couple of weeks.”* Furthermore, there were a number of issues with using the traditional counter-weight systems, including the fact that they were inefficient and labour intensive. The health and safety issues associated with the traditional counterweight systems had the potential to create a new market for DGS, as in Holland these older systems had been banned, and the trend was set to continue throughout Europe. The current projection for DGS was thought to be good, as *“we have a lot of friends in the industry that genuinely like DGS and they are people that are at the top end of the industry that ... say ‘look we need this sort of system.’”*



#### 4.4.2 HoldOn

HoldOn was a product that was not originally intended for the theatre industry. Through a chance meeting between a sales representative for the clip now branded as 'HoldOn' and Hall Stage's Managing Director, Charles realised the benefit of such a product for the theatre industry (illustrated in Figure 4-4). The benefit was that *"no longer will theatre technicians have to shred knuckles on rusty wing nuts or get splinters off the beaten up bits of old timber."* It was a product that could be used to hold together pieces of scenery and had a 'median loading capacity' which had been tested under laboratory conditions to hold up to 100kg. As the product was already being manufactured, Hall Stage appreciated the benefits of buying in the product rather manufacturing it themselves, as manufacturing this product would have taken them into a new and complicated manufacturing process of injection moulding. Therefore HoldOn was purchased and then re-marketed under the name of Hall Stage. At the time of the case study this product was already being successfully sold and had won an innovation award.

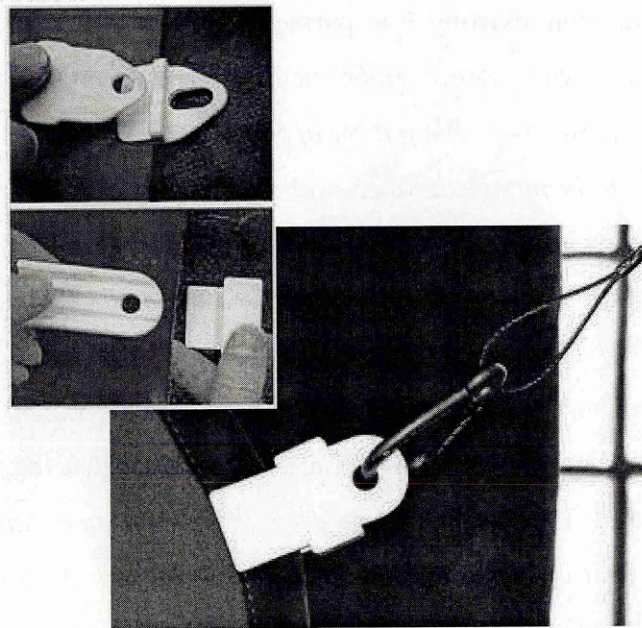


Figure 4-4 Illustration of HoldOn

## 4.5 EXTERNAL

This section examines the external constructs and sub-constructs that emerged from the case study findings. The findings deal with the external networks that Hall Stage utilised to enable them to access resources and skills that were crucial in developing their new products. This external section includes government agents, which refers to organisations such as the Manufacturing Advisory Service (MAS-East) and Business Link. In some cases Hall Stage had sought to leverage information from these government agents to enable them to create a NPD capability.

### 4.5.1 Networks

The development of DGS utilised the technology of German company ASM (highlighted in Section 4.4.1). When Hall Stage first met ASM at a trade show, they were already contractually tied to another distributor, and were therefore unable to do business with Hall Stage. In the meantime ASM were given a recommendation for Hall Stage by *“one of the big players which was brilliant because being a small company that the German’s didn’t know that well.”* As ASM became increasingly disillusioned with their existing UK partner, the next time the two parties met a favourable solution was agreed upon and a three-year contract was signed to distribute ASM’s products. *“We got on like an absolute house on fire and they said that we are going to bring our alliance over to you guys.”* After the alliance had been agreed, Hall Stage’s Managing Director presented the idea of the DGS to ASM’s Technical Director. *“Charles (Managing Director) had the idea that we could use this (ASM’s) steel band system to move counter-weight cradles ...basically Charles thought that if we marry this type of technology with this problem we would come up with a solution.”* It was from this meeting in September that the Managing Director showed ASM the idea of DGS and *“we drew the system on a napkin in ten minutes! ... we made the first one, trialled it, and tested it through January and February.”* Hall Stage were then able to show it off at their exhibition stand, which saw DGS winning International Rigging Product of the Year, then going on to the next exhibition stand and winning the innovation award presented by the Professional Lighting and Sound Association (PLASA).

Whilst ASM had worked with theatres and TV studios, they had never thought of using their motor and steel band together, as in the DGS application. It was the

combination of the two companies joining and working together that enabled the concept of DGS. Furthermore, it was the networks and contacts that the Managing Director had in the theatre industry that proved invaluable, both in gaining the respect and the business of ASM, and in gaining access to their technology. *“They (ASM) wanted to see some of our work, so I took them around to every theatre that I worked for before and we came up with, we made a presentation to their senior technical people at the National Theatre and of course they were all starry eyed and everyone is going ‘hey Charlie how’s it going’ of course all my mates down there and they (ASM) were dead impressed.”*

Throughout the development of DGS, the support of local networks proved immensely helpful in the development and testing stages of DGS. Throughout the testing phase Milton Keynes Theatre provided Hall Stage with its stage as a test bed, *“for the DGS as a system it needs to be tested in theatres, it has been vital that we have had support from people in the industry.”* Furthermore this meant that *“people will get every opportunity to play with them there”* allowing theatre consultants to view the installation of DGS. It was the background of the senior people at Hall Stage in providing these contacts that offered huge benefits through being able to *“phone someone up and say can I borrow your theatre, well it is being used at the moment but it is free next week, so we are in very good turns with a number of theatres.”*

Finally, Hall Stage’s network was not restricted to the theatre industry, and they realised the benefits of dealing with a varied group of people. Strange but useful contacts had been established, which had brought an added dimension to the development of DGS, as well as the personal experiences of people at Hall Stage. One particular instance was when Hall Stage had been investigating the use of a Kevlar system found in space shuttle cargo bays. *“These guys in the California ribbon mills and they put me on to an alchemist I have never worked with an alchemist before ... for me it has been a personal journey and now we are in the privileged position of actually being able to make a difference to the way that the theatre is run and with my background that is phenomenal.”*

#### 4.5.2 Government agents

The value of government organisations such as Business Link were treated with mixed feelings as *“we had to go around the most obtuse of routes, you know there was no clear path laid out, we had to find the secret hidden door to DTI’s small firms loan guarantee and we had to find the right bank who were offering to support us at that level and it took a lot of finding and we went to the Business Link and all those off the shelf support agencies which we found a complete load of duffers until we find the right guy in the right business link office who knew the right bloke in the right bank who knew the right guy in DTI.”* The opinion of the Technical Director differed somewhat from that of the Managing Director who was involved later on in the process with Business Link, and felt that they had been *“very, very good in terms of giving us very basic information in terms of the very early stages of setting up the company ... Business Link gave us a huge amount of information on grants and expertise.”*

The benefits of using the service of these government organisations was acknowledged, as Hall Stage admitted that they were not always experts and relied on *“experts recommended by Business Link in most cases or we go on training courses and we get information; that way they have been very good in terms of the actual ideas and implementation of the ideas.”* It was the advice element that Hall Stage *“appreciated and they have kept our feet on the ground to be perfectly honest.”* As well as Business Link, Hall Stage had used the advice of the Engineers Employees Federation and the Manufacturing Advisory Service in the East (MAS-East) for advice *“but they tend to be on legal and industrial that type of thing.”*

In summary, Hall Stage’s experience of government agents was one that was serendipitous in nature but of course this was felt to be a *“very dangerous word when you are trying to raise this amount of cash and you don’t want that sort of impressionability”* and instead of finding a ‘business angel’, Hall Stage had to revert to buying books from Waterstones because *“I didn’t have a clue how to do it and that’s just the terms. It would be great to say here is the government support; there wasn’t just a web-based click here and do that it required somebody to genuinely tell us what you want to do.”* Later in the process when Hall Stage had started to develop DGS seriously it was felt that there was a point in the development that required

*“nerves” to carry on and to sustain a belief in the product. It was at this stage when, “you look to the government for some support ... you want to go through a series of validation ideas that this isn’t just a pipe dream; here is something that is actually going to work, here is the market for it, here is the potential, and here is the research... now what we have got to do is pay our wages for the next 3 to 6 months.”*

## **4.6 INTERNAL**

This section presents the findings within the internal construct. From the interview data analysed there were six sub-constructs that emerged from the data. The sub-constructs were found to enable Hall Stage in creating a NPD capability.

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

### **4.6.1 Manufacturing**

The history of manufacturing within Hall Stage had been dogged by neglect and problems created by poor layout and facilities. Under the ownership of Harkness, Hall Stage’s manufacturing requirements were second priority. *“With Harkness we were totally under their control; we were on five different sites. You could go missing for days.”* Furthermore, managing a process that was spread over a number of units meant that products would *“jump from process to process and from building to building.”* This was further complicated by the priority levels that were set: *“our job was probably only worth £10,000 whereas theirs (Harkness’s) job was £100,000... they were going through the same workshops so theirs took priority,”* causing delays and disruption to the flow of work for Hall Stage. With the change of ownership and new premises *“it is a lot easier for manufacturing because we are all in one site, it can come in one door, progress up the shop and out the other door,”* meaning that products progress *“from one end of the factory in 20 minutes; I think we are doing about 30 pieces of tracking a day and previously we were only doing about 10.”*

#### 4.6.1.1 Rationale for manufacturing

The rationale for instigating a management buy-out (MBO) was predominantly because of the history and background that accompanied Hall Stage, as its name and reputation were known widely in the industry. More than just a name, it was the link with manufacturing that provided a steady income that formed part of the reason for taking over Hall Stage. It was deemed that *“in its most simplistic form we could have formed our own company and we thought about this long and hard but what we actually bought was the name, and it is worth something. It isn't always good, there are some negatives as well. But it has got a big chunk of the market share, it is still a world leader of supplies of certain types of curtain track in theatres and film studios, and it has that kind of regular income that buying a going concern can give you and it has given us a platform on which we can develop new ideas... there are financial benefits on the back of that.”*

#### 4.6.1.2 Investment in manufacturing

The ability to manufacture its own products offered a source of revenue that would otherwise have been difficult to generate. *“The metal bashing will always form the sort of cash cow ... something that people will always want regularly and form the backbone.”* The continued investment into manufacturing illustrates Hall Stage's understanding of the knowledge and expertise that was inherent in the manufacturing department and the ability of those people to aid in the development of new products (further elaborated in Section 6.4.1.3).

There was recognition that if manufacturing was to continue to provide support to NPD, plans to expand were necessary. *“We have two options, one is we take the unit next door ... the other option is that we look at buying this factory rather than renting it and in which case we could expand sideways by building.”* The future expansion for manufacturing created some interesting dilemmas for Hall Stage. *“How big can you become... we have got 19 people, we probably want to keep the company under 30, I think Charles has said that if we ever need a full time human resources department then we are too big, so it would be a combination of our designs, so external manufacture and some assembly in this area.”* The Managing Director's aim was to be successful with his business, but for it to be contained in a manageable 'lifestyle' firm.

### 6.6.1.3 Role within new product development

As a function of Hall Stage, manufacturing was becoming more involved in the process of new product development. Whilst not involved in the design process at the initial stages, the *“products get designed and then come to us (manufacturing) and we might find an easier way to make it.”* The advantage of having manufacturing on site rather than in China was the ability to utilise the knowledge and experience of the people in manufacturing. *“The guys out there (in the factory) have probably a much bigger input into that and knowledge of how it works or how they could be manufactured cheaper. Just sitting down with them for half an hour and saying this is the design for the modules but how can we make it better, cheaper?”* The result was that people on the manufacturing side felt that their roles *“will get bigger and more interesting because myself and my son do all the interesting/specialist stuff whereas the other two do all other welding, the track and stuff, so it will become more stressful.”*

## 4.6.2 New product development

At the beginning of their one hundred year history Hall Stage had been involved in innovating and developing new products, but as their management teams altered, the willingness to continue to develop products faltered. Then, under the ownership of Harkness, its priorities changed to simple ‘metal bashing’. Therefore a reputation at one time associated with innovation was no more; certainly not in the living memory of its current employees (with perhaps the exception of Doug).

### 4.6.2.1 Current new product development capability

Hall Stage’s current new product development capability was demonstrated in winning three awards (two for DGS and one for HoldOn) very early on in the company’s strategy to create a NPD capability. *“We put it (DGS) on an exhibition stand and we won International Rigging Product of the Year, and then it went on to the next exhibition stand and won the Innovation Award so everybody agrees with me (Managing Director) that it is a clever idea and it is now rolling out to quite a few people.”* The awards came from the theatre industry; the Association for British Theatre Technicians (ABTT) Product of the Year Award and the Professional Light and Sound Association (PLASA) in 2004. The feeling within Hall Stage was that it *“was absolutely superb because we have been known as a company that mainly make*

*curtain track to be honest and pulleys ... and for us to come up with something completely new ... for us to get awards like that was completely unheard of.”* To Hall Stage the awards demonstrated that people saw the real benefit of the products, which spurred Hall Stage on. *“We are looking at whatever we are going to come up with next year for the next award because we entered three awards and won all of them, which again is unheard of from our point of view so we are kind of proud of that and features quite a lot in our marketing.”*

#### *4.6.2.2 Rationale for new product development*

Whilst re-launch of the company name was the first step in the plans for Hall Stage, there was a growing realisation that the company would not survive as a manufacturing subcontractor. Indeed the view was that *“it is only by coming up with new ideas and moving them forward, raising our profile and getting into new areas that the company is going to grow and become more profitable, I mean we do ok on the basic curtain track, the sort of standard product, but that is simple metal bashing with relatively low margin.”* Thus the introduction of HoldOn and DGS ensured survival and facilitated Hall Stage in creating their new image.

It was the very concept of moving up the value chain to survive and grow which placed new product development at the centre of Hall Stage. *“If you sit on a dwindling product we know that it is only a couple of years before somebody in China comes up with a better idea or somebody else comes up with an idea, but the important thing to me is that it is us.”* In other words, Hall Stage realised that whilst manufacturing was important, it had to be supplemented with something that would make a difference. That something had to make it hard for the competition to imitate their products in order to continue to provide them with a competitive advantage. The rationale for being ahead of the competition was that there were only two reasons why people purchase from Hall Stage, *“because we are a good company in terms of service and price and then we have the goods that they want and we have to push both those areas and that does involve a certain amount of development.”*

#### *4.6.2.3 New product development process*

Hall Stage's current approach to NPD followed a less traditional approach (also highlighted in Section 4.6.2.3). However, it was maintained that whilst parts of the



process required formalisation, generating ideas should still be a fluid and creative process, reflecting that *“if I was to sit down and start again I would sit down and write a design parameter and get the group of people together that I knew were extremely talented, drink a lot of alcohol and have a really good time for a long weekend and then come back together and think about that idea more clearly.”* In reality the NPD process was still at an early stage, with the expectation that *“the design office will start pulling ideas together.”* At this stage Doug (one of the longest serving employees at Hall Stage) was expected to get involved in the NPD process as he had *“a lot of knowledge about what has been tried in the company.”* Doug’s knowledge and experience proved valuable, one recent example being that Hall Stage attempted to develop a new idea, something that had been attempted ten years previously, and Doug knew *“that there were samples around and where the reports on that were.”* The reports and samples were accessed and time was not wasted by recycling the same problems. *“I can tell people what we have done before and what the faults are of our products.”*

In order to provide some formalisation to the NPD process a report was being compiled on how the process was conducted, and suggestions as to how it could be altered. The report was based on the past experience of the design engineer Peter, and was *“loosely based on a quality assurance ... I have tried to think of the best points of those and why they are used and apply them.”* Primarily, the rationale for providing some form of formalisation to the process was to provide *“control and accountability.”* The report was the first stage in attempting to *“try and start the thought process of regular meetings with new ideas or ideas that come in from people for products that people want”* and provide more focus to the people involved. Enquiries on products were recorded but nothing necessarily happened with them. Therefore the plan was to pool the ideas together and to see whether it *“might be worth investigating and spending the time in coming up with a design and a cost for manufacture and deciding whether we think that is a competitive product within the market.”*

#### 4.6.2.4 Lack of resources

Whilst Hall Stage had already achieved success with their NPD ventures, they still maintained that their development capability *“is fairly limited...we have a design cum*

*drawing office that has three people in it; one who I have to say is very, very good although somewhat overworked at the moment.*” The interviews highlighted that the task of developing new products was difficult to do from scratch, especially with little prior experience, and that limited resources were stretched. It was considered that through formalising at least part of the NPD process this would help to manage the resources of the firm better.

#### 4.6.2.5 Future for new product development

Plans for the future regarding what Hall Stage should do next had already been discussed. *“We need to get into different materials and not be locked into the traditional materials that have always been used, as now there is a shift to using different materials that have benefits.”* It was expected that venturing into new materials could bring efficiencies to manufacturing as well, simply by using a material other than steel. *“If you designed it correctly then you could make miles and miles from one set of tooling.”* Currently Hall Stage had to weld, cut and punch the relevant pieces, which involved different machines and skills. Changes were also anticipated in the industry, such as with the *“tracking system that is made on site...if you go to a TV studio you can make the track there and then on site by assembling various components.”* The future was to concentrate on the development of products as well as to break into new markets such as flying equipment, an area in which one of the new recruits to Hall Stage had worked previously. Hall Stage were concerned with *“moving one stage up the value chain to more service and if done correctly could be profitable side to it”* through installing their products as well as manufacturing them. This was acknowledged to be riskier than simple manufacturing, but the rewards perceived to be greater.

#### 4.6.3 Top management

The Managing Director and the Technical Director, who were part of the management buy-out, both faced the challenge of running a business for the first time. *“We are doing it ourselves, yeah, but there is every possibility that we will fail, every possibility, we are fighting against every possible hurdle; we have to raise the finance ourselves, we had to find this place ourselves, we had to recruit ourselves, you know, all the red tape all the government bureaucracy.”* The first steps taken by the new management team *“started off in some fairly simple things, like getting rid of*

*the problems and getting a corporate image ... getting the packaging and service and all that up to scratch, responding more positively, promoting our own identity rather than being part of (the parent company)."* The task facing Hall Stage's management team was to convince their customers that *"we weren't dying; that we had bought the company and we were going places, it wasn't just in the shadows and in decline."*

Since the management buy-out it was expected that *"the company has grown (we haven't got the final figures in yet) but I suspect by 60 to 70%."* Overall, the *"the projection is to grow the company from £1½ million to £4 ½ million in the next four and half years and I don't see that any of that is in the slightest bit difficult; that is just being competitive in the market."*

Reflecting on his role in the company Charles stated *"I am the wrong kind of person to start a business up - I am too flighty of mind, too much of an entrepreneur in a lot of ways; I am not enough of a realist, hard arsed businessman in a lot of ways."* This lack of experience and suitability for leading a firm was further extended to the management buyout team. *"We are probably not experienced enough at the start of this venture to get into that. We should have had some more sensible control at the top."* However, arguably the Managing Director was the instrumental person in driving the firm, providing the enthusiasm and encouragement for creating new products. It was the experience that he offered Hall Stage that was invaluable in providing the company with a clear purpose and understanding of their customers. *"Charles has a fairly intimate knowledge of the industry and he knows everybody, he is the sort of guy that goes into a pub anywhere in country and knows somebody, so Charles has been driving that forward."* The vivid memory of Charles's first loading session provides some insight into his close connection with the theatre industry. *"It will stay with me to this day, as in August, with temperatures in the 90s outside, and the grid was well over 100 degrees and very humid. Spookily, it was a 'Hall Stage' counterweight system! I came down after three hours on the loading gallery, pouring with sweat, with blood blisters on my fingers and cuts and bruises – all part of the normal day-to-day operation of the giddily exciting and glamorous world of theatre."* The effect of actual being part of the hard and laborious task of a 'loader' gave the Managing Director a real insight into the injuries people sustained and the cost implications of such a process. *"We reckon that every day there is an injury through the use of counterweight systems, even from people just trapping their fingers and*

*getting blood blisters, and from that you lose a nail and that's pretty unpleasant."* After years of experience at senior levels within the theatre industry, from being a production manager, then technical manager and director, *"you spend a long time as any manager looking at the cash flow, looking at the weekly income and how much you're spending on cover time for people that are off sick and you become aware of just how much money theatres spend on an annual basis on this sort of problem."* It was this real-life experience that sparked the stimulation for DGS, providing a motorised computer operated system, enabling people to be removed from the process, and thus reducing the likelihood of injury.

With the introduction of Charles, there was a change in the way that Harkness-Hall were viewed, and later Hall Stage, as Charles was somebody who was well known in the theatre industry, being *"was a big noise ... lots of people knew me, and I knew lots of people because I had worked with them."* This immediately created an impression of Hall Stage as an approachable firm again. It was perceived that customers were talking to somebody who knew what they were thinking, rather *"than a tedious rep phoning them up starting to pester them to sell them a piece of kit."* It was this atmosphere that the Managing Director still brought to the firm, being able to understand that a theatre production might want something quite ridiculous, but having an understanding that there was a way around it and a willingness to work with them. It was not only the customers who felt that felt the change of management style; it also effected the employees of Hall Stage: *"One of the biggest impacts that they made when they took over they are much more personnel orientated than any of the previous owners, not that the other owners were bad like mean or anything, they are much more pally basis with the workers, they spend a lot more time on the shop floor, they know everyone."*

#### **4.6.4 Culture**

The beginnings of an innovation culture could be witnessed with the expectation that everybody in the company generated new ideas. *"We are all supposed to come up with new ideas..."* although it appeared that ideas was not necessarily a problem, as *"we came up with tons of ideas and we have very grandiose ideas."* One of the passions and possible concerns of the management team was to try and generate *"enthusiasm and drive and buzz that we have all had in the industry to the welders is*

*the biggest challenge and what I really, really want to do is to enthuse people that work here with the application and the products that they make.”* This illustrates the fact that Hall Stage recognised that people were integral to the process of moving forward and creating a NPD capability. There was also the recognition that ‘individuality’ was one of the hardest elements to deal with. *“There has to be a certain amount of culture change obviously as people get older they become, generally, become less innovative and prefer things the old way and that can’t ever be present in a company like Hall Stage.”* It was the change in culture that at times was thought to be one of the hardest elements to effect because what was important to the top management team was not always so for the rest of the company. *“What is important is that they get treated well and fairly and respected by their colleagues and we know everybody intimately; we know exactly what their problems are, and, you know, the difficulties with their job and occasionally we will ask them to push themselves with their job a bit that they are not used to or thinking about things in a new way that they haven’t thought about in the past and it is a challenge... I genuinely wish that people that work here and in the future jump out of bed in the morning and can’t wait to come to get to work to have the enthusiasm... to have the blind enthusiasm to see through the grind ... but see the vast potential of the business.”*

It was important to Hall Stage that the whole company was heading in the same direction. *“We have to make it clear to our staff - and that is all our staff; sales and production staff, that we need to have good ideas coming out and make sure that people understand.”* For the future it was perceived that the buy-in from all the employees was going to be *“one of the biggest problems”*, as the issue of persuading people that the company was changing and moving into different areas was expected to cause problems.

#### *4.6.4.1 Rewards*

One of the ways in which the Managing Director had attempted to generate an interest in the company was by rewarding the employees for their extra effort and saying thank you. By providing monetary rewards, the Managing Director acknowledged that *“there are many ways that you can say thank; ultimately you can slip people £50 and I have got 20 staff altogether so that is a lot of money.”* The

concern was how long monetary rewards would motivate the staff without it becoming an expectation. Yet the Managing Director was keen to show his appreciation of all the people who worked for Hall Stage, and was prepared to *“take everybody out to the pub and buy them a beer from my own pocket because it is heartfelt genuine thanks.”* The rationale for the rewards was to try to instil a passion for what Hall Stage was attempting, and the Managing Director believed that it could only happen through the people in the company. *“What you have to do is chop all that kind of magic and appeal into making bits of stuff out of metal for people - that’s the real challenge.”*

#### 4.6.4.2 Training

In a bid to have the best staff in the industry, Hall Stage recognised the need to train their employees. *“We were on day four of a five day training course that we are doing with Protec, a European funded course that is covering a number of things within the company ... we are trying to up-skill the company ... neither of us have run an engineering company before and had a steep learning curve... we are trying to expand that learning opportunity out from just the directors.”* This was to justify Hall Stage in their belief that *“we have sent all the right signals out to the industry saying that we are revived we are moving forward we are responsive.”* In order to do this it was important to have fully trained and qualified staff, in addition to members sharing the excitement of the world of the theatre.

Hall Stage had recruited two new members of staff in senior positions within the firm. Not only were these like minded people from the industry, who instantly demonstrated an understanding of the satisfaction that comes from the work, but their education and qualifications explained why Hall Stage decided to invest in their expertise. *“We do have to employ the people that, you know, the wage bill is huge... the people you need with the letters after their name and the blokes that have done this business... you know, you can’t replicate that... you can pull some bright kids off the street and put them in a hot-house but it will still take them five years to work out how to rig a by-line so what you need is a combination of talent, experience and qualifications that we have got here.”* Employing qualified people was a new experience for Hall Stage, but a necessary one. *“They also never had someone who was university educated in terms of engineering, I could give them a lot of signatures*

*on products or design.*” This provided Hall Stage with the ability to certify their designs as well as complying with the legislation, and for example, through Pete’s education, Hall Stage gained somebody who would ensure that the product development process progressed well, as well as ensuring that *“it was more robust.”*

#### **4.6.4.3 Communication**

There was an open approach to communication. This was witnessed on the tour of the facilities, where everybody knew one another. People freely expressed any issues with the management, so that the management team were fully informed. The reverse was evident with the way in which the top management communicated the planned changes with the whole firm. This was done through the informal communication channels reported above, as well as through staff briefings and the rewards that were offered. Consequently it was considered that the new management team created a more *“pally”* atmosphere in the firm.

#### **4.6.5 Individuals**

The experience and expertise of the individuals within Hall Stage was key in aiding the development of new products. The Managing Director had held of a range of jobs in the industry (see Section 4.6.3) including having been the Technical Director for the Royal Albert Hall and the Millennium Dome, a project that the current Technical Director at Hall Stage had also worked on. In order to achieve the objective of developing new products Hall Stage had been proactive in bringing new people into the company who *“have done some very big grown up things”*, bringing with them their own sets of skills, which were essential to Hall Stage.

##### **4.6.5.1 New People**

The requirement to bring in new people was paramount, bringing with it a new perspective to Hall Stage. It was suggested that *“in terms of people we are looking at maybe increasing, primarily it is going to come from a non-industry experience... we can give people the experience.... it’s harder to find people like the idea generators if you like; that is the skill that we require and increasingly will require.”* The idea of bringing people into Hall Stage was reiterated on a number of occasions. *“We do need to get people in and we do need to be ahead of the game.”* When the Top Management team took over Hall Stage they had been working closely with some

external people and provided them with the opportunity to bring some of the people in house. Part of the rationale for taking on one of their recent recruits was they had *“a lot links into the television industry ... he comes up with ideas ... and basically one of the areas that we are looking at, and in fact working on the last couple of days is systems for television studios, which is another new opportunity from our point of view. We now working with Channel 4, SKY and ITN and targeting the BBC in the near future.”*

#### *4.6.5.2 Expertise*

The requirement for people with certain qualifications was not to diminish the role of the employees on the factory side, as it was acknowledged that *“we have got some very talented guys on the shop floor”*, but it was felt that the attitudes reflected the past ownership, who *“didn’t realise that what they were working in was a niche market, they just thought that it was another market.”* There was, however, an appreciation of the need to blend qualifications and education with experience, and as the designer explained, he insisted on using the experience of manufacturing in the NPD process. The benefit of utilising the experience of people from manufacturing, who make the products on a daily basis, was their intrinsic knowledge of the processes. Their knowledge aided the manufacturability of the product, helping to keep costs down, as well as providing knowledge of what could and could not be done. In addition, the people in manufacturing considered that it *“makes it more interesting as well because we are involved in sorting out the problems. At the moment we are involved in pricing up the jobs which is something that we did before at Harkness, but they were running on four year ago prices, that sort of thing - we’re not.”*

#### **4.6.6 Marketing**

An important part of the eventual success of DGS was considered to be the package that supplemented it. The purpose of this package was to encourage theatres to make the changeover to the new DGS system, and Hall Stage had to think of a new way of ‘selling’ their product. *“What we have done is come up with the innovation but getting it to market is not the big issue; its selling the concept and the financial package that we have put as much effort - I have put as much effort - in to financial*



*ability to sell with the Bank of Scotland to lease the products to the theatres so they are paying the same amount for casual staff as they will be for the DGS system.”*

There was a realisation for Hall Stage that their customers viewed DGS as a package. *“The product is 60% - what people want to buy is the service.”* This would appear especially so with the theatre industry, which values firms’ sharing their determination in organising productions and running theatres. The future for DGS was expected to be good, especially in line with the changes in health and safety laws. It still remained a case of *“being able to take all of those things and think about that from the end user. It’s not about innovation, it is about market research and knowledge of the market, it is marketing it is not about technical innovation.”* felt that marketing was another under-developed capability within Hall Stage, but that the links with the networks provided a clear path to market.

#### **4.7 NPD STRATEGIES**

New product development strategies will be dealt with separately in this section as it relates to the specific research objective raised in Section 2.11. Through the analysis of the interview data, this section sought to understand the actual strategies Hall Stage employed to enable them to create a NPD capability:

1. Alliances
2. Licensing
3. Outsourcing (buying-in)
4. In house development

##### **4.7.1 Alliances**

Alliances were *“the quickest”* way to develop DGS, and by working with ASM, both parties gained from the experience, each capitalising on each other’s strengths. ASM were not as *“good on the marketing side”*; something that Hall Stage had worked on and had been able to provide assistance with, developing a financial package and having extremely good contacts with key personnel in the theatre industry. However, ASM were, *“very good on the engineering side; they have the facilities and the background and an intimate knowledge of some of the most tedious specifications that*

*I have ever heard, they are all health and safety stuff so they are all essential and their stuff is so safe that it is unbelievable... there are standards going from sort of from nothing at all to ultra safe and all their stuff can be certified as ultra safe for flying.”*

The aim was that Hall Stage would be the ones to sell DGS world-wide and ASM “would get the benefit of supplying the band-hoist and the motors”. The “great relationship” between Hall Stage and ASM developed over a series of meetings. At the first meeting “we came up with some thoughts on that front and we didn’t scare them away.” The relationship grew over four or five months and “developed elements of trust” as Hall Stage “got some of the key personnel there so it was a one to one personal relationship and a technical requirement that matched quite well.”

#### **4.7.2 Licensing**

This strategy was used in conjunction with alliances. In order to use the technology developed by ASM it was necessary to license the technology from them. This enabled Hall Stage to overcome the expensive development costs. Furthermore, it was felt that it would have been virtually impossible for them to overcome the patent issues, and it therefore made more business sense to license the technology from ASM, as part of the alliance.

#### **4.7.3 Outsourcing (buying in)**

HoldOn, as described in Section 4.4.2, is another product introduced by Hall Stage, which “won us product of the year award in 2003” and saw Hall Stage taking advantage of “a quick win”. Hall Stage brought in HoldOn, packaged it as a Hall Stage product, and sold it on. The HoldOn clip grips virtually any flexible material that fits into its jaws, and has proved very successful in the theatre industry as hanging drapes and temporary fittings is a big problem, “because if you put a hole through it, it is going to fray.” HoldOn prevents this, and so it is “going like hot cakes”. Prior to Hall Stage spotting the product, it had not been used in theatres. “Charles saw an opportunity” so a general purpose product was simply re-marketed; “brought it into our industry and we started making a fuss about it but we make a fuss about anything that is new.”

#### **4.7.4 In-house**

As Hall Stage was a small company and at was the embryonic stage of creating a NPD capability, its in-house capability was not yet fully formed and it was considered that they would not be able to manage the NPD process for a product such as DGS because they *“are hugely expensive to do from scratch and to come up with a new system that has to be certified and tested... you are talking £50,000 to £60,000; maybe even £100,000”* which was conceded was a *“risky undertaking”*. Ultimately using an alliance enabled Hall Stage to find *“an economic and speedy way of getting products to market; the risk is far less because we know that ASM is certified for use in all the applications we are going use it for ... the DGS is basically an application of their technology ... it was a quick fix with a partner that we can rely on,”* whilst still maintaining control of the project internally, and developing key skills such as marketing in-house, which was proving extremely beneficial.

#### **4.7.5 Future strategies**

The future for NPD will be a combination of strategies. By focusing on external companies, Hall Stage were constrained by the lead times of other companies. Therefore another choice was to innovate using the people within Hall Stage, investing in the machinery and training people in a specific function, but it was felt that these decisions would have to be on a *“case by case”* basis, as was the case with DGS, because using *“outsourcing is very simple... they are the only people that you can buy from in the world ... so in a way we are tied to that agreement.”*

### **4.8 SUMMARY**

The background to the theatre industry sought to explain the demands that were now placed on firms in the industry, such as Hall Stage. With audiences expecting vibrant and spectacular shows, theatres are required to respond by having the equipment to enable such dramatics. At the start of Hall Stage's history, new product development may well have been present, but over the years, and especially under the ownership of Harkness, NPD was not of paramount importance. These findings have revealed how Hall Stage was beginning to regain and create a NPD capability.

The external construct (see Table 4-2) for Hall Stage included:

- Networks
- Government agents

Hall Stage utilised both external networks and government agents to enable them to create a new product development capability. Due to the contacts and experience of the Managing Director and the Technical Director within the industry, these were vital in providing contacts with ASM, who supplied the necessary technology for DGS. In addition, the networks offered facilities that Hall Stage would not have had access to otherwise, such as a full stage on which to test DGS. In addition, Hall Stage sought the help of government agents, whilst used within Hall Stage, the role which they played and the benefit that derived from using them was mixed and mainly disputed as too serendipitous.

The internal construct (see Table 4-3) for Hall Stage included:

- Manufacturing capability
- New Product Development
- Top management
- Culture
- Individuals
- Marketing

The manufacturing capability played an active role in Hall Stage's creation of an NPD capability. The existing manufacturing capability helped by acting as a 'cash cow', providing resources to finance the development of new products, which would have been difficult otherwise. It also provided technical knowledge and know-how as to how products should be designed. Therefore manufacturing was considered vital and further investment was anticipated.

Early on in its quest to create a NPD capability, Hall Stage demonstrated their ability to be innovative and capable of developing and taking new products to the market. This was confirmed when the company received three innovation awards for the DGS and HoldOn products. The top management team guiding Hall Stage was instrumental in providing the drive for creating an NPD capability, and this was

particularly due to the vision and passion of the Managing Director, who strongly believed that the firm should develop new products, and pushed this vision throughout the company. It was this leadership skill which saw the importance of people, especially if it was going to be successful. An important finding from the interviews was the importance of 'individuals', and Hall Stage particularly required people with experience and qualifications, who provided know-how of the industry and the ability to turn ideas into products. The combination of the vision of the top management and technical skills of its people underpinned the culture that the management team was trying to create within Hall Stage, which was one of passion and caring for the industry – and a determination to succeed.

The data relating to NPD strategies found that Hall Stage supported their in-house strategy through the creation of a key alliance with ASM, and by buying in HoldOn. These two strategies enabled Hall Stage to develop the products and to utilise the resources and technology of other firms that already had the necessary capabilities in place. With HoldOn, this involved the entire manufacturing process. Hall Stage's in-house development process gave them control of how the product was assembled, and the marketing aspect – this was a necessary requirement as Hall Stage had the contacts and networks that its alliance partner ASM did not have. In order to create a NPD capability Hall Stage developed two key strategies, which included partnerships through licensing technology and buying in. Both these strategies were used successfully and utilised external capabilities that the company did not possess.

<b>NETWORKS</b>	<b>Market linkages</b>	Through a recommendation from “one of the big players” in the industry made the link with ASM easier to make, which then provided the technology for Hall Stage’s first product, DGS.
	<b>Contacts</b>	Local theatre was “used as a test bed ... as the system needs to be tested in theatres it has been vital that we have had support from people in the industry” and the opportunity for potential customers to view DGS in action.
	<b>Scouting networks</b>	Hall Stage looked at many industries for a technological solution for DGS such as the Kevlar band used in the US space shuttles.
	<b>Conference/trade shows</b>	It was through these networks that Hall Stage first met contacts from ASM, which was the start of the strategic alliance. They also won innovation awards from their peers by presenting their product concepts.
<b>EXTERNAL AGENTS</b>	<b>Serendipitous process</b>	Working with government agents was considered to be a serendipitous process as there was “no clear path laid out... we had to find the secret hidden door to DTI’s small firms loan guarantee and we had to find the right bank who were offering to support us at that level it took a lot of finding, we went to the Business Link and all those off the shelf support agencies which we found a complete load of duffers until we find the right guy in the right business link office who knew the right bloke in the right bank who knew the right guy in DTI.”
	<b>Provide advice</b>	Advice on how to run the business in the early stages of the MBO and enabling them to “keep our feet on the ground.”
	<b>Lack of funding during development period</b>	“you look to the government for some support ... you want to go through a series of validation ideas that this isn’t a pipe dream here is something that is actually going to work; here is the market for it, here is the potential and here is the research, now what we have to do is pay our wages for the next three, six months, whatever.”

Table 4-2 Summary of the external constructs and sub-constructs for Hall Stage

<b>MANUFACTURING</b>	<b>Rationale for manufacturing</b>	Manufacturing base part of the rationale for purchasing the company using manufacturing to provide a resource <i>"metal bashing will always form the sort of cash cow ... something that people will always want regularly and form the backbone."</i>
	<b>Investment</b>	Expanding manufacturing division in terms of people and buildings to support its cash cow.
	<b>Role within NPD</b>	Manufacturing is becoming more involved in the process of new product development. Whilst not involved in the design process at the initial stages the <i>"products get designed and then come to us (manufacturing) and we might find an easier way to make it."</i> The advantage of having manufacturing on site rather than in China has been the ability to utilise the knowledge and experience of the people in manufacturing.
<b>NEW PRODUCT DEVELOPMENT (NPD)</b>	<b>Current NPD capability</b>	Hall Stage demonstrated their NPD capability at the early stage by winning three awards from the industry.
	<b>Rationale for NPD</b>	The move to create new products was because it was felt that <i>"only by coming up with new ideas and moving them forward, raising our profile and getting into new areas that the company is going to grow and become more profitable, I mean we do ok on the basic curtain track, the sort of standard product, but that is a simple metal bashing with relatively low margin."</i>
	<b>NPD process</b>	Hall Stage followed a less traditional approach. <i>"If I was to sit down and start again I would sit down and write a design parameter and get the group of people together that I knew were extremely talented, drink a lot of alcohol and have a really good time for a long weekend and then come back together and think about that idea more clearly."</i>

	<p><b>Lack of resources</b></p> <p>The task of developing new products was difficult to do from scratch with no prior experience. It was considered a weakness that there was no formal process for developing new products, which was being put into place.</p>	
	<p><b>Future for NPD</b></p> <p>Desire to get involved in the next opportunity. <i>"We need to get into different materials and not be locked into the traditional materials that have always been used as now there is a shift to using different materials that have benefits."</i></p>	
<p><b>TOP MANAGEMENT (including top management team)</b></p>	<p><b>Experience and understanding of industry</b></p> <p>Experience of the senior members of the company provides an understanding of what is required in the market if Hall Stage are going to be successful.  <i>"If somebody comes up to me and says (MD) I need this in a hurry and it needs to be on time the show is in whenever ... that kicks off on this date therefore your stuff needs to be in for this date I will make a commitment when I say yes we can do that."</i></p>	
	<p><b>Reputation in the industry</b></p> <p>Experience and passion for the industry, with the Managing Director <i>"scouting around for solutions for them."</i>      Enabled through the Managing Director who <i>"has a fairly intimate knowledge of the industry and he knows everybody, he is the sort of guy that goes into a pub anywhere in country and knows somebody."</i></p>	
	<p><b>Champion of NPD</b></p> <p>Managing Director was the instrumental person in driving the firm, providing the enthusiasm and encouragement for creating new products. It was his desire and commitment that wanted the rest of the firm to buy in too.</p>	
	<p><b>Culture of innovation</b></p> <p>There was an expectation that everybody came up with new ideas. <i>"We are all supposed to come up with new ideas."</i> The change from a manufacturing subcontractor carrying out metal bashing, to innovation and developing new ideas was problematic; <i>"one of the biggest problems."</i></p>	



## **Rewards**

To encourage passion and enthusiasm for the industry the Managing Director attempted to achieve this through rewarding the employees for their extra effort. *"There are any so many ways that you can say thank you. Ultimately you can slip people £50 and I have got 20 staff altogether so that is a lot of money ... but if you have to do that every couple of weeks, £50 well it is £50 ... there are many ways of rewarding people there are people on the shop floor that I respect beyond belief ... I will take everybody out to the pub and buy them a beer from my own pocket because it is a heartfelt genuine thanks."*

## **Training/further education**

In a bid to have the best staff in the industry Hall Stage recognised the need to train their employees, which they are actively encouraged to do. *"We are trying to up-skill the company."*

## **Communication**

The management team would walk around the factory and make sure that the employees were ok and knew the plans of the firm.

## **INDIVIDUALS**

### **New people**

Hall Stage recognised that people were integral to the process, but moving forward this potential created a problem. *"We have a couple of people at the moment with some experience and different experience, there has to be a certain amount of culture change... obviously as people get older they become generally less innovative and prefer things the old way and that can't ever be present in a company like Hall Stage."*

### **Expertise/ Qualifications**

Experience and expertise of the people within Hall Stage has been key in aiding the development of new products and had seen a number of appointments to reflect this. Also, the expertise of the people in manufacturing was viewed as essential in supporting the development of new products. *"we have got some very talented guys on the shop floor."* Hall Stage found that it was necessary to bring in people with specific qualifications as *"they also never had someone who was university educated in terms of engineering, I could give them a lot of signatures on products or design."*

<b>MARKETING</b>	<b>Introducing innovation into marketing</b>	To sell their products Hall Stage had to devise a package so that final product was attractive to the customer. <i>“What we have done is come up with the innovation but getting it to market is not the big issue, its selling the concept and the financial package that we have put as much effort - I have put as much effort in - to financial ability to sell with the Bank of Scotland to lease the products to the theatres so they are paying the same amount for casual staff as they will be for the DGS system.”</i>
	<b>Lack of skills</b>	Hall Stage found that in developing a NPD capability to sell their products was not always related to development task but also to marketing issues. <i>“Being able to take all of those things and think about that from the end user, its not about innovation, it is about market research and knowledge of the market, it is marketing, it is not about technical innovation.”</i> But this was an area Hall Stage were still developing.

*Table 4-3 Summary of the findings from the internal construct for Hall Stage*

NPD STRATEGIES	Alliances	Creating an alliance with ASM was viewed as having “ <i>been the quickest</i> ” way to use the technology that was used in Hall Stage’s DGS product. It would have been to time consuming and financial difficult to develop technology such as ASM.
<b>Outsourcing (Buying-in)</b>	With HoldOn it was not viable to manufacture the clip in-house as it would mean invest in new injection moulding equipment as was not an area Hall Stage specialised in. Therefore it was a better proposition to buy-in the clip from the original manufacturer.	
<b>In-house</b>	This allowed control of the process and enabled them to market the product using their contacts as Hall Stage wished.	

*Table 4-4 Summary of NPD Strategies for Hall Stage*

## CHAPTER FIVE – MRP LIMITED

*This chapter presents the findings from the second case study, MRP. The begin of the chapter covers the background and history of MRP, detailing the people interviewed as well as the past experience of new product development within MRP. The subsequent sections present the case findings highlighting the key constructs and sub-constructs. A series of summary tables of the key findings conclude this chapter.*

### 5.1 INTRODUCTION

MRP Electronics were introduced to this research through the Manufacturing Advisory Service (MAS-East). After a series of communications between the Technical Director and the researcher a meeting was arranged. The meeting was conducted with Technical Director and the Managing Director, in which the background of MRP and the nature of the research process were discussed. A factory visit followed the meeting and was conducted by the Technical Director, enabling a deeper understanding of MRP's operations to be gained. The people who were relevant to the case study were identified from this meeting. The three people interviewed, and their positions, are detailed in Table 5-1. It is important to note that the people who were interviewed were the only three people involved with new product development, and therefore the only people applicable to this study.

<b>Name</b>	<b>Position</b>
Mike	Managing Director
Andy	Technical Director
Nick	Marketing Director

*Table 5-1 People interviewed at MRP*

## 5.2 BACKGROUND TO MRP

Since it was founded in 1987 by Mike the Managing Director, MRP Electronics PLC have become one of the UK's leading contract electronics manufacturers, specialising in surface mount PCB (print circuit board) assembly. At the time of the case study the firm employed approximately 200 people. A timeline of the key events for MRP, especially those relating to new product development, is highlighted in Figure 5-1. MRP Electronics occupies a modern, recently refurbished factory with 30,000 sq feet of space in Bedford. Recently, MRP expanded their facilities to be able to provide the service of 'complete' product assembly; this involved the establishment of dedicated flow lines for testing and packaging customers' products. Further process innovations were adopted to include Just-in-Time production, which meant that MRP also took on the burden of producing to order, often holding stock for the customers they supply. Whilst providing MRP with an extra workload it was felt necessary in order to provide their customers with 'added' services. MRP had built a strong reputation with their customers and were clearly known for their commitment to their customers' requirements, and for producing quality products. *"Receiving a quality product is our customers' given right, not an option."* With the recent investment in new technology and process innovation, MRP were capable of dealing with a wide range of volumes, underlining their commitment to manufacturing and to their customers, by attempting to be at the forefront.

One of MRP's competences, and one of the reasons for their strong customer base was their ability and willingness to consistently work with their customers to produce their products as efficiently as possible. This meant that in some cases MRP helped their customers to re-design their products to enable them to benefit from cost savings. On reviewing MRP's business, it would appear this ability to design was one that had been overlooked, although it had been used to their customers' advantage and had continued to bring work into MRP. It was this ability and skill for design that had yet to realise its full potential for MRP, and to be utilised to the benefit of MRP when developing their own products.

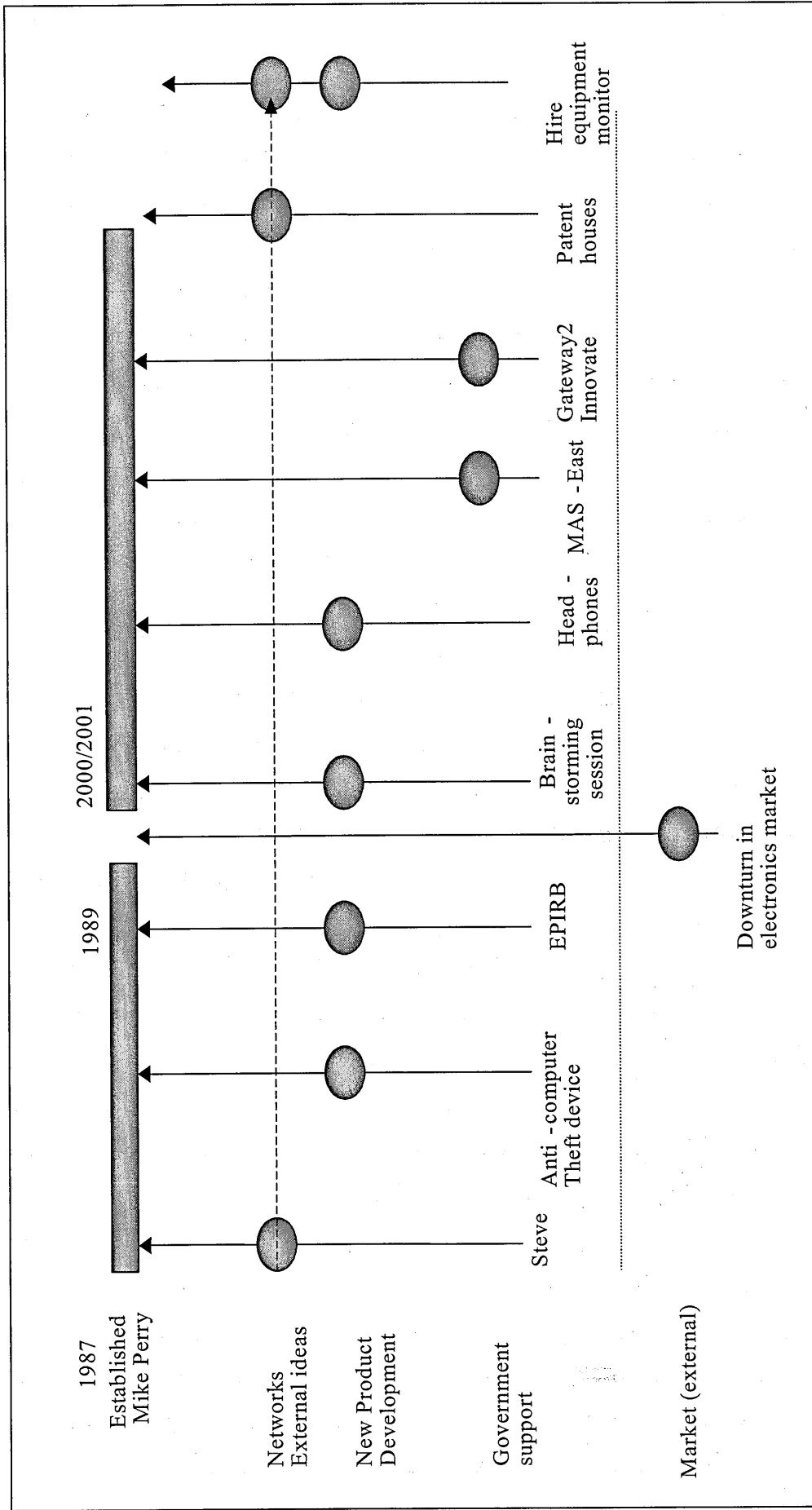


Figure 5-1 Timeline for MRP

## 5.3 NEW PRODUCTS

Throughout the company's history MRP attempted to develop their own products, especially during periods of downturn in business during the 1980s (as discussed in Section 5.3.1 and 5.3.2). It was only in 2001 that MRP made a concerted effort to develop their own products; to add more value to the process in an attempt to move away from being a traditional subcontractor and product assembler to "*being in charge of our own destiny.*" MRP initiated this proposal to create a NPD capability by conducting a brainstorming session between the top management team. Moderate success was achieved, with one of the ideas reaching the prototype stage (Section 5.3.3 – noise cancelling headphones). Further developments had been achieved by employing the ideas of an external designer, and these had also reached the prototype phase of the development process (Section 5.3.4 – equipment hire product).

### 5.3.1 Computer anti-theft device

During the 1980s MRP worked with a design engineer, Steve, to develop and manufacture a computer anti-theft device. MRP worked with Steve and invested time in developing the device. The potential for the market was considered "*so big.*" The initial concept came from "*Steve and another guy who had been working on raising the capital speaking to venture capitals and white knights at the peak of the need for the product.*" At the time Steve and his colleague were having some problems in raising funds for the device itself. The rationale for the product came from the example of a Scottish company; one night the company had had a lorry load of memory chips stolen, which were "*worth a fortune.*" The concept behind the product was that if the computer was armed and movement occurred for a period of time without the device being disarmed, an alarm would be triggered inside the box. If the alarm was not disabled it would eventually pierce a canister inside the computer, spraying orange dye over all of the parts. This would essentially make resale of the parts impossible as the orange dye would indicate that they had been stolen, thus preventing theft by removing the value of the goods. MRP were approached because of their manufacturing capability and their interest in being involved in new product development. However, once the product was at the development stage, the price of computers and components began to drop, rendering the product redundant.

### **5.3.2 EPIRB - (Electronic, Personal, Identification, Radio, Beacon)**

In 1989 MRP attempted to develop a product using an external electronics design engineer to develop an EPIRB (Electronic, Personal, Indication, Radio Beacon). The idea behind the concept was that it would be a device worn around the neck of a sailor that would automatically trigger a beacon if they were to fall overboard. Market research carried out by the Managing Director found that the products currently on the market were what he considered to be 'Mickey Mouse', whereas the that product MRP were attempting to design had added features which included easy identification of the sailor. MRP's product included a helium balloon tethered to the device that was inflated when triggered, providing a visual aid that was easier to distinguish and identify, *"because if you are sailing in the Northern hemisphere and you fall overboard you are not in the water long before you are dead... even with a team of experienced sailors the main threat is at night when there is a sailor on night watch because if they fall in no-one knows and it only takes 50 yards before the person is virtually invisible and it becomes extremely difficult to find them."*

However, MRP experienced a number of problems with the balloon during the development stage, as they could not find a way of sealing the helium in the balloon once inflated. MRP revised their thinking and tried the biodegradable orange dye used in the computer-theft device (Section 5.3.1), that would identify the area where the person had fallen overboard (by releasing the orange dye in the water), *"but we couldn't get that to work either."* As time moved on, MRP found that regardless of all the market research the Managing Director had carried out, and all the statistics of people drowning at sea, the Managing Director's personal experience of sailing was that people simply did not use them, thus raising the question *"whether there was a market there in the first place."* Subsequently, further development of the EPIRB was discontinued. This marked the end of product development in the company until more recently in 2004.

### **5.3.3 Noise cancelling headphones**

The noise cancelling headphones was an idea that was sparked from the brainstorming session highlighted in Section 5.3. MRP still felt that they did not have the necessary skills to design the product to enable development. Therefore, they again enlisted the help of Steve (the external designer) to design the product. Market research indicated



there was a clear need in for such a product. However, once it reached the prototype stage, the headphones experienced technological problems. At the time of the case study MRP was still working with Steve to examine the fault and continue development. However, early market testing indicated a positive response.

#### **5.3.4 Equipment hire product**

The concept of the 'equipment hire product' stemmed from the relationship that MRP had established with Steve, the design engineer mentioned in relation to the computer anti-theft device, and one of Steve's colleagues. Someone at MRP had met Steve's colleague through Steve at a previous meeting and he "*mentioned that he had ideas and inventions so we went back to him to see if he had anything lying about in his cupboard that we could work with him on or buy off him.*" This saw the development of the 'equipment hire product'. Essentially, the product was an "*electromagnetic security device for the equipment hire market such as JCBs, forklift trucks, cherry pickers, any heavy plant... it is really a box of electronics that fits to the engine or another part of the machine (it can fit all kinds of equipment).*" The idea behind the product was that it could be programmed so that the use of the machine could be controlled, allowing operation only with the insertion of the right code, and enabling it to be shut down completely at the end of the hire period, after which the code would become invalid (this could be remotely programmed if further work were required and agreed accordingly with the hire company).

The rationale for the product was rooted in the problem of misuse of hire equipment. Often the equipment was hired for a period of time but was used beyond that period (e.g. the hire period ended on Friday, but knowing that the equipment would not be collected until Monday, its use was continued over the weekend - effectively using the equipment for free). The requirement of a valid code effectively authorised the use of the machinery. The product was at the stage where the design had been completed; five had already been produced, with two prototypes being tested in the hire industry. The agreement between the designer and MRP was that MRP would license the rights to manufacture the product as well as market it and sell the product, paying royalties to the designer.

## 5.4 EXTERNAL

This section examines the external constructs and sub-constructs that emerged from the case study findings. The findings deal with the external networks that MRP ‘tapped’ into, in an attempt to use external expertise to realise their desire to develop new products, and as a potential source for new ideas which they could develop. In addition to networks, MRP also utilised government agents. Specifically, government agents refer to organisations such as the Manufacturing Advisory Service - East (MAS-East) and Gateway2Innovate, from which MRP leveraged information to enable them to create a NPD capability.

### 5.4.1 Networks

Over the years MRP had linked in with a number of networks of individual designers who had provided ideas and solutions. MRP recognised that their capabilities did not extend to being a design house or to generating ideas. Consequently, one way in which they had tried to break into the area of new product development was through working with people who already had ideas, or who were good at generating ideas. This created the ideal situation, as the idea generators lacked the necessary resources to develop the idea themselves, while MRP had the resources but no ideas. MRP were reliant on finding ideas externally; *“we want more input from potential products,”* rather than generating ideas in-house. These networks stemmed from a number of different places, such as previous product development ventures, as in the case of the ‘plant hire product’ which involved a past contact – Steve. It was through this network of design engineers that MRP had been able to develop one of their most promising products, the ‘equipment hire product’ (Section 5.3.4). These external networks provided MRP with expertise that they did not possess and were unable to invest in or develop at the time of the case study.

The external focus was an important factor for MRP, and they proactively sought people and organisations that had generated new ideas and products that required further development. As part of seeking external help MRP contacted two patent houses. However, according to one of the patent houses, this approach would be unlikely to provide MRP with ideas, as people do not go to the Patent Houses and ask if they know of firms willing to invest and help with manufacturing. The

serendipitous nature of new product development emerged from contacting the other patent house. A conversation between an employee of the patent house and MRP sparked a useful connection, as it transpired that the man had an idea and needed help with manufacturing. A meeting between the man and MRP was arranged to explore how the two parties could possibly work together (this was after the case study interviews were conducted so the result was not known). A further network that MRP were involved in was a *“member of the chamber and Bedford Technology group who gets into contact every once in a while... they are contract manufacturers that get together and talk, but not that impressed... it is just another talking shop.”* Although this had not provided MRP with any cross fertilisation of ideas, it was perceived as currently not adding real value to the business. Furthermore, at one time MRP had spoken with a professor at a nearby university, who was developing an idea and required the manufacturing capability of MRP. It was an idea that MRP were interested in so they agreed to work with him, but in the end the terms of the contract became unreasonable and the project did not continue.

#### **5.4.2 Government agents**

In addition to networks, MRP were instrumental in taking an outward approach to improving their business and creating a NPD capability. MRP employed the help and advice of various government agents to provide them with support and guidance in improving their business, as well as aiding their progress up the value chain. One of the government agents that MRP had made a link with was the Manufacturing Advisory Service (MAS-East). MRP initially came into contact with MAS-East as a result of a recommendation of one of MRP's customers. *“We had a recommendation from the operations director at Marconi that were ... they had done a project for them and they were very impressed and they are a big customer of ours and they suggested that we spoke to them which we did and they did a beneficial report and then did the lean project.”*

The benefits of working with MAS-East resulted in more than just the lean project which provided beneficial results for the company in its own right. Further benefits were encountered as MAS-East provided help and advice on MRP's plans for the future. MAS-East made a number of recommendations: *“we talked about the fact that we don't have the creativity, how you get ideas and seed of products. Martin*

*suggested that we talk to Gateway2Innovate as a clearing house of ideas... although we have spoken to them there hasn't been anything yet but we are in touch with them and they know about us, they are also in touch with Nick and he is seeing what is happening.*" Although the relationship with Gateway2Innovate had not delivered any potential ideas at the time of the interviews, it was a relationship that MRP had chosen to maintain, as it was felt that there was the potential for something to develop from the relationship. The Marketing Manager had been in regular contact with Gateway2Innovate, providing MRP with another avenue of potential idea sources.

## **5.5 INTERNAL**

This section presents the findings from the data analysis that was concerned with internal constructs and sub-constructs that were found to enable the creation of a NPD capability within MRP. From the interview data six sub-constructs emerged from the data, namely:

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

### **5.5.1 Manufacturing**

Manufacturing was the backbone of MRP, as the company produced a variety of products for a varied customer base. The concept of 'quality' was important to MRP; it was a strong selling point and an area in which MRP had invested heavily. As already discussed, MRP had attempted innovation in the form of the 'lean' project and introducing JIT, however, as MRP discovered, this still was not enough to remain competitive against low-cost competition.

#### *5.5.1.1 Rationale for manufacturing*

MRP felt that their manufacturing skills underpinned the concept of new product development and so supported continued investment. It was believed that

manufacturing was something to “*build on. But the future of manufacturing doesn’t see growth as high as it used to be, its not as buoyant as it was, we are hitting a mature market because of the emergence of the Far East. They are becoming very good electronic manufacturers and particular China now, as they have the money to buy the equipment and the technology.*” The defining characteristic of the competition that was making it extremely difficult for MRP to remain competitive was considered to be related to the fact that “*their labour rates are much lower than here... they are a tenth of ours and a lot of the electronics manufacturing is going out there to the Far East and China because in China they are paying \$7 per day whereas we are paying the equivalent of \$7 per hour.*” This created the view within MRP that if they were to survive, value had to be added, which MRP was attempting through new product development.

Further reasoning for MRP’s willingness to continue with manufacturing was the supplementary services that they could offer their customers. As highlighted in the background section to MRP (Section 5.2), the primary concern was to provide their customers with a quality product, which MRP did by helping their customers with the design of their products. Through the experience and expertise created by manufacturing, this had led to MRP developing a tacit knowledge of the development process. MRP had been instrumental in aiding their customers in improving their designs for manufacturing – creating a base for MRP to build their own new product development capability.

#### *5.5.1.2 Investment in manufacturing*

MRP’s commitment to manufacturing was demonstrated through their continued investment in their manufacturing facilities. One such project that was undertaken was adoption of the concept of lean manufacturing, supported by MAS-East. The understanding from within MRP was that if they were to continue to manufacture, then their processes had to be as efficient possible, simply to allow them to compete. Further investments and efficiency measures were witnessed with the introduction of the Just-in-Time philosophy. However, more recently MRP’s rationale for investing in manufacturing has moved beyond process innovation, towards efficiency, and instead MRP’s focus was to ‘add value’ in order to provide a competitive advantage, through creating a NPD capability. Manufacturing became the foundation in creating

such a capability, which was reflected in the Managing Director's view of the synergy between manufacturing and new product development, which he described as being like a *"hand and glove, they go together."*

#### *5.5.1.3 Barriers to new product development*

In deciding on which market/s to focus on, MRP encountered a problem that had the potential to act as a barrier to the creation of a NPD capability. It was MRP's manufacturing subcontracting work that was the root cause of the conflict. On one hand was MRP's desire to move up the value chain, while on the other MRP considered manufacturing to be its *"bread and butter."* The dilemma centred on MRP's wish not to go into direct competition with its existing customers, and potentially cannibalising the business. This was further exacerbated by MRP's customer base, which was diverse, creating the predicament of having to decide which market to focus on.

### **5.5.2 New product development**

New product development was not a new concept for MRP, as was highlighted in Section 5.3. Rather, NPD was a process that MRP had tackled unsuccessfully on a number of occasions. In the past the rationale for attempting to develop new products was due to a downturn in the subcontracting work; *"it was just a trade cycle, particularly with the telecomms industry during 2000/2001 - it went through a huge dip which had a knock on effect to MRP"*, acting as a stopgap to fill in time, but NPD suffered when the business *"picked up again"* and it was put on the back burner. Despite the consistent attempts at NPD the Managing Director considered that *"we don't really have initial product development skills at MRP."* However, it was something that MRP felt they could no longer ignore and knew that they would be required to develop in terms of an NPD capability.

#### *5.5.2.1 Rationale for new product development*

Since the initial brainstorming session in 2001, the push into new product development was considered weak (as highlighted in Section 5.3 and Section 5.5.2.2). Part of the reason for this was that the subcontracting work returned, leaving little spare time to concentrate on generating new ideas and developing new products. However, with the realisation of the continued downturn in manufacturing in the UK

(Section 5.5.1.1), MRP renewed their focus was on 'adding value'. As outsourcing of manufacturing overseas increased, MRP decided that their long-term survival would be through the development of their own products. Ultimately, this offered MRP control of the process, as well as being able to benefit from larger profit margins: *"the margins are greater than when you are a contract manufacturer."* Further reasoning was provided by the Managing Director: *"there is a greater level of stability and the fact that you are in charge of your own destiny and you are not at the whim of your customers who could change to another manufacturer at any time."*

#### 5.5.2.2 New product development process

The process of NPD was one that appeared to be ad-hoc and informal. It was complicated due to the involvement of the external designers, which MRP still relied on because of the intrinsic knowledge associated with the design. Furthermore, MRP often found themselves reacting to the designers' *"whims"*, as the designers were arguably entrepreneurial in their approach, where the design was their *"baby"* that they wanted to continually improve. This often demonstrated the designers' desire for perfection, whereas MRP's approach differed as they took a more pragmatic and engineering perspective, taking a design, developing the product and launching it in the market. Consequently, the involvement of an external designer had the potential to extend the development time by concentrating on achieving a 'perfect product' rather than a commercial viable product. There was therefore a feeling within MRP that the process was one that was not wholly controlled by them. To ensure success of the product a relationship which would enable the transfer of knowledge from the designer and MRP had to be created. *"Steve gives us the design brief and it is Andy that works with him directly... which we have regular meetings on various aspects of the design on the technical design. Steve has particular experience in that type of product."*

In an attempt to reduce the frustration of involving external people within the NPD process, MRP attempted to look internally within the company by conducting a brainstorming session. This was restricted to the senior management team. Involvement of the whole of the organisation was discounted, dismissing the value of different perspectives and experiences. The purpose was to try to identify products that they could develop using their expertise in electronics subcontracting. *"A number*

*of ideas came out of the brainstorming session, there were six suggestions and through discussion, the result was that the ideas were reduced to three. Those were: noise cancelling headphones, remote door chimes (cordless)<sup>2</sup>, water conditioner (an electro magnetic device that clamped around water supply break down and preventing scaling).”*

The outcome of the brainstorming session was that essentially three ideas were taken forward from a number of selected ideas. Upon further research MRP found that the water-conditioning device could not be taken any further, as an existing company already had a very good design that was protected by patents preventing any further development. Research revealed that the door chimes product was not a viable concept as it was not something MRP could advance any further than the market leader. Ultimately, the noise cancelling headphones (Section 5.3.3) was the product that was developed, and at the time of the interviews it was at the prototype stage but was experiencing some technological problems. The success of the brainstorming session was debated within MRP, being viewed more as a failure than a success, the notion of the development of the noise-cancelling headphones being somewhat dismissed. The idea of a future brainstorming sessions was not something that had been considered necessary to continue to fuel the idea pipeline.

### **5.5.3 Culture**

The culture of MRP in terms of innovation and new product development was somewhat disjointed. The view was that MRP was interested in the concept of NPDP and throughout the years had invested money into projects; conducting market research into ideas, developing the ideas, prototyping the concepts and even taking some of the ideas to market trails. Whilst it was conceded that in the past it was the fact that the market upturn which had prevented MRP from continuing with their plans to develop new products, *“now there is the impetus to do it, we will have to change.”*

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<sup>2</sup> Discussed this idea but MRP couldn't produce anything radically different to what was in the market, the market was already saturated with cheap product.



As a consequence of the past attempts at NPD, it was perceived that there was “*a culture of innovation already, we are expected to come up with ideas and solutions and to think laterally... come up with the best way, no boundaries.*” The engineers had already worked on ideas and problems for MRP, but they were not involved in the innovation process as it was “*not their brief, they are not told to think of new products. They are not coming up with new products because they are not pointed in that direction in the first place.*” The judgement was that the role of innovation was one that was the responsibility of the senior management team, and the main feeling was that “*just that at the moment it is too early to change; we are just at the beginning.*” By their own admission, this was not to say that this would always be the case. “*We will have to bring the engineering department earlier, much earlier into the process of product development.*”

#### **5.5.3.1 Training**

Outside the realms of new product development, MRP appeared dedicated to providing their employees with training and up-skilling them; processes which often meant working with MRP’s suppliers. The rationale behind involving suppliers in their training programme was that “*they often know how the machines/programmes work better than sending people on training courses, they work with it everyday, day in, day out – therefore have a better understanding of how it works.*” MRP’s intention was to provide their employees with the best possible knowledge that they could.

#### **5.5.4 Top management**

The philosophy of the top management within MRP was such that the Managing Director felt that it was his responsibility to “*come up with ideas and make it happen... encourage people to think in that way.*” More specifically, the Managing Director saw his role as that of a facilitator and a champion in the process of creating a NPD capability; to have an entrepreneurial spirit and enable the process of new product development to become an integral part of MRP. The people who owned the company (Mike, Managing Director and a silent business partner) were instrumental in pushing forward the concept of new product development and were always on the lookout for new ideas that could be introduced by MRP. “*Mike (Managing Director) and Gerald (Mike’s silent business partner) have always been on the lookout for new products that they could develop, looking at adverts where people have product ideas*

*for sale.*” The main ambition for the Managing Director and his company was for MRP to continue to grow; it had *“never been a problem before but in the future it will be”* and MRP were turning to NPD as a way of proceeding up the value chain to pre-empt any periods of downturn.

#### *5.5.4.1 Top management team*

Although the Managing Director was key to creating a NPD capability, he relied heavily on his other two directors (see Table 5-1), and it was these three people who were instrumental in driving forward the concept of new product development. Specifically, the task had been placed on the directors, especially the Technical Director. His job role incorporated the responsibility for driving the development of new products through the company, and it was his experience of the manufacturing process that appeared to be invaluable to MRP in achieving their goal.

#### **5.5.5 Individuals**

This section of the case study was limited in that, as highlighted previously, MRP were reluctant to involve people outside the top management team in the NPD process. Therefore, the possibility of discussing the involvement of other people outside the top management team was restricted. At MRP’s own admission, they felt that they had competent engineers capable of realising the process of new product development. Whilst they had already worked on some of the new product development project, a holistic approach, which involved the engineers, was not forthcoming; something that was recognised and would change over time. It was suggested in the interviews that the engineering team were *“more than capable”* of aiding the process of developing new products, as was true with the sales people.

#### **5.5.6 Marketing**

The role of marketing and sales was one that involved working with existing customers and targeting new customers; *“talking to existing customers and finding out if they aren’t happy with their other manufacturers.”* The role of marketing within the new product development process has been one that had been fairly limited to date, but it was expected that it would become more involved as MRP moved along the process of developing their own products and progressed towards product launch. However as previously mentioned in this thesis, the biggest marketing problem that

MRP had encountered to date was focusing on which market to choose. This issue could be helped by marketing taking a more proactive role within the first steps of the new product development process. Thus, by understanding the purpose and specification of the product, a good market-product fit was achieved.

With the attempts that had been made to develop new products, MRP had always been through a thorough marketing research exercise to determine whether a market existed. Investigations into customer requirements were carried out as well as research into the products that already existed. From the marketing research the concepts progressed to the development stage, and in the case of the hire equipment product, it had been trialled in the market place and was going through rigorous prototyping.

## **5.6 NEW PRODUCT DEVELOPMENT STRATEGIES**

Relating specifically to the research objective raised in Section 2.11, new product development strategies will be dealt with separately. This section seeks to understand the actual strategies that MRP employed to enable them to create a NPD capability through the analysis of the interview data. It was evident from the data collected from MRP that they utilised a number of different strategies, namely:

1. Outsourcing of design
2. Licensing
3. In-house development

### **5.6.1 Outsourcing of design**

As previously stated, MRP had no internal design team as it was felt that they did not have the requirement i.e. enough ideas, it was felt that *“we wouldn't be able to keep a design engineer in enough work ... there wouldn't be enough for them to do.”* The main point is that MRP felt that the design engineer would require more than one skill set to design the products required by MRP, and this was believed to be hard to achieve. Furthermore, the value of keeping a person in such a role full time was questionable. Therefore, MRP outsourced the design element, using a small number

of design engineers who provided them with ideas (e.g. the computer anti-theft device and the hire equipment product) and designed the products for development.

### **5.6.2 Licensing**

In the case of the hire equipment product, in order to develop the ideas and take the products to market, MRP agreed to license the concept from the designer. At the time of the case study this was MRP's preferred method of working. MRP worked with the designer on the product, which was the most well developed product that MRP had been involved in. At the time of the case study, the results were looking extremely positive, with the design "*just about done, with one already in the hire industry.*" Once complete, MRP will be responsible for marketing and producing the product.

### **5.6.3 In-house**

Even though MRP have utilised different strategies to outsource the front end of the NPD process, MRP themselves took control of the development aspect of the process. This was primarily because this was the area that was linked to their manufacturing capability. Eventually it was anticipated that there would come a time when they would have an in-house design team, but that was a future aspiration, and instead, the company used other strategies to develop their new product development capability.

## **5.7 SUMMARY OF FINDINGS**

The concept of new product development was not new to MRP. However, it was a capability that whilst MRP had always had a dalliance with, was never fully implemented. This was mainly due to the fact that it was attempted only when there was a downturn in the company's manufacturing activities. It was thus never a priority and was always relegated once manufacturing activities recovered. It had been felt over the previous eighteen months that this could no longer be the case, and a concerted effort to create a NPD capability was being made.

The external constructs (see Table 5-2) for MRP included:

- Networks
- Government agents

MRP was aware of their lack of creativity and internally to generate suitable ideas for the firm to develop. Therefore there was a heavy reliance on external people and MRP's own network to find new ideas, which enabled them to employ different strategies to create a NPD capability. This was further extended to government agents, and although at the time of the case this had not yielded any benefits, it was something that MRP were continuing to pursue.

The internal constructs (see Table 5-3) for MRP included:

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

Manufacturing was at the heart of MRP. There had been continued investment and improvement, some of which had been initiated through MAS-East in the form of the lean manufacturing project. Whilst manufacturing offered a source of knowledge and know-how to develop the products, in terms of idea generation it had the potential to act as a barrier due to the wide and varied customer base that MRP served. They were fearful of cannibalising their market, and were inclined to dismiss new product ideas.

Instrumental in the process of creating a new product capability was the willingness of the senior management team to learn and understand how new ideas could be brought into the company. It was this drive that arguably prevented them from reflecting on their capabilities and developing market opportunities for themselves. It would appear that the challenge for MRP was to continue to look in unexpected places to find new ideas. It was stated in the interview that MRP knew design engineers who could be used to carry out the work externally – the only barrier being the generation of the idea in the first place. Fundamentally, the Managing Director felt that as the leader of the company, his role was that of a champion to drive the

concept of new product development throughout the company. Therefore, finding ways of bringing the whole company on board, or at least the engineering and sales departments, was something that needed to be tackled, and utilising their knowledge and experience could prove a useful asset.

However, this supportiveness did not extend to the entire organisation. The interviews presented a disjointed approach to involving people outside the senior management team, preventing a holistic innovative culture within MRP. Whilst the senior management team understood the importance of NPD, the engineers were not involved in the process of generating new ideas, restricting the ideas pipeline, and thereby missing the opportunity to create a truly holistic, inclusive culture capable of supporting innovation.

As previously mentioned, MRP was active in gaining external help to generate new ideas for them to develop. It was the recognition that MRP did not have the in-house design capability that led them to seek an alternative strategy to generate ideas. MRP actively sought to leverage partnerships with people external to the company who generated ideas but did not have the necessary resources to take the idea to market. These partnerships offered the ideas that MRP lacked with a solution to enable them to develop their own products, which involved licensing the technology from the designer. It was in attempting this outward facing approach that led to ideas being developed. However, this dogmatic reliance on external people arguably may have prevented success from being achieved – the designers whose ideas they were may have a different agenda from that of MRP. MRP's desire was to take a product to market, whereas the designers maybe wanted to produce the 'perfect' product, thus slowing down the process or preventing it from reaching its market potential in the first place. In addition, MRP managed part of the in-house development as this gave them control over the process and utilised their manufacturing skills in the NPD process.

<b>NETWORKS</b>	<b>Contacts</b>	MRP understood that their strength was not as a design house, and so worked with design engineers who had expertise in that area. They also sought out patent houses and contacted them to see whether people required help in developing their products. This led to a contact with an employee of the patent house who had an idea of their own. It was suggested to MRP that people do not contact patent houses looking for resources.
	<b>Scouting networks</b>	These were used to generate ideas for MRP to develop.
	<b>General business networks</b>	This form of networking was not viewed positively; <i>“just another talking shop.”</i>
	<b>Universities</b>	This formed part of MRP’s idea generation. By linking in with current research MRP considered it would be a good source of ideas, for which the company could provide the funding to develop the ideas further.
<b>External agents – MAS-East and Gateway2Innovate</b>	<b>Provide advice on manufacturing and wider context</b>	MAS-East conducted a beneficial report and then conducted the lean project. Conversation regarding MRP’s future and desire to create a NPD capability guided them towards Gateway2Innovate and this research project (link with university).
	<b>Link between ideas and MRP</b>	Gateway2Innovate was an ideas clearing house – although it has not delivered any results yet, MRP are still in touch with them.

Table 5-2 Summary of the external findings for MRP

<b>MANUFACTURING</b>	<b>Rationale for manufacturing</b>	<p>Already built a capability for which MRP are well known and respected. Provide knowledge and expertise for developing new products, like a "hand and glove they go together."</p> <p>To continue to provide a quality service for customers.</p> <p>Limited market to develop new products for, due to the span of MRP's subcontracting business.</p>
<b>NEW PRODUCT DEVELOPMENT</b>	<b>Current capability</b>	<p>A number of projects had been developed before but had hit problems during the development stage. More recently, two products looked promising; "noise cancelling headphones" and "equipment hire device."</p>
	<b>Rationale for creating capability</b>	<p>NPD allowed MRP to the freedom of "being in charge of our own destiny" as well as "if you got own product then you have greater stability."</p>
	<b>Process of NPD</b>	<p>Ad-hoc and informal process. The NPD process was often interrupted by the entrepreneurs or designers who created the product. The lack of a holistic approach to NPD was demonstrated by the brainstorming session, which only included the management team.</p>
<b>TOP MANAGEMENT (including top management team)</b>	<b>Champion of NPD</b>	<p>Viewed as the Managing Director's responsibility to champion NPD, "to come up with ideas and make it happen, encourage people to think in that way." It was the Managing Director and his silent business partner who looked out for the ideas; "Mike and Gerald (Mike's business partner) have always been on the look out for new products that they could develop looking at adverts where people have product ideas for sale." Role to aid the Managing Director in driving the plans for NPD into reality, they provided insight and expertise in manufacturing and the customers.</p>



<b>CULTURE</b>	<b>Culture of Innovation</b>	The culture within MRP was disjointed; a holistic approach was lacking and did not involve all people in the company.
	<b>Training</b>	With current suppliers <i>“they often know how the machines/programmes work better than sending people in training courses, they work with it everyday, day in, day out – therefore have a better understanding of how it works.”</i>
<b>INDIVIDUALS</b>	<b>Expertise</b>	Competent engineers – <i>“more than capable”</i> of aiding the NPD process, but under-utilised as part of the NPD process.
<b>MARKETING</b>	<b>Lack of skills</b>	Not previously had to think about marketing the final product to the end customer.
	<b>Role of Marketing</b>	Under-utilised at present, as sales had a much more important role to play in marketing, but seen to add value when the products were to be launched.

Table 5-3 Summary of internal construct for MRP

<b>NEW PRODUCT DEVELOPMENT STRATEGIES</b>	<b>Outsourcing design</b>	As MRP lacked ideas, the design element and generation of ideas was found from sources external to the firm. This enabled them to overcome the internal barrier.
	<b>Licensing</b>	By working with external designers it was necessary in the case of the equipment hire product for MRP to license the idea from the designer and pay him royalties. This meant that MRP could start to develop a new product and market it as their own.
	<b>In-house</b>	The two previous strategies were supported by MRP's in-house development team (the top management team) which provided MRP with control of the process, and also utilised their skills in manufacturing in the NPD process.

*Table 5-4 Summary of NPD Strategies for MRP*

## CHAPTER SIX – MAGNET APPLICATION

*This chapter presents the findings from Magnet Application, the third case study conducted in this research. The introductions cover the background and history of the firm, detailing the people interviewed as well as the past experience of new product development within Magnet Application. The main section of this chapter deals with the case findings, highlighting the key constructs and sub-constructs. The chapter concludes with a summary table of the key findings.*

### 6.1 INTRODUCTION

The case access to Magnet Application was initiated by John Christopher at MAS-East, who introduced this research to Simon, the Planning and Resources Manager. After the initial contact had been made between the researcher and Simon via email, and they had to be involved in the research, a meeting was arranged. The meeting took place between the Managing Director of Magnet Application, the Planning and Resources Manager and the researcher. During the meeting the background to Magnet Application was discussed, along with their plans for moving up the value chain. The meeting concluded with a factory visit that enabled the researcher to understand the context of the business. As a result of the meeting an interview schedule and dates were arranged. The people who took part in the research are listed in Table 6-1.

<b>Name</b>	<b>Position</b>
Simon	Planning and Resource Manager
Robert	Accounts Manager
Jeremy	Sales Manager
Richard	Managing Director
Alan	Production Manager
John	Engineering Manager

*Table 6-1 People interviewed at Magnet Application*

## 6.2 BACKGROUND TO MAGNET APPLICATION

Based in Hertfordshire in the UK, Magnet Application Ltd was established in 1964 in London as an agent for Arelec products, and was part of a group of three manufacturing units, with other sites based in France and the USA. Magnet Application became the first merchant of permanent magnets in the UK to offer customers a complete range of products. In 1991 production of bonded rare earth magnets commenced, which was a 'new to the world' process. Realising the rarity of finding a new product that was an easy area to move into, and with little competition, Magnet Application embraced the opportunity. Around 2001, a management buy-out was initiated and a change in ownership ensued with the new owners of Magnet Application and their American counterparts being Mac Application Group Ltd., who were backed by Lloyds Development Capital. This report will focus its attention on Magnet Application based in Hertfordshire, as it operates as a self-autonomous business group, and this is where the interviews were carried out.

As a consequence of the changes in the ownership structure, £250,000 worth of Magnet Application's manufacturing was moved to the US. This saw a reduction in manpower in the UK to roughly half, reducing the firm from 40 people to 26 people, with the consequence that *"we do rattle around like a few peas in a very big pod."* However, the situation was summarised as being one of a *"catch twenty-two"*; the options were either to move premises, which would cost too much, or to stay in the current premises, which was also felt to cost too much. The final decision was to *"stay and battle it out."*

In the past Magnet Application had major customers *"who were taking a million magnets a week."* As a result of changes in the magnet industry, these companies were no longer customers of Magnet Application. One example that was cited in the interviews was Phillips, whose decision to move their manufacturing base to Czechoslovakia resulted in Magnet Application no longer being one of their suppliers. Thus there was increased pressure from competition, mainly in China. *"The manufacturing side is now under very serious threat from China and other parts of the world."* The situation for Magnet Application was described as one where *"there are a couple of manufacturers that want to deal with a UK company but they are*

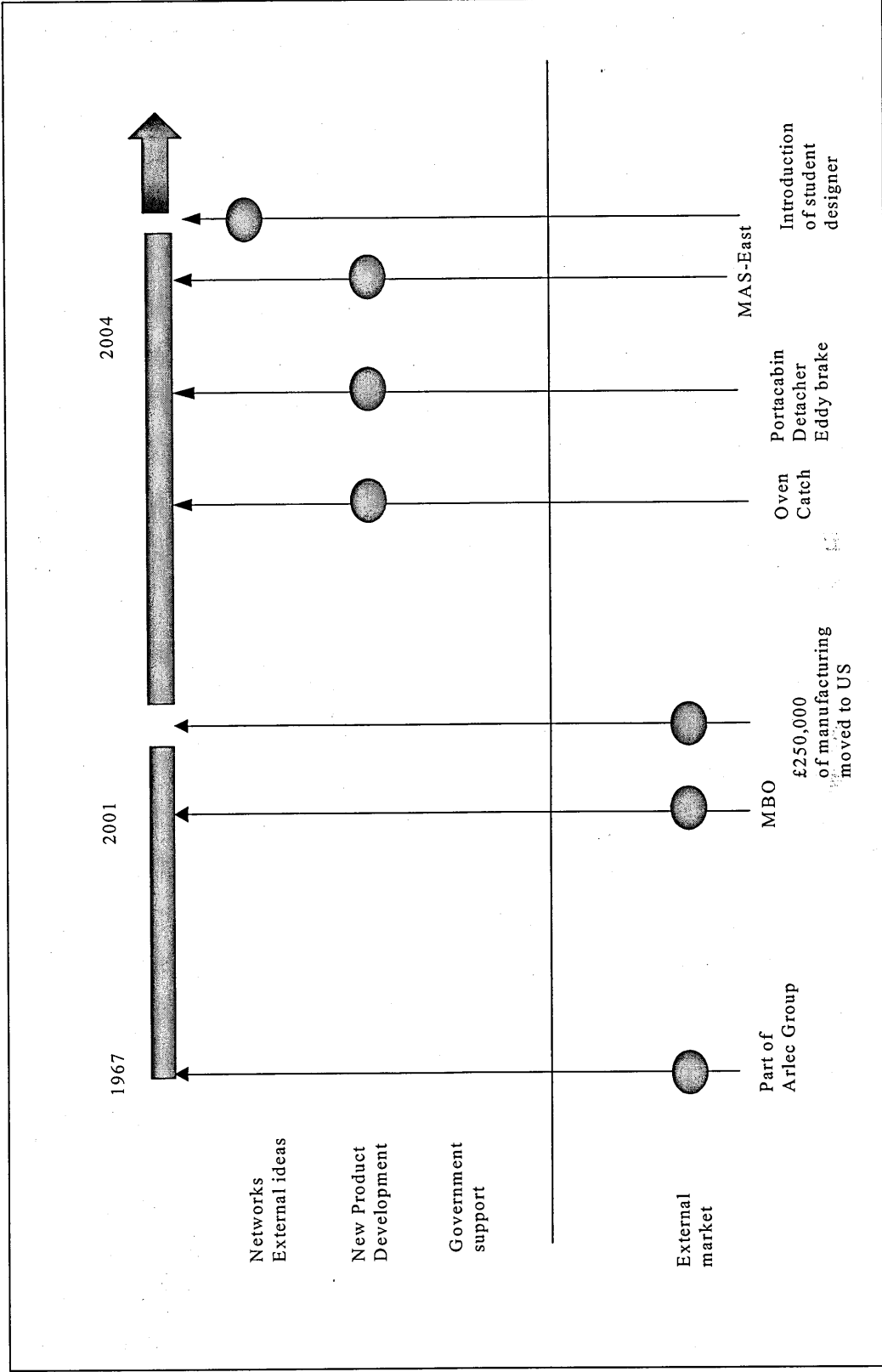


Figure 6-1 Timeline for Magnet Application

*small value companies.*” However, even the custom of these smaller customers was beginning to come under threat where “*in the last two years they (smaller businesses) have moved 60% of their buying to the Far East*”, the rationale being that these customers “*save so much money*” from trading directly with China. The result was that Magnet Application were faced with the situation of having to fight for any relevant business, but occasionally “*you think well we shouldn’t be fighting for this, it probably costs us more money getting the order than we are going to get back from it but you never know what is going to develop from it.*”

A turnaround in fortunes was being witnessed, as the customers who had initially moved their custom to the Far East (mainly China) were “*coming back.*” It was believed that the reversal of the trend was because most people could check whether the size of the magnet was right, but they could not check the magnetic properties. It was realised that a cheaper price does not always result in cheap overall costs. In order to check the properties of the magnet, extra resources were required to manage the process of purchasing from China. In addition, extra stocking holding facilities would be required due to having to conduct quality inspections and build reliability into the system, as there were communication barriers when dealing with firms in the Far East.

However, Magnet Application were not about to become complacent about their plans for the future, and clearly understood the requirement “*to put our own bit on, that is going to lock them in and whether that is done by good technical back-up or our own discreet products.*” The result was an understanding that value had to be added with a move up the value chain. This realisation “*you know the box that we are working in, isn’t bringing in enough income*” resulted in the decision to “*start looking outside the box.*” Changes were under way, through a two pronged strategy, firstly, of charging for their design services, and secondly, developing new products. By adopting the strategy, there was a positive feeling that “*we have held our ground, certainly sales turnover is starting to go up, which is down to new products.*”

The first element of their new strategy involved the fact that they could “*provide solutions*” as their customers often knew the end point they wished to achieve, but not how to achieve it. In the past Magnet Application had provided free advice, but

changes in their fortunes and their new approach meant charging for the provision of solutions; *“we have got to provide them the product to that solution.”* The future strategy Magnet Application were working on was to *“make out money from offering that service ... offering the design side, prototyping, demonstration versions.”* By providing a design service, they also created an outlet for their manufacturing facilities. Magnet Application realised that *“customers don’t want to assemble things, they don’t want to put magnets on steel hooks”*, and for the first time Magnet Application found themselves working with their customers to design products which they could manufacture and assemble for the customer.

In the past it was conceded that Magnet Application *“have never had a product of our own, you could argue the catches, but really they were Arlec.”* One of the major effects of no longer being joined with Arlec was that the feeling towards new product development had changed to one of *“receptiveness.”* In the past when new products were requested from the sister company *“you are talking years and so we have got used to that culture.”* But there had been a growing realisation that *“you can’t continue, the magnet market is decreasing therefore you can sit there and watch your market decrease or you can do something about it”*, and Magnet Application had chosen the latter option. In a bid to change and re-focus, yearly management meetings have been introduced, which consisted of the senior management discussing the future of the company team over a weekend.

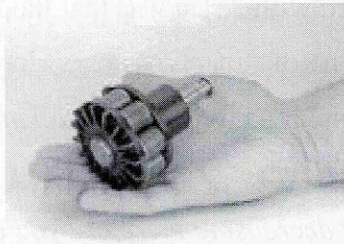
### **6.3 ATTEMPTS AT NPD**

Magnet Application was involved in six new ideas ranging from devices for the railway industry to products for the security industry. These projects were not new to the world products, but they were innovations for Magnet Application. The projects ranged from customer enquiries to projects that had been generated internally within the company. The four products that were discussed in the most detail in the interviews will be covered in the following section.

#### **6.3.1 Eddy current brake for car doors**

The fashion for people carrier vehicle was for them to be fitted with sliding doors. However, if the door of the vehicle were pushed open when parked on a hill, there

was the potential for the door to fall back on the person either entering or exiting the vehicle. Effectively the door acted as a guillotine and could potentially cause injury. The concept of Eddy current brakes (illustrated in Figure 6-2) was that it would slow the movement of the door so as not to cause harm to passengers. The problem was how to build such a door. Having been approached by a German manufacturer, Magnet Application had established the principles that were required, and designed one. The challenge that the company faced was in designing something to slow the door down. Once this had been achieved, it was considered “*relatively easy to do.*” At the time of the case study, Magnet Application felt confident of having an idea capable of solving the problem, and as a result, negotiations with the German manufacturer ensued.

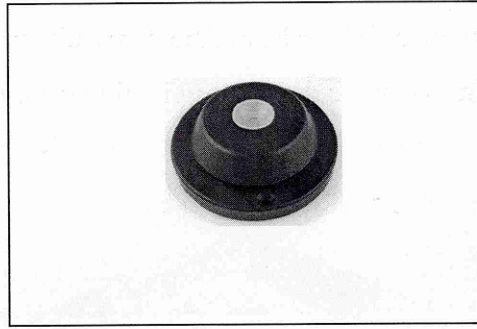


*Figure 6-2 Example of an Eddy braking system*

### **6.3.2 Detacher**

The detacher was a device to remove the security tags placed on clothes to prevent them from being stolen (illustrated in Figure 6-3). If a potential thief attempts to leave the store without having the tag removed, an alarm is triggered. This was not a new to the world product, but it was certainly a new product for Magnet Application. The concept was suggested by a salesman who joined Magnet Application from a competing company and suggested that the product had a potential market. Initial analysis indicated to Magnet Application there would a significant profit margin in designing their own product in this field. After working with potential customers, one customer had been secured. The product uses components from the Far East, as it was cheaper to outsource this operation, with the assembly taking place at Magnet Application’s premises in Hertfordshire. With further customers being sought, the product had become a successful revenue generator.





*Figure 6-3 Example of a detacher*

### **6.3.3 Oven door catch**

The original concept for the oven door catch stemmed from *“an enquiry about six months ago (September 2003) and that sort of prompted thoughts of either we could develop something.”* This demonstrates Magnet Application’s ability to be receptive to enquiries from the market and to act accordingly. The idea was considered because *“we know a lot about catches and we were already working with the people that manufacture ovens.”* Furthermore, the argument for this product was *“from a cost view, it is quite cheap for us to do and we have got all the skills.”* In its infancy Magnet Application were *“still at the stage of assessing the market and the market needs.”* Whilst it was a concept to which Magnet Application were fully committed, through attempting to talk to manufacturers of ovens, and assessing the market – there was a sense of reality in their approach and an awareness that their resources were thinly spread and they could not afford the luxury of time *“to spend six months or a year spending lots of money to find out that we are ten times dearer than what can be brought in from somebody else.”* At the same time, they appreciated that the project had to be thoroughly researched, and asked questions such as *“is there a market for oven catches? Are there people already supplying oven catches and if they are, can we be competitive against them?”*

Research revealed that many oven door catches were mechanical, which had its own set of problems such as wear and tear. Through the original customer who had raised the enquiry about the product had previously used mechanical catches, *“we were able to ascertain what the market cost was.”* After initially contacting potential customers to understand their requirements and parameters, one company had agreed to a

meeting, while two potential customers had to be chased. An example of the type of catches that Magnet Application were developing is illustrated below in Figure 6-4.

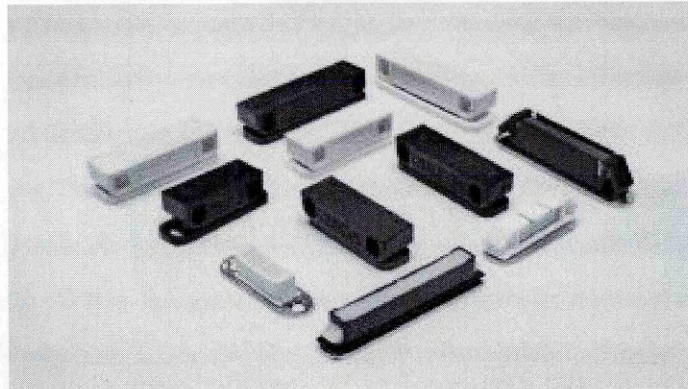


Figure 6-4 Example of oven catches developed by Magnet Application

#### 6.3.4 Portacabin

Perhaps one of Magnet Application's most exciting yet challenging projects was designing a range of products for Portacabin. It had been Portacabin's approach to its own product that created the opportunity for Magnet Application to develop an office stationary range. Magnet Application felt that Portacabin had *"a product that needs filling out,"* as their product range did not simply consist of *"tin huts for building sites, they also make school rooms etc."* The main issue that Portacabin faced was that *"they get very upset when people drill holes into them for cabling and anything"* mainly *"because it can let water in when you move it from one place to another."* As the cabins were manufactured from metal, the creation of a range of magnetic products would eliminate the need to drill holes to fix things to the wall, thus providing a solution for Portacabin and a market opportunity for Magnet Application

Having identified the market, Magnet Application's sales manager made visits to Portacabin, *"asking them what else they want and their attitude is, what have you got? Well what do you want? Well what have you got."* This created a situation which Magnet Application realised that they needed to take control of by taking the initiative and developing a range of products. The early analysis of the project revealed the potential for it to be lucrative, as every time a Portacabin was moved, there was the potential to sell a new range of stationary products to a new set of

customers. Magnet Application's main concern regarding this project was their ability to design the product to be aesthetically pleasing.

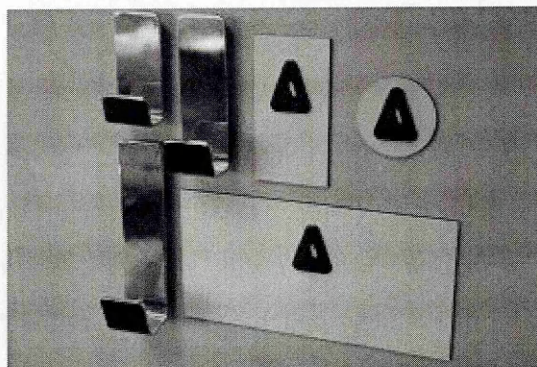


Figure 6-5 Example of the type of product designed for Portacabin

## 6.4 EXTERNAL

This section examines the external constructs and sub-constructs that emerged from the case study findings. The findings deal with the external networks that Magnet Application have 'tapped' into to combat any resource constraints suffered by the firm. This section also includes government agencies, which refers to organisations such as the Manufacturing Advisory Service (MAS-East) and Business Link. In some cases Magnet Applications have sought to leverage information from these government agencies to enable them to create a NPD capability.

### 6.4.1 Networks

In the past Magnet Application had considered themselves to be "*perceived as suppliers of magnetic catches and other cheapo things for a lot of years.*" This view was rapidly changing and they were slowly beginning to build a reputation in the industry and gain respect for their services. It was felt that this change of image "*has got to continue.*" The change stemmed from becoming more actively involved in committees and societies related to the magnet industry. The involvement in external networks was believed to bring "*peripheral benefits because you get to meet more contacts through talking.*" One particular example that was cited illustrated the unexpected opportunities that arose from being involved in networks. Magnet Application became involved in a network relating to fine powders, which included a

company called Indesit. Originally Indesit were involved in the network because of their connections in the refrigeration industry. However, they were also manufacturers of ovens, which provided a useful contact for Magnet Application's new product – the oven catch.

In addition to industrial networks Magnet Application had connections with a number of universities, but Sheffield University was an important contact, because *“we supply them with a lot of magnets and bits and pieces.”* Furthermore, through this connection other avenues of business had been generated for Magnet Application. *“They come straight to me and they will say that this is a project for Huntley Technology and eventually we get an order from Huntley Technology direct.”*

Magnet Application found that utilising networks and being able to leverage other people's knowledge was extremely useful *“because at the moment the couple of us who are principally doing it (developing new products) we find ourselves into areas where we're not really experts ... we have had a couple of instances where we have chosen the wrong thing.”* It was during these instances that Magnet Application were able to tap into the knowledge of the people they knew. *“Usually I know somebody who can tell me or Alan knows somebody that can tell him and we are going that way.”* Using the expertise and advice of other people was invaluable to Magnet Application's development process. The case study revealed that these networks often stemmed back a long way, even *“back to college days”* and with past working colleagues. The benefits enabled problems to be hurdled through by knowing the right people in the right place. *“Sometimes you need someone with a 3D system and you only have a 2D system and you can usually get them to do it.”* It would appear that this was often carried out by unofficial means, which meant that work was done faster, and possibly cheaper.

#### **6.4.2 Government agents**

Magnet Application used government agents sparingly, with a degree of scepticism surrounding them. *“You are always getting people ringing up offering you training schemes or trying to sell you something.”* Refreshingly, Magnet Application did find the services of MAS-East of benefit, but finding out about their services was completely by chance. *“I just got a phone call out of the blue to ask if we would like a*

*day's free consultancy. I nearly said no because you get a lot of phone calls to say do you want something for free and you wonder what is it going to cost us."* The experience with MAS-East was considered very different, with the consultant *"picking up straight away that our problems were not in manufacturing, it was getting work into the plant."*

Rather than utilising government organisations for their knowledge directly, Magnet Application used government awards and grants to their advantage. *"We have an award that helps us with the design side, we are using that so that is useful because it would be something that we couldn't afford.. we wouldn't want to pay out for"*, which was partly funded by the government. Magnet Application also became involved with Cranfield University in the context of a SPARK award to look at developing the manufacturing side., as well as investigating the grants for innovation available from BETA Crafts; *"I think they are useful and we do use them."* Magnet Application was also involved in a DTI sponsored project called "Powder Matrix", which they found had good networking results. The network was for powder and patent companies, which covered a large field, as well as involving Oxford University, Birmingham University and Leicester University. The purpose of the network was to identify the problems associated with powder. The consensus regarding the project was *"that we have definitely gained from it, they might not have answered any questions fully but they have allowed us to move forward."*

## **6.5 INTERNAL**

This section presents the findings within the internal construct that were found to enable a NPD capability being created within Magnet Application. From the interview data that was analysed there were six sub-constructs that emerged from the data. The sub-constructs were found to enable Magnet Application in creating a NPD capability.

- Manufacturing
- New product development
- Top management
- Culture

- Individuals
- Marketing

### 6.5.1 Manufacturing

Manufacturing was a key element of Magnet Application's business, but due to the recent management buy-out, changes had taken place, with a large portion of the manufacturing being moved to their US counterparts. Therefore the volume of manufacturing now dealt with had dramatically reduced and Magnet Application were seeking ways to utilise their manufacturing capability.

#### 6.5.1.1 Rationale for manufacturing

Continuing with manufacturing was considered vital as *"I don't think that people want to have the (manufacturing) capacity now, because if you are buying all the bits in and you have just ten guys putting the final assembly together, if things start tailing off you just stop buying, you haven't got a huge problem of making 500 people redundant."* It was envisaged that this would provide Magnet Application with a real opportunity as these firms were willing to pay for firms that were capable of *"providing their expertise."* Further benefits were acknowledged, as it was conceded that there was a *"kudos"* that went with manufacturing and a level of skill that would ordinarily have been missing from the company. *"If you have not got an engineering background, talking to sub-contractors is very difficult... we have got the skills to do the drawings as well, we have got an in-house capability."*

The consensus was that Magnet Application would *"love to think that we could still manufacture."* However, there was a realisation that on certain products currently being developed internally such as the detacher, the manufacturing of some of the components would have to be conducted abroad, as there were cost implications and Magnet Application could not always compete on a low cost basis with companies in China and the Far East. However, it was still their plan to carry out the final assembly.

From a broader perspective, Magnet Application explained that a small shift in the market was being witnessed. There was beginning to be a small yet significant change

in attitude, with some firms only wanting to deal with people who were manufacturing or assembling in the UK/Europe. One example was Bosch; *“they wouldn’t want to make it in China, they would want it made in Europe”*, providing Magnet Application with a significant opportunity to capture elements of the business from like-minded firms.

#### *6.5.1.2 Investment in Manufacturing*

Investment in manufacturing was recognised as an essential requirement, especially with the move towards more complicated engineering work. There was an understanding that *“under the current regime it could be a problem, purely because we are funded by venture capitalists.”* Whilst there was clearly a case for investment, there was a fear that funds would not be made available. Faced with the interesting dilemma of having to upgrade some of their current resources to be able to provide the services they wished, the company created a small engineering workshop *“with second hand equipment which is quite adequate for what we are doing, but it was never intended for production.”* This situation illustrates the resource constraints that the firm faced, as initially the workshop had been created to *“support ourselves to scale our customer samples quickly ... but now we find that we can’t do it because the lathe is tied up for the next two weeks so we have got to extend those engineering facilities.”* Key personnel were very much aware of the constraints caused by the changing role of the firm *“from a straight-forward manufacturer of magnets ... to a small engineering shop that is now bursting at its seams as we are becoming an engineering company”*, as well as understanding the problems that it would cause.

#### *6.5.1.3 Role within new product development*

The role that manufacturing played within the NPD process was only witnessed within the top management team. The Manufacturing Manager was a key advocate of moving up the value chain by creating a NPD capability, even championing his own NPD projects. Unfortunately the employees in manufacturing were not involved in these projects, other than in creating prototypes and samples. However, this could be attributed to the embryonic nature of the NPD process. As the section on culture (Section 6.4) will highlight, Magnet Application were an inclusive firm.

#### *6.5.1.4 Barriers to new product development*

The market that Magnet Application served was so varied that this did have the potential to have a negative effect, as they were unsure of which market to concentrate on. This was demonstrated through a mixed approach to manufacturing which they were struggling to support. With Magnet Application's standard manufacturing process designed to deal with high volumes, the reduction in manufacturing output, and a change in their strategy, the objectives for manufacturing were changing. Smaller volumes were planned, and manufacturing would have to deal with prototyping and testing. A small engineering workshop had been created but this was under-resourced and there was little hope of new investment.

### **6.5.2 New product development**

New product development was a completely new concept for Magnet Application. They realised that only through developing new products could the business fill a gap where its US counterparts had taken a proportion of their manufacturing processes as well, as added pressures from global competition. Magnet Application had been proactive in attempting to develop at least six projects.

#### *6.5.2.1 Current new product development capability*

The current capability for developing new products was limited within Magnet Application. As previously acknowledged, developing products had always been the responsibility of its sister company Arlec. Therefore the experience of developing a new product was indeed a new phenomenon for Magnet Application. In general it was felt that the journey of creating a new product development capability was about *"making small steps to push it all along ... it is a very slow process."* There was an air of trepidation around the NPD process at Magnet Application; *"It has taken two years, we are always talking about it"*, or at least until recently, when a new sense of urgency was felt. This was not to say that they had not had any success, as the detacher product had been developed and was being successfully sold in the market, with further customers expected. Other products were being developed, illustrating their ability to keep the NPD pipeline flowing.

Due to the size of Magnet Application, people resources were often stretched, but there was a sense of pulling together, and while frustration was felt that jobs were



delayed and did not progress as quickly as would have been ideal, the end result was achieved. *“We are fairly stretched, particularly in sales; we have four people who want to see you and you can’t get to see them for another three weeks.”* Further stretched resources were considered to operate as a barrier to NPD *“Time is spent keeping existing customers happy, keeping future potential customers happy, reporting side internal management happy ... they say well what are you doing for the long term future, you know I want to make sure that I am keeping this week happy never mind two years time.”* There was a recognition that there were good people, but that a lot of the experience *“is not freed up.”*

#### *6.5.2.2 Rationale for new product development*

The rationale behind developing new products was clearly understood within Magnet Application. *“If we don’t it will slowly wither because people don’t want to buy a magnet to assemble, they want the finished thing.”* The competition from low cost competitors was pulling customers who were attracted by the perceived savings that were to be gained away from Magnet Application, reducing the company’s customer base. Furthermore, the decision by the group that owned Magnet Application, which concerned moving a large portion of manufacturing to the US, created a further shortage. Therefore Magnet Application realised that a solution was required, which took the form of developing new products.

#### *6.5.2.3 New product development process*

Overall, the process of developing new products was summarised as *“challenging”*, with the whole company facing what was described as *“a painful learning curve, steep, we get better with all the mistakes.”* Despite the pain there was an air of excitement in what Magnet Application was trying to achieve. *“It is an interesting product (magnets), there are few people outside the industry that recognise what magnets do.”* The main challenge facing Magnet Application was that in the past they had not been faced with having to play a proactive role in product development. *“Up to now it has generally been the case of this is what the customer wants and the customer says they need this.”*

There was a steady realisation that NPD required focus and clarity throughout the entire process. The main concern centred on the front and back end of the project

which mainly related to marketing issues (reviewed in Section 6.5.6). However, to summarise, the concerns related to how to identify ideas and how to find and sell to customers, raising questions such as “*we need to think about what is going to sell, what does the market want.*” Anxiety was also evident in other aspects of the development process, including the design phase. “*What are the ergonomics involved ... does it have to conform to any legislation, what about health and safety?*” Being fully aware of the issues they faced provided them with the knowledge that “*we have got to start building that into the system.*” However, undaunted by the arduous task ahead, there was an air of confidence in that “*people produce new products all the time so there are systems there, it does work, we just have to learn about back up systems.*”

Attempts at new product development were sometimes felt to be frustrating, especially the areas that were the least familiar to them, such as generating ideas through new methods such as brainstorming. There was a feeling that more often than not it wasted time and little was achieved; “*the grand sum of our hours brainstorming session and three cups of coffee.*” The frustration came from the difficulties of facing this situation for the first time; after generating potential ideas “*then you eliminate them one by one and then end up with a blank board.*” The case study highlighted the fact that Magnet Application were in danger of “*running before you can walk*” and expressed concern that “*we haven’t got this blue sky approach*” rather sticking to products that were familiar to them. Magnet Application felt that there was a requirement for “*something that no-body else had thought of, to start a craze*” but as they progressed with developing new products from their position of little experience, the realisation of how difficult this was began to emerge.

Despite being at the early stages of creating a NPD capability, Magnet Application was attempting to bring elements of formality and discipline to the process. This was illustrated through the daily meetings that communicated the developments in the projects, creating awareness of what was happening. Furthermore, Magnet Application embarked on being more proactive with customers, approaching potential customers with new product ideas – as with the oven catch concept. This change towards “*telling the customer this is what they want rather than waiting to see what the customer wants ... it has been a big culture shock and it has taken us some time to*

*learn how to do that.*” Through the process of visiting potential customers Magnet Application had begun to build an appreciation of what was required; *“what the spec is.”* But the company were aware of the balancing act required between listening and understanding the customers, whilst maintaining ownership of the product. *“The danger of going to the customer and saying look we can offer this and that, is he suddenly starts saying well it would be nice to have it in that colour and suddenly your spectrum of opportunities grows and you can’t control anything.”*

#### *6.5.2.4 Lack of resources*

As previously highlighted, Magnet Application were concerned about the ability to design an aesthetically pleasing range of products for Portacabin. In response to this dilemma, and through its contact with the local university – the University of Hertfordshire – Magnet Application employed one of the design students over the summer of 2004. This enabled them to bring in a resource that was cheaper than a fully qualified designer, yet have the opportunity to witness what a designer could do with their products. The benefit also extended to the student, who would have the experience of working on a full product range.

#### *6.5.2.5 Future for new product development*

Magnet Application recognised that in order to move up the value chain through creating a NPD capability, investment was required. The main area of investment was in their technical resources, a process which had occurred fairly recently. The investments enabled new mathematical ways of designing elements of the products, as well as improving the analytical and numerical processes that were used. The future strategy for Magnet Application recognised the requirement of building internal resources, but the requirement to assess was beneficial. *“It is good because it makes you really assess, you need to think through the way that the company is going.”* Furthermore, to aid their technical resources it was necessary to invest in bringing in a person with the right skill set.

### **6.5.3 Top management**

The Managing Director of Magnet Application took a dual role within the company *“I am an investor ... I am a facilitator for actions.”* The role of facilitator was considered to involve enabling *“actions to actually happen and for trying to form the*

*environment that people can put forward ideas.*” Ultimately the goal was for people within Magnet Application to *“feel confident in putting forward ideas, but not just ideas but ways of having things happen and then ensuring they do happen.”* Finally, the Managing Director saw his role as one that involved recognising changes in the market and making decisions regarding *“whether we want to follow that route or beat a different path”*, which is arguably how the concept of product development was initiated in the company.

The interviews with Magnet Application revealed that the Managing Director’s style was inclusive and heavily involved his management team. The view was that *“I am not the expert, I don’t know everything”*, and he therefore appreciated the wealth of experience that surrounded him. Rather, he orchestrated his management team, allowing them to impress upon him their views of what the firm should do and which direction the firm should move, as Section 6.5.31 illustrates.

#### *6.5.3.1 Senior management team*

From the interviews was the strength of the management team. *“As managers we have all got different skills and all get on well as a team, we have disagreements, but they are healthy disagreements; everybody respects each other and their opinion.”* Fundamentally it was believed that it was the team as a whole that was driving forward the desire to move up the value chain, with all six members pushing the company forward equally. The consensus for the driver of change was *“that it is the team, I wouldn’t say that there is one champion ... we have just viewed it as a natural progression of moving on or adding value.”* The calibre of the team and their ability to gel was considered the real benefit. *“It is the management team, the way that we work here, it is a very select, intimate company and we have got a very select intimate team of guys around who have different responsibilities,”* arguably enabled by the transformational management style of the Managing Direction.

#### **6.5.4 Culture**

The role of new product development, and Magnet Application’s approach to it was one of change (as detailed in Section 6.2). *“The concept of building your own product rather than something you have been asked to make is a big culture shock.”* The changes to the firm and the individuals within the firm were considered minimal;

*“probably little has changed in our attitude.”* Initially it was not a process that Magnet Application were involved in, except the observations of how NPD was carried out in its sister company Arlec. But the culture had become one that resembled a firm faced with survival but determined to win. *“I think we are open to anything really; we have always been very flexible ... we are not very set in our ways if we can find a different way of making money then we will do it.”*

The culture at Magnet Application was one of openness; *“We have got sales and purchasing all together, so if a customer rings up people talk across the room about supply and deliveries”*, creating an open forum for communication. Reflecting back on the history of Magnet Application it was not always the case; *“People have been very departmentalised; they were responsible for there own little area”*, but there was a new emphasis on working together with *“everyone as a team, it is much, much easier.”* Importantly this extended throughout the company; *“everyone is familiar with the company, everyone is familiar with the problems that go on and what we are trying to aim for.”*

#### 6.5.4.1 Communication

Communication with everyone in the firm was key to Magnet Application, and helped in their desire to create an NPD capability. It was found that through communication, awareness was raised; *“Sometimes you don’t even have to do anything; just being aware of something makes it happens,”* simply by people understanding meant that a solution could be found.

Part of the communication was a series of meetings that were held throughout the year which enabled information and knowledge to be shared throughout the entire firm. The meetings that were conducted were:

- Twice yearly strategy meetings
- Monthly meetings
- Daily meetings

The purpose of these meeting was to help and enable the management team to drive the strategy of the firm. *“It is not the board of directors, its not the group that are*

saying that you have got to do this or you have got to do that; it's here, the local management team that say we need something and because it is us it is our responsibility of how to do it and how to fund it." This close connection extended to the rest of the company; *"Ideas could come from people on the shop floor or sales."* Whilst the daily and monthly meetings were not directly reported back to the employees outside the management team, the employees were informed of the outcomes from the twice yearly meetings.

#### 6.5.4.2 Learning

As part of the culture of innovation, Magnet Application were very much aware of the importance of learning. *"We are learning to talk to people or trying to talk to people who would be using the product, because they are the experts."* The needs and desires of the customer were very important to Magnet Application. This was extended to looking outside the workplace and looking for new stimulus. *"The only way to learn is by looking at what the customer wants or walking around Staples and looking around what people are buying."* Learning was also being enabled through their networks. *"We want to move forward by talking to the experts, Cranfield, the University of Hertfordshire or wherever."*

#### 6.5.4.3 Training

As an employer Magnet Application demonstrated a strong commitment to training to enable individuals to carry out their jobs correctly and through the introduction of systems such as 'Investors in People'. This ethos of training ran throughout the firm and was considered an important element, to the degree that *"I (the Managing Director) have had instances where I have put people up to the next level and they want to re-do a bit of training."* The rationale for the level of training was partly attributed to the fact that *"you can't advertise for a magnet maker, they don't exist."* Therefore, to readdress the skill shortage, at least within the factory, it was necessary to conduct their own training. It was important for Magnet Application to know and understand everybody's skills, from top management to the people who worked on the factory floor, *"from talking with them because we have reviews and make sure that we have these things checked and up-to-date."* This allowed Magnet Application to have a key understanding of their skill set, through which continued training and development could be enabled.

### 6.5.5 Individuals

The interviews highlighted the importance of individuals to Magnet Application. The innovation culture was built around individuals, and this acceptance helped Magnet Application to create a NPD capability. It was the belief that it was the expertise and knowledge within the firm that saw individuals enabling the process of developing new products.

#### 6.5.5.1 Investment in new individuals

Despite the recent need for redundancy, this did not prevent Magnet Application from employing new people into growth areas of the firm. There was an appreciation that to grow and be successful, there were areas that required strengthening through bringing in expertise. This was the case with Chris, who was brought in “*as a resource*” to aid in the development of a magnetising product which required electrical support as the product was dealing with very high currents. Without the addition of Chris the development of this new market was considered to be impossible.

#### 6.5.5.2 Expertise

The level of expertise within Magnet Application was acknowledged to be a key factor for its success. There were instances of people having been in the industry “*over thirty years*” admitting that “*people are going to struggle to find that length of experience,*” and the knowledge and know-how that goes with it. Furthermore, this degree of expertise was being used as a resource by employing it in a developmental role for the ‘newer’ staff members, and was considered key as they “*are the next generation.*” One potential issue that was raised was the lack of experience and expertise on the design side, mainly concerning the aesthetics or ergonomics of products. It was felt that past attempts were “*awful ... people look for smooth lines, colours ... we have not got the intuition inside.*” An attempt to solve the problem was sought by bringing a student designer into the company over the summer period, recognising the benefits of seeing NPD through a different viewpoint.

### 6.5.6 Marketing

Magnet Application had recently attempted to market their products in a new way, through an e-commerce site that had become *“a valuable tool.”* At the beginning very little was invested in its development but *“huge results”* were being realised; so much so that a new website was being developed, with Magnet Application willing to invest ten times more than the first time, although they had problems of how to resource the website, with them being a small firm it was felt that *“as usual we are trying to do it amongst the other jobs so it has been a bit slow.”* However it was felt to have had a *“big impact, we are getting regular business for the small volume.”* It was felt to be an excellent way of dealing with the small volume and did not intrude into the rest of the business.

However, there were elements of marketing that Magnet Application were struggling with and these were found to be related to two areas; the front end of the development process, concerning market research, and towards the end of the process dealing with direct marketing. The following Section 6.5.6.1 and 6.5.6.2 will examine the marketing difficulties faced.

#### 6.5.6.1 Market research

One area of concern for Magnet Application involved researching the market and knowing *“which markets are going to be available to us”* as well as the fact that *“it is really having ideas that is the difficult part and recognising where the market would be.”* Magnet Application were confident in their technical and engineering skills, *“it’s just the front end.”* Ideally they were looking for help and assistance with the market research aspects of developing new products. *“Somebody might come back and say I have done a big scan of all the domestic appliance market in Europe and they don’t want magnetic catches for one reason or another and you might pay £500 for that piece of advice or you might pay £1000 for it but if it saves you £10,000 in lots people running around trying make it then it is worth it, on the other hand it might come back and say well people would be interested in an oven catch if it could do this and that and if it met this regulation and if it fits within this small space that we have got available.”*



#### 6.5.6.2 Direct marketing

One of the major concerns within Magnet Application was *“how do you market ... if we came up with some fancy magnetic catches or hooks, coat hooks to hang on partition walls and all that, what would we do with it? Would we sell it directly?”*

Whilst Magnet Application had a strong skill set in selling to existing customers, the confusion was over how to market to new customers of whom they had no knowledge – a task that appeared to be quite daunting. Previously with their existing customers there had been an element of the customer telling Magnet Application what they wanted. However, seeking their own market brought with it the need to find the customer and then go and sell to them, without knowing how or who to sell to – a task which Magnet Application felt extremely daunted by.

### 6.6 NPD STRATEGIES

Magnet Application was developing their new products internally. This created conflict with the other pressures within the business *“because you have the day-to-day running of the jobs and everything else so we try and set ourselves goals.”* The rationale for developing the products in-house was that they felt that they all had the necessary resources in-house. Furthermore, there was a financial constraint placed on them because of the venture capitalist. The concept of using NPD as a survival mechanism was one that was decided by the management team, and therefore the pressure was on them to shoulder the responsibility. Previously there had been two internal strategies that Magnet Application had utilised to create a NPD capability.

#### 6.6.1 Design service

Magnet Application had always been involved in designing for their customers the parts of products that incorporated the magnet, and in part, this design capability provided them with the confidence to expand this operation. In the past it had been a service that was offered to customers for free, in the hope that it would bring work to Magnet Application. Increasingly Magnet Application were faced with the familiar situation of offering advice and even developing ideas with customers, only for them to source the product elsewhere. As part of their bid to move up the value chain Magnet Application realised the potential for this service and began to charge for it. The first year that Magnet Application started charging for the service was in 2004,

and they were unsure that what they were charging was aligned with market expectation; *“I suspect it is on the low side, but I don’t know until we have a year’s worth of trading.”* The idea of offering their design services was twofold; firstly, it would continue to bring revenue into the company and ensure that their costs of their services were recovered, and secondly, it would create a potential for future manufacturing work to be secured.

The element of design was expanded to include what Magnet Application called ‘project management’. Magnet Application realised that OEMs in particular were not interested in assembly; this was something they wished to move down the value chain, and Magnet Application welcomed this move. The aim was to be able to provide certain companies with a full package, from offering the design of the product through to the stock holding and inspection – providing the whole solution. The design element had become an integral part of Magnet Application, where the importance of design was summarised by the Managing Director. *“I can cope with manufacturing moving out to some extent if it leaves behind the design because we have worked with some these countries and probably could make a lot of money doing that but if that flows from there that could be more of an issue.”*

### **6.6.2 Subcontracting**

As Magnet Application became more involved in new product development, they began utilising their knowledge and experience of working with the Far East to their advantage, *“taking products and getting them tooled in the Far East so again it would reduce the cost to maximise the margins that has led to success with those products and we think that we can do that with other products.”* This was witnessed with the detacher product. The detacher was designed and assembled in the UK on Magnet Application’s premises but they took advantage of their contacts out in the Far East by sourcing the components more cheaply than they could have been manufactured by Magnet Application themselves.

## **6.7 SUMMARY**

Magnet Application was in a position in which the creation of a NPD capability was slowly beginning to regenerate the business. After a fairly recent management buyout

and subsequent changes to its customer base (with much of Magnet Application pressing work being transferred to its US partner) the company had to find new ways of generating revenue. Whilst completely new to the concept of NPD, it was its previous capability in design and manufacturing that was proving to be advantageous for Magnet Application.

The findings were presented as two constructs; external and internal. The external construct (Table 6-3) includes the networks and government agents that Magnet Application utilised to enable them to create a new product development capability. Specifically, networks were fundamental to Magnet Application, enabling them to improve their reputation, gain access to key players in the industry in which they were developing one of their new products, and aiding them in new technology areas. The role of government agents was one that was viewed with a degree of scepticism, rather than as a body of experts that could help Magnet Application. Instead, the company took part in government sponsored projects such as the Powder Matrix, and government awards.

The second construct reported on was the internal findings (Table 6-4) which included the manufacturing capability that Magnet Application had and was continuing to utilise as part of creating the new product development capability. Whilst investment was considered somewhat hard due to the corporate venture which owned Magnet Application, there was still a desire for manufacturing to be at the core of the company's strategy. The findings revealed that new product development was at an embryonic stage, yet its current NPD capability demonstrated that Magnet Application had had some success with their detacher product. Further projects were in the pipeline in a determination to combat the increased competition from low cost competitors. The area of new product development did illustrate that a formalised process was lacking, but this was recognised and strong communication enabled transparency.

Instrumental in providing the drive and impetus for creating a new product development capability was top management, and specifically, the top management team of Magnet Application. The joint response of the senior management team fuelled the desire to make the creation of a new product development capability into a

reality. The desire to create a NPD capability was aided through the culture that was seen to be developing; through the openness to communicate and learn. This was supported by a commitment to its staff and their training and development.

The findings from the case study highlighted the importance of individuals in championing the NPD process through their expertise which was being leveraged to create new products. Furthermore, this was supported by the introduction of new people to help Magnet Application take advantage of new growth areas. Finally, the interviews conducted at Magnet Application illustrated the importance of marketing, as well as the difficulties that the company experienced with respect to conducting market research and marketing to direct end customers. Prior to creating a NPD capability, marketing had not been a necessary skill.

The strategies used to create a NPD capability were dealt with separately and revealed that Magnet Application utilised two key strategies (Table 6-5) in addition to developing the products in-house, namely a design service, and subcontracting. The move towards charging for these services was becoming well respected and meant that Magnet Application were being taken more seriously, creating a demand for manufacturing. The second strategy utilised their existing contacts, taking advantage of the cost savings of manufacturing certain components abroad, as was the case with the detacher.

<b>NETWORKS</b>	<b>Contacts</b>	Over the years people at Magnet Application had developed a series of very useful external contacts, "usually I know somebody who can tell me or Alan knows somebody that can tell him and we are going that way."
	<b>DTI network forums (e.g. Powder Matrix)</b>	Powder Matrix – "they might not have answered any questions fully but they have allowed us to move forward."
	<b>Universities</b>	Cranfield University, University of Hertfordshire, University of Sheffield.
	<b>Conferences/trade shows</b>	Managing Director used these to determine the trends in the market, and used this to inform the direction of Magnet Application.
<b>GOVERNMENT AGENTS</b>	<b>Provide advice</b>	When Magnet Application did use government agents such as MAS-East, there were positive outcomes, "picking up straight away that our problems were not in manufacturing; it was getting work into the plant."
	<b>Sceptical view</b>	Magnet Application did always view government organisations positively. "You are always getting people ringing up offering you training schemes or trying to sell you something."
	<b>Grants and awards</b>	Magnet Application found that they utilised awards. "We have an award that helps us with the design side; we are using that so that is useful because it would be something that we couldn't afford we wouldn't want to pay out for."

Table 6-2 Summary of external constructs for Magnet Application

<b>MANUFACTURING</b>	<b>Rationale for manufacturing</b>	One of the main aims for Magnet Application was they would <i>"love to think that we could still manufacture."</i> Furthermore, it was perceived that firms were beginning to want manufacturing to remain in the UK, with some firms feeling that <i>"they wouldn't want to make it in China they would want it made in Europe."</i>
	<b>Investment in manufacturing</b>	Due to the MBO it was felt that investment could be difficult. <i>"Under the current regime it could be a problem, purely because we are funded by venture capitalists."</i>
	<b>Barrier to NPD</b>	A diverse market challenged Magnet Application as to which market to target. Changes in manufacturing objectives.
<b>NEW PRODUCT DEVELOPMENT</b>	<b>Current NPD capability</b>	As Magnet Application had not developed a new product before the experience was described as <i>"a painful learning curve, steep, we get better with all the mistakes."</i> Success had begun with the development of the detacher process.
	<b>Rationale for NPD</b>	Due to the current market situation it was deemed that <i>"if we don't it will slowly wither because people don't want to buy a magnet to assemble, they want the finished thing."</i>
	<b>NPD process</b>	Previously <i>"it has taken two years we are always talking about it."</i> The process lacked formality but this was being changed through strong communication in the daily meetings.
	<b>Lack of resources</b>	Within the design element it was felt that they did not have the necessary skills and resources to create an aesthetically pleasing product.
	<b>Future for NPD</b>	Investment in new processes to enable new products was planned. To enable Magnet Application to improve their aesthetic design they planned to employ the services of a student designer from the local university.

<p><b>TOP MANAGEMENT</b> (including top management team)</p>	<p><b>Champion of NPD</b></p>	<p>The role of the Managing Director was viewed as <i>"I am a facilitator for actions."</i> This was demonstrated through his transformational style which fully allowed the top management team to drive the creation of a NPD capability. The top management team was key in driving forward innovation, and specifically the development of new products. <i>"It is not the board of directors, its not the group that are saying that you have got to do this or you have got to do that; its here, the local management team that say we need something and because it is us it is our responsibility of how to do it and how to fund it."</i></p>
<p><b>Experience and understanding of industry</b></p>	<p><b>Experience and understanding of industry</b></p>	<p>The experience and broad skill set of the top management team was vital in creating a NPD capability. <i>"The managers... we have all got different skills and all get on well as a team, we have disagreements, but they are healthy disagreements; everybody respects each other and their opinion."</i></p>
<p><b>CULTURE</b></p>	<p><b>Culture of innovation</b></p>	<p>As Magnet Application had not developed a new product before <i>"the concept of building your own product rather than something you have been asked to make is a big culture shock."</i></p>
<p><b>Communication</b></p>	<p><b>Communication</b></p>	<p>Regular communication enabled an open culture to aid the creation of a NPD capability.</p>

<b>Training</b>	<p>There was a strong sense of the importance of training and development within Magnet Application. <i>"I have had instances where I have put people up to the next level and they want to re-do a bit of training."</i> Arguably this could be attributed to the fact that <i>"you can't advertise for a magnet maker, they don't exist."</i> Magnet Application's commitment to training meant they had detailed knowledge of the skill set within the firm, gained <i>"from talking with them because we have reviews and make sure that we have these things checked and up-to-date."</i></p> <p>Magnet Application's approach to new product development was summarised by their willingness to learn. <i>"We are learning to talk to people or trying to talk to people who would be using the product, because they are the experts."</i></p>
<b>Learning</b>	<p>People were viewed <i>"as a resource"</i> when developing new product; hence it was important for Magnet Application to invest in new people in important growth areas.</p> <p>Within Magnet Applications there was a wealth of experience that <i>"people are going to struggle to find that length of experience."</i></p>
<b>INDIVIDUALS</b>	<p><b>New people</b></p> <p><b>Expertise</b></p>
<b>MARKETING</b>	<p><b>Lack of skills</b></p> <p>One of the most difficult areas for Magnet Application to develop was their marketing skills, such as <i>"how do you market ... if we came up with some fancy magnetic catches or hooks, coat hooks to hang on partition walls and all that, what would we do with it? Would we sell it directly?"</i></p>

Table 6-3 Summary of internal constructs for Magnet Application



NPD STRATEGIES	In-house	
<b>Design service</b>		<p>It was felt that Magnet Application had most of the necessary skills required to develop new products. Therefore there was feeling that there was little need to look externally.</p> <p>A change in emphasis meant that Magnet Application had started to charge for their design service which <i>"has been really warmly received."</i></p>
<b>Subcontracting</b>		<p>When developing detacher it was considered an advantage to subcontract part of the manufacturing in the Far East, through <i>"taking products and getting them tooled in the Far East so again it would reduce the cost to maximise the margins... that has lead to success with those products and we think that we can do that with other products."</i></p>

Table 6-4 Summary of NPD strategies utilised by Magnet Application

## CHAPTER SEVEN – PERSEVERANCE MILLS

*This chapter presents the findings from Perseverance Mills, the final case study conducted in this research. The introductions cover the background and history of the firm, detailing the people interviewed as well as the past experience of new product development. The main section of this chapter deals with the case findings, highlighting the key constructs and sub-constructs. The chapter concludes with a summary table of the key findings.*

### 7.1 INTRODUCTION

The initial meeting to gain access for this case study was conducted with Julie, the R&D manager. Within the meeting, the history of Perseverance Mills was discussed, providing the context as to how the company had reached the position it was in at the time of the interview. This helped to identify the key personnel who would be useful to interview as part of the case study (detailed in Table 7-1). Finally, the meeting concluded with a site visit that gave an insight into the operations of Perseverance Mill. Overall the interviews took place over two days.

<b>Name</b>	<b>Position</b>
Keith	Managing Director
Julie	R&D Manager
Steve	Product Manager
Kathryn	Development Technician
Kelly	Development Technician
Hannah	Development Technician

*Table 7-1 People interviewed at Perseverance Mills.*

### 7.2 BACKGROUND

Perseverance Mills was established over a hundred years ago and employed approximately 230 people at the time of the case study. The majority of the people were employed at the Padiham site, with 80 people based at the site in Blackburn. The factory at Blackburn prepared warped yarn for weaving, from whence it was shipped to Perseverance Mills at Padiham, where it was dyed and then finished.

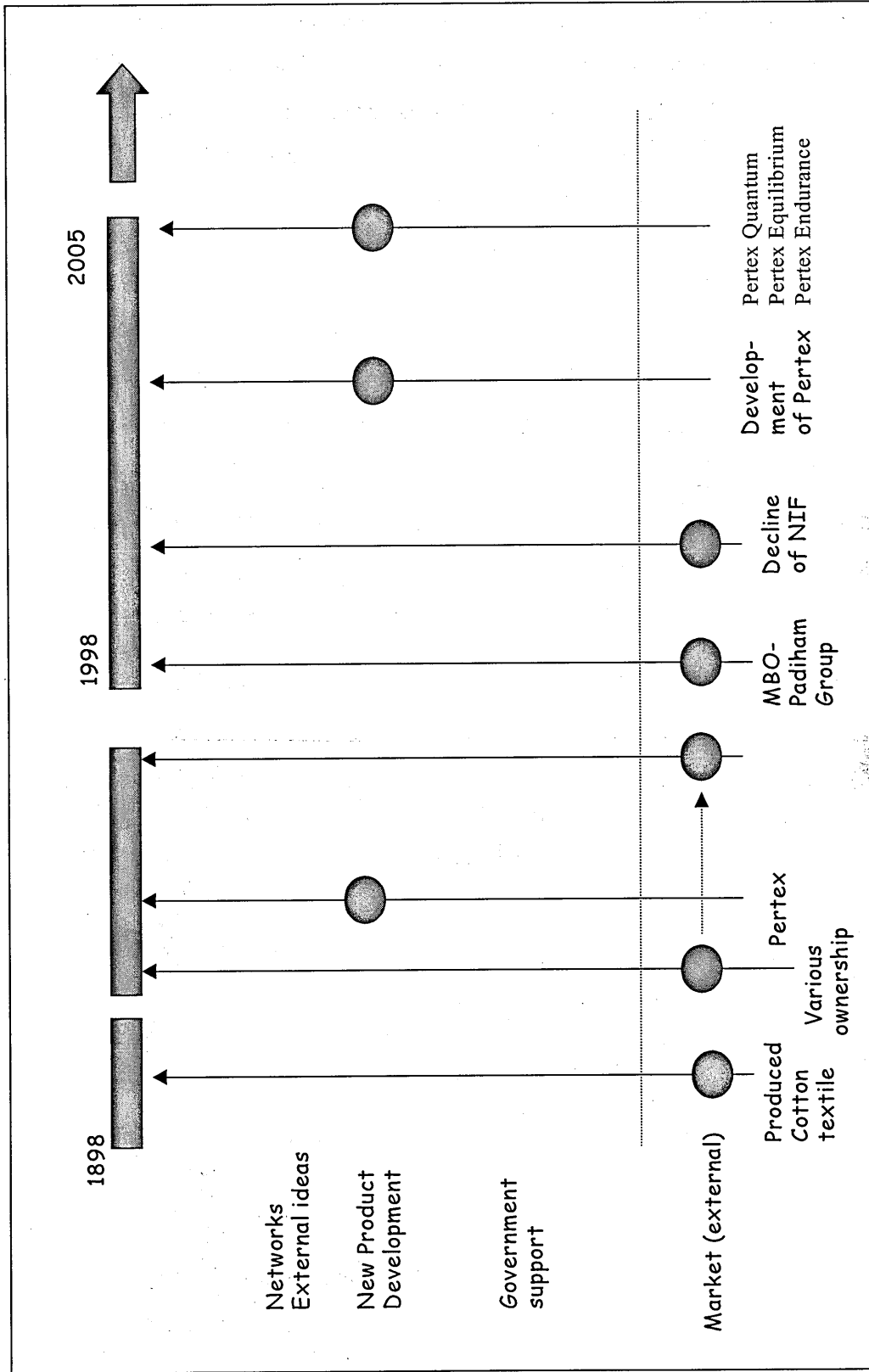


Figure 7-1 Timeline for Perseverance Mills

Over the years Perseverance Mills had been part of several groups, including RFD Group, which was involved in safety and survival equipment such as life jackets. During the late 1980s and early 1990s Perseverance Mills was part of a group of companies called SCAPA who specialised in industrial textiles, for example paper-making fabrics. In 1998 ownership of Perseverance Mills changed again through a management buy-out, which for trading purposes was known as the Padiham group. Alongside the takeover of Perseverance Mills, the Padiham Group purchased from SCAPA a packaging division that specialised in polystyrene packaging. Initially the Padiham Group managed both companies until 2002, when the packaging division was sold.

The traditional business of Perseverance Mills was producing nylon impression fabric (NIF); a material which when inked was placed in cartridges to be used for typewriter or print ribbon. This process was not carried out at Perseverance Mills. The company also manufactured parachute fabric for both military parachutes and sports parachutes. A derivate of NIF was Pertex, a branded outdoor material. Pertex was sold all over the world, the main markets being the UK, Scandinavia, Germany, Austria, Switzerland, Japan and the United States. The history of Pertex is dealt with in Section 7.3. Traditionally the market for Pertex was the outer layer of sleeping bags; however, this was beginning to change with a move into outerwear. Overall the positioning of Pertex was *“really anywhere where light weight is important because we’re (Perseverance Mills) known as specialist lightweight weaves.”*

During the 1970s and early 1980s Perseverance Mills considered itself to be *“becoming quite a serious player in this computer printer market”*, as it was recognised that there was a semi-boom in IT as *“printers were developing, everybody was getting into printers.”* Also around this period there was *“this Pertex idea coming into play into the equation.”* However, Perseverance Mills was suffering from an eclectic mix of products within the factory; *“We have still got a mill a factory producing all sorts of things.”* Mainly through reacting to customer demand, *“basically as people came to us and asked ‘so can you make this fabric and what will you charge for it’ so very reactive, not proactive sort of marketing effort, no outward R&D.”* With no real competitive edge, the consensus was that they were a *“typical textile manufacturing company and at that time without any vertical integration; no dyeing or finishing, and the yarn processing plant was a separate company.”* The only consistent product was computer print ribbon/NIF; *“the*

*only thread of consistency that perhaps runs through the company.*” It was at this juncture that *“there were starting to become some real things... we have got the computer printer part of the business, we have got parachute canopies fabric.”* But still there was little in the way of being proactive. *“We were exporting them (NIF) but we weren’t really out there driving it; we were very much reactive again because it was very much in boom that you could sit and wait for the orders to come in.”* On reflection of the company’s history it was felt to be *“so very different to what we have now.”*

During this part of the Perseverance Mill’s history it was felt that the organisation *“was very much run as a family business it was dead typically very old fashioned.”* However during the early 1980s a new Managing Director was appointed, *“a young lad, he was only thirty four when he joined us so quite young.”* He visualised that the business could not survive in the reactive state that it had been pursuing. It was acknowledged that *“we were doing all of it, anything, if somebody said can you cover our walls with fabric we would probably have gone in there and done that.”* It was felt that *“it was just like anything and everything that you could make.”* In a reappraisal of the organisation, the new Managing Director envisaged *“two real areas that we were specialising in; one was the computer print business and the other was parachute canopies.”* From that point on *“we geared ourselves up to be the leading supplier of those two predominant fabric groups; there were some exceptions but that was the main thrust of everything.”* Today Perseverance Mills owes the existence of its core products to this strategy *“because Pertex was very closely linked to the computer fabric; it was essentially computer fabric but dyed, so that came along with it.”*

Further changes to Perseverance Mills’ strategy was witnessed with the management buy-out. The Padiham Group encouraged Perseverance Mills to be more proactive in its approach to R&D. Prior to its takeover by the Padiham Group, it was considered that the laboratory at Perseverance Mills *“spent most of its time doing product testing for the factory and doing a bit of R&D, now we have a proper R&D team... they may help out in the lab but they are developing products for customers and developing products for us for the future rather than testing the products for ... so that was a big change and two years ago we took a further step rather than just develop things for specific customers which was the strategy of the company.”*

However, even with a more focused emphasis on R&D it was felt that the organisation was still *“quite reactive in what we did... if people said that a customer needed this then we would jump and do it so there wasn't a big plan there.”* It was deemed however *“over the years that we have been doing this we have seen that we have probably been too reactive and jumped around too much so it's a conscious decision”* for Perseverance Mills to set more structures in place to aid the strategy of R&D. The more proactive approach consisted of a *“three year plan to say this is what we should be working on ... this is what we are working on, and these are the customers that we would like to launch with ... we have it sort of planned out saying we will do this for this season and this for this season, so we are a little more proactive in looking for the opportunities and seeing things rather than just jumping when someone says jump.”* Whereas the parachute market was perceived as *“a more stable market and we are not seeing the same level of competition, probably because it is very demanding from a technical quality point of view.”*

The parameters that Perseverance Mills were competing on were *“performance and quality.”* The risk assessment was required to ensure the quality of the product, as the company was moving into high value consumer products. The end consumer was paying more than for the competitors' products, therefore the quality issues within Perseverance Mills had to be addressed. *“We can say that we are confident with it, different meterages and basically we need to do a lot more risk assessment than we were doing before we say yes ... we'll sell it.”*

### **7.3 NEW PRODUCT - PERTEX**

The development of Pertex has a long and chequered history, and only through chance was the product continued. Pertex had become an extremely important product to Perseverance Mills, and was at the forefront of their strategy. Initially it was *“a product that the firm could manufacture but whilst it was doing very well making nylon impression the senior manager in the company didn't really encourage the growth of Pertex although it was tolerated as a product that they could make and sell and it”.*

Around 1979, a man called Hamilton came up with the idea for the fabric that we now call Pertex. Hamilton's background was as a tent designer, and products such as the

Force Ten tents proved to be his inspiration. He concluded that the cotton fabric used to make the canvas was actually working by a different means than had previously been thought. Actually the fabric was transporting moisture through capillary action along the side. Hamilton's theory completely dismissed the textile industry's theory, which stated that cotton fabrics swell when they get wet, blocking the holes and preventing water from penetrating. Consequently, Hamilton's theory was completely at odds with the Textile Institute. It was his concept, however, that sparked the creation of a synthetic canvas that worked using the same capillary action as in his theory, producing a synthetic fabric from very closely woven fine synthetic yarns. Initially, Hamilton presented his idea to ICI fibres in Harrogate, a company capable of producing such a fabric. The verdict from ICI was it was a ridiculous idea, quickly pointing him to three weaving companies. Two of the companies were not willing to enter into the idea. Perseverance Mills were already weaving closely woven synthetic fabrics for the computer print industry (NIF) and decided they would be willing to work with Hamilton. From this point the history of Pertex has been bumpy, with Hamilton exploring the idea further for three or four years and marketing the idea – but no real success was achieved.

Perseverance Mills continued producing Pertex, but with a lack of interest, which was put down to the fact that it would involve *“quite a lot of investment.”* Pertex was a product requiring a complex dyeing and finishing process whereas nylon impression required no dyeing and little finishing. *“It is a product that we weave and wash, take the sides off it and slit it and send it out on rolls so there is no complex dyeing involved.”* Consequently, in *“the good days of nylon impression it was ‘why bother with Pertex?’ because we can make more money just churning out nylon impression.”* This strategy was advantageous until the NIF market started to fade; it was at this time that it was recognised that *“if we are not going to disappear as a business, what other products do we have?”* The conclusion was the company had two product areas, *“parachute was one and Pertex was the other obvious one which could be branded.”* So around 1996 *“the company was just beginning to recognise that nylon impression was starting to decline and starting to develop Pertex.”* However it was at this stage that *“there was no structure to R&D ... if there was a fight in production for producing Pertex or parachute ... so it was very much the poor cousin of a product.”*

When Perseverance Mills recognised that it was no longer the number one supplier in the market of NIF, it was *“when Pertex became less of the poor cousin, in other words, we stopped producing computer fabric and we actually designed our own Pertex fabrics.”* Whilst the parachute side of the business *“has grown... it is still a growing market share but the market for parachutes is unlikely to alter very much, the war may have an effect but it is essentially very stable, but we are gaining market share so that’s great”*. It was felt that *“Pertex is the one that has got to grow.”*

Since the decision to develop the Pertex brand a number of Pertex products had been developed and marketed, as Table 7-2 illustrates. The principle behind Pertex was a successful platform had been designed and through changing the density of the yarns, using different types of yarns and dyeing techniques, a number of product ranges were developed. These different product ranges could then be marketed to different groups within the outdoor market, for example Pertex Quantum is ideal for sleeping bags, and Pertex Endurance for the outer skin of windproof tops and trousers. Therefore the Pertex name was exploited for its brand, while at the same time providing different fabrics for different uses.





Pertex Classics encompasses a wide variety of fabrics whose advantages are proven by time. Since its first appearance more than 15 years ago until today Pertex Classic is the basis of Pertex technologies.

**Key Benefits**

- Special weave and finishing, with natural, cotton and hand.
- Wicking finish improves absorption of moisture and drying time.
- Rapid removal of moisture, leaving the wearer feeling dry and comfortable.
- Lightweight and breathable.



Endurance fabrics have one main objective - to provide maximum protection from moisture.

Pertex®Endurance fabrics are coated with a microscopic thin layer of hydrophobic material. This layer is so thin that it hardly adds any weight, nor does it affect the softness of the material considerably. One thing we learned from sleeping outside is that your bag tends to get wet. Pertex®Endurance fabrics have one main objective - to provide maximum protection from moisture. This works both ways:

- Pertex®Endurance keeps water, snow and wind out.
- Pertex®Endurance allows moisture to pass freely from the inside. This keeps your bag dry from condensation.

**Key Benefits**

- 100% windproof.
- 1500mm water column, highly water resistant.
- Very breathable, also at low temperatures.
- Moisture movement ensures the filling is kept dry.
- Winner of Backpacker Award 2003.



Pertex Quantum is the lightest fabric ever made by Pertex. It is a true featherweight.

**Key Benefits**

- Mass 30g/m2 (0.9oz/yd2).
- Composition 100% Nylon 6.6.
- 50% weight reduction (\*)
- 50% less packing volume (\*)
- Outstanding strength to weight ratio.
- Excellent durability in the field.
- Softness like silk that enhances the loft of the filling.



Pertex Microlight is one of the softest and lightest fabrics in the Pertex portfolio - essential when grams and ounces count.

**Key Benefits**

- Dense weave prevents excessive heat loss.
- Soft hand enhances comfort and helps the filling to achieve maximum loft.
- Lightweight
- Packs 25% smaller (\*)
- Surface moisture 'beads up' and runs off due to the water repellent treatment, keeping the wearer comfortable and dry.
- Downproof
- Windproof

Table 7-2 Description of Pertex products

## 7.4 EXTERNAL

This section examines the external constructs and sub-constructs that emerged from the case study findings:

- Networks

### 7.4.1 Networks

A strong and important element of the success of Pertex was the development of a relationship with the large outdoor manufacturers such as W. L. Gore, manufacturers of the brand Gore-Tex and other outdoor activity clothing. Such development of key relationships meant an expansion in the responsibilities of the R&D department which now involved *“looking after technical trails, problems with the plant that needed looking after, developing Pertex, but also having to develop for Gore”*, as a result of which the department had steadily started to expand and had employed three new team members. The development of these relationships relied heavily on the R&D department innovating, *“for the future, certainly of the Pertex, it is critical that we innovate”* as this was considered to be *“what keeps us in the frame as far as those people (Gore, Marmot, North Face)”* through developing new products and forming important alliances by *“joint marketing with them so we are persuading them all the time that it is worth playing a premium for our product.”* Through working with these companies very closely it has been advantageous on two accounts:

- Development of the Pertex fabric in line with customers’ demands
- Links into the market, creating a barrier for other companies

The ability to network and deal with customers was essential to Perseverance Mills as it was one of the ways that they built relationships with the key players. Part of their networking involved R&D personnel visiting trade fairs and conferences, something the business had made a firm commitment to. Importantly this provided them with an opportunity *“to meet the customers so they are not just sitting in a lab, so there is quite a lot of interaction”* as it was envisaged that *“the customers value direct contact with the R&D people because they see them as being objective; they don’t see them as trying to sell them something”*.

Further networks had been established with the University of Lancaster Institute for Entrepreneurship and Enterprise Development, and the University of Derby. These two institutions joined together with Perseverance Mills to establish a conference on Clothing for Extremes. The conference helped to set Perseverance Mills at the heart of the industry. Not only did it attract like-minded people with whom Perseverance Mills could explore the trends for the industry, helping them to understand future trends; it also illustrated their position as being at the forefront of technological advancement. Helping Perseverance Mills to meet with the key players in the industry proved useful in building the relationships mentioned previously. The link between Perseverance Mills and the University of Derby was extended, with the students from the Masters in Performance Sportswear Design demonstrating their work to Perseverance Mills. This not only allowed them to follow the advancement of the young designers entering the industry, but also provided first access to the student market so that they could recruit *“the best from the bunch.”*

## **7.5 INTERNAL**

This section presents the findings concerned with internal themes that were found to enable a NPD capability to be created:

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

### **7.5.1 Manufacturing**

Manufacturing for Perseverance Mills was made difficult, mainly because of the location of the business; *“We are sat here in the north of England, we are not closely linked to where our customers build their product”*, as most of the products were made in Asia and China. It was conceded that Perseverance Mills was *“a fair way from that manufacturing point, we are about four weeks away by sea, that’s a big disadvantage.”* Therefore it was acknowledged that Perseverance Mills had *“to come up with advantages for people to buy*

*from us, and one is our brand name". Therefore there was a conscious push to add value with "our partners... that's what we have to maintain, if we simply become a fabric mill that churns out fabric then we are just like the big and we are talking seriously large fabric mills in Taiwan and they ... are very close to the point of manufacture we are dead in the water."* As a consequence *"we have to build and maintain this brand."*

#### *7.5.1.1 Rationale for manufacturing*

Despite the difficulties facing manufacturing, Perseverance Mills had invested a lot of resources into manufacturing. It was argued that the reason for this was that manufacturing allowed Perseverance Mills to be competitive by offering their customers a whole service. Thus it was important that they manufactured *"at the lowest possible cost that we can and we make every effort to make our manufacturing efficient."* Furthermore, it offered a complementary body of knowledge that could be utilised when developing new products.

#### *7.5.1.2 Investment in manufacturing*

Due to the nature of Pertex, and to some degree the parachute market, Perseverance Mills had to invest in new machinery to enable the products to be *"dyed and have different finishes added to them, such as water-repellent finishes."* As well as having to invest in machines for dyeing, and finishing machines, Pertex *"has a lot of different weave structures, some are for performance and some of them are for aesthetics, making it look nice as well so we had to invest in new weaving types."* The investment was necessary because, as highlighted in Section 7.4.1, Perseverance Mills' competitors were not UK based, with the advantage that *"they have very low overheads and we can't compete simply on the basis of cost"* so *"they are cheaper than us."* Therefore Perseverance's strategy to be innovative and develop new products required new machinery to support the NPD process.

#### *7.5.1.3 Role within new product development*

The role of manufacturing within NPD was limited; it appeared from the interviews that there was still a degree of hostility between the two departments - R&D and manufacturing. This was steadily dissolving through the work the technicians had put into resolving the issue. It was perceived that it was a slowly changing relationship; *"sometimes they can be absolutely fine and they can say we know that it needs doing ok we will get you on – but that's everyone."*

#### *7.5.1.4 Barriers to NPD*

The change in strategy to concentrate on new products also required changes in manufacturing. *“There was an occasion where production was quite loathe to put developments though because they weren’t getting any recognition for doing it.”* This was something that continued to be an issue as *“they (production) are measured for the throughput”* which created conflict when a new product required testing, as this was not measured. Perseverance Mills was forced to re-examine the situation, and the decision that was taken was to *“actually change the way that developments are measured through production in that they get paid in the same way.”* This created an alignment between the R&D and production strategy, helping to alleviate such issues. *“Their (production’s) budget gets allocated in the same way for plant/commercial work as they do for developments so that would come out of the development budget.”*

The technicians involved in the development of the new products had worked very hard with the people from manufacturing to try to change their mindset and attitude towards developments. *“I am taking up production time and we are not necessarily getting money for it straight away, therefore developments are seen as in a way they take up production time which is a problem and that’s where we have to work very hard to get around.”*

### **7.5.2 New Product development**

The concept of new product development was arguably a new concept to Perseverance Mills. Although the company had an R&D department prior to the new surge to develop Pertex, it was a department that ‘fought fires’ and solved customer problems rather than created and developed new products. Whilst Pertex was not a new product to Perseverance Mills, it was revolutionary to the outdoor leisure industry and the new developments (see Table 7-2) all involved further developments to the product through making key structural changes to the fabric platform.

#### *7.5.2.1 Current new product development capability*

Since the completion of the case studies Perseverance Mills Ltd was honoured with two Awards at the annual Burnley Business and Innovation Awards Ceremony in 2005. The two awards recognised the company’s contribution to the international textile industry as well as the local community. The Innovation Award was given to Perseverance Mills for the globally successful launch of Pertex Quantum, a fabric which is up to 50% lighter than other

fabrics in the Pertex range, making it one of the lightest technical fabrics in the world. Perseverance Mill's second award was the Michelin Development Award for Business Excellence, which was given for the company's achievements in innovation, research and development and continued success. Furthermore, the award recognised how Perseverance Mills' international success contributed to the local textile industry. The Managing Director of Perseverance Mills summarised the meaning of the awards thus: *"It is a great honour to receive these awards. We are very proud to be seen as a success in an industry that has seen so many manufacturers disappear."*

#### 7.5.2.2 Rationale for new product development

As previously highlighted, Perseverance Mills' traditional market, NIF, was in decline having provided Perseverance Mills with a high profit margin for a number of years, as until about *"five or six years ago NIF still represented a good proportion of our business."* The attraction of the NIF market was that the customers were *"generally big customers who had a reasonably good payment record, large volumes were being dispatched so it was all nice."* With the changes to the computer print industry Perseverance Mills conceded that it was no longer a viable market to maintain and grow the company from, thus the position was summarised as *"we haven't really got a choice, we have to have innovation on the other side to balance it out."*

The link between new product development and survival was firmly made by one employee: *"To stay ahead we have to compete on performance and innovation so that is a certainly a survival strategy, certainly on the Pertex side we need to keep innovating to be able to compete in that market."* At the time of the case study the situation was described by the Managing Director thus: *"I believe that for this company we won't survive unless we have effective R&D producing new products, we can't compete on cost alone."* Therefore to compete with the extremely large facilities of the factories in the Far East, innovation was essential. In comparison to Perseverance Mills their competitors could *"produce some of our standard fabrics at half the cost."* However, the mills in the Far East were deemed to be *"followers"* and not at the forefront of development, while Perseverance Mills had the prospective advantage; *"we need to be on that top end always looking forward ...to be able to give our customers new ideas"* through trying to *"be ahead of the game."* It was acknowledged that the position was not static; rather, that NPD was required to be dynamic; *"we need to be producing new things all the time."* The development of such radically

different products enabled Perseverance Mills to defend their *“niche market that we have got, because if we are not ahead of the game then we will always be beaten on price.”*

### *7.5.2.3 New product development process*

To enable Perseverance Mills to create a new product development capability, the company recognised the need to restructure their NPD process. The rationale for the required structure was that *“we were becoming more and more dependent on Pertex; it had to become more structured.”* No longer could the R&D team be reactive as they once were. *“We would say yes, no problem”* to customers who wanted to work with Perseverance Mills, which resulted in *“so many development projects ... we didn’t deliver anything and that became very frustrating for the team working on it... they were either delivered late, or they weren’t right so they actually never came to market”*. Through restructuring the NPD process was tightened, *“justifying”* product cases through implementing a set criteria for each product case *“we looked at the project in hand and basically said yeah or nay based on facts with regard to was there a market there, what was the competition, that sort of thing so it became more professional.”* Further formalisation was introduced with *“R&D reports (being given) to the board”* outlining the products that were being launched for each season. Each month the R&D manager would report to the board *“where we are with our development products for each of those seasons if there are any issues that they have highlighted if it is being slow.”*

Providing communication to board so that knowledge was shared was important and meant that *“the board is aware at any time where it is in this development schedule.”* A formalised schedule of product launch was also devised which *“showed which products we intend to launch over the next three or four years.”* These moves all enabled the communication and NPD strategy to be visualised, forcing action and accountability. As well as NPD being on the agenda of the board meetings, a meeting specifically to discuss NPD was in operation. The aim was to aid communication between the R&D department and the senior management team. Every month the Managing Director met with Sales Director, R&D Manager and the Product Manager, in addition to the Marketing Manager. *“We review each month where we are with product launches that might have taken place, or are about to take place, where the product development programme is... Steve (Product Manager) will tell us where our new product is, who is going to take it and who is going to come on board with us on the launch and that kind*

*of thing... Gary the Sales Director will be telling us about the existing products in the field and how they are being received."*

In a further bid to aid formalisation and commitment to NPD, over the last few years R&D had been working to become BSI accredited. As part of becoming accredited, *"we naturally wrote for what we were doing and then discussed that with our BSI auditor who comes to see us every six months and what we were doing already fulfilled what BSI wanted."* Therefore the transition to becoming BSI accredited was not a major change; it was simply *"to make sure that we filled in the right paperwork so we could prove what we were doing."* This was intended to make the process of new product development at Perseverance Mills *"probably ... more bureaucratic"*. However, the advantage was *"that anyone can walk into the development department just about and I hope within reason see what projects we are working on, and the review processes that we have gone through, the thought processes that we have gone through ... it is very documented but we try to do it so that it is not too bureaucratic."*

At first when the BSI initiative was introduced it was considered *"a bit annoying"* due to the fact that it prevented a flow in the work, *"but now because we can look back and say oh we did it that way before and it didn't work... that's quite useful,"* the final conclusion was that formalisation of the process did have some benefits and prevented time from being wasted. Further benefits of formalising the process included the open communication; *"say Kelly (technician) isn't here we can just go to the file and find out exactly what she has done and it is all there in black and white."* Prior to BSI and the decision to become more structured, one interviewee described the R&D department as *"a lot less organised and a lot less structured."*

The NPD process that Perseverance Mills followed was considered to be *"quite a traditional process ... initial concept ... project brief... we sort of... we decide what we are doing."* After this stage the team would work on the weave finishing; *"we do the first iteration of developments, probably a few different samples and then actually bring them through and evaluate them"*, then jointly the R&D team would decide *"what we are doing with it commercially."* Finally, *"we have got quite a formalised commercialisation system in that if it is decided to be commercialised it is signed off by the board"* then *"we normally weave around 5000 metres and do it in three full batches"*



*within the plant to actually commercialise the fabric to say yes we can make it in the plant.” As well as the board signing off the product, it had be to “signed off by the production team to say that they are happy to have that fabric in the plant.”*

#### *7.5.2.4 Idea generation*

As part of the interviews, the concept of idea generators was discussed within Perseverance Mills. It was perceived that the R&D Manager and the Product Manager for Pertex were the primary means of generating ideas. It was stated that the development team *“tend to work on the ideas that we (R&D and Product Manager) have.”* A possible cause for this was that *“they (technicians) have the ideas and they don’t have the confidence to say anything.”* An alternative argument was that the idea generators in the company were the two people who were involved in the outdoor activities for which Pertex was designed, *“so certainly the ideas and the creative side just comes because of who we are rather anything that is consciously done.”*

The issue of creativity and the time for being creative was a point that was expressed within the R&D team as *“we don’t have as much creative time as we would like”,* as well as, *“there is scope for us to be more creative,”* but the day-to-day issues did *“pull them away from the R&D side and they don’t necessarily get the time to do have creative thoughts.”* Furthermore, there appeared to be some disparity within the organisation with regard to the Managing Director’s willingness to encourage creative time in the organisation. *“If Julie said that she wanted to take her team off for a couple of days to brainstorm things they were doing then I would be happy about it because it’s not as though we are trying to straight-jacket their activities to a 9 till 5 situation.”* However this was not further iterated in other interviews; in fact the reverse was stated, and it was acknowledged that *“one of the weaknesses that we have is that we think that we are an R&D team when really we are a development team so we need to have more resources to do research.”* with the proposed solution being that *“we need to go out and spend an awful lot of time to really think about what’s going on.”* This created one of the barriers to generating ideas.

#### *7.5.2.5 Lack of resources*

The lack of resources acted as a barrier to developing new products, with the R&D team being involved in fire-fighting problems. One example was provided in the

interviews, as during the case study there had been a problem with a large customer which meant that *“whatever Julie (R&D Manager) intended to do for the last two to three weeks, she has probably spent a lot of the time solving the problem looking after the customers.”* The R&D strategy was an attempt to be proactive; *“We can still be sales led in the short term... sometimes we do things that detract attention from the R&D team – fire-fighting.”* It was acknowledged that *“apart from growing the size of the department it is hard to see how we will get away from that.”* Within the R&D department it was perceived that Perseverance Mills had gone some way to resolving the issue by employing someone in a *“problem solving”* role.

#### *7.5.2.6 Future for new product development*

To enable Perseverance Mills to move up the value chain through NPD, an *“R&D plan, which is our proactive development of what we want to do”* had been devised. There was a dogmatic determination that anything outside the plan was *“meant to go through a screening process where it is signed off from a marketing brand point of view, commercial and technical point of view.”* The mindset was taking time to change and *“now not everything goes through that process”*, although at no point in the interviews was this highlighted as a problem.

The expectation inside Perseverance Mills was *“to increase so we will become a specialist house for lightweight and novel fabrics and that way we can continue to produce here as opposed to the Far East.”* In the long term the aim was that *“in four or five years time we would expect to be producing hi-tech fabrics here rather than the standard type of products that were being produced elsewhere, particularly in China or Taiwan.”* This was something that was felt could only be achieved through innovation. Perseverance Mills felt that it was beginning to learn how to read the market and aid its survival. *“If we hadn’t have reacted when we did with the quantum then we would have missed the boat because there are a lot of those fabrics out there now.”* This in part explains why the R&D strategy was beginning to be linked with marketing. Finally, the general consensus was that the company was still at the beginning of its journey. *“We are changing, we haven’t changed”*, and there was a long way to go; one that saw *“a critical learning curve.”*

### 7.5.3 Top management

It was observed from the interviews at Perseverance Mills that leadership was on two distinct levels; board level and management team within R&D, which included the R&D Manager and the Product Manager. Both were fundamental to the achievement of Perseverance Mills moving up the value chain, but aided in different ways.

#### 7.5.3.1 Board level leadership

The support of senior management was evident by the inclusion of new product development in the company's overall strategy. In order to move up the value chain NPD was viewed as a necessary cost that would provide the business with a future, with the Managing Director feeling that *"we decide that is the cost (of R&D) and that is it and we haven't cut that back."* Perseverance Mills' senior management met regularly and helped to generate the strategy. One of the key elements of the yearly strategy away day involved *"two days out to review off site where we are with both... primarily it is a marketing and R&D sales meeting so we will revisit that plan and say what happens."*

#### 7.5.3.2 R&D level leadership

The management support that was fundamental to driving forward NPD was identified as lying predominantly with the R&D Manager and the Product Manager, who were the champions of the NPD process. Arguably, their passion for outdoor activities was felt to be key. The management of the R&D team was described as being informal and transformational in nature. *"Julie (R&D Manager) is the boss but we are very much in the way that we work on a level"*, endorsing a *"very close knit team."* The R&D Manager explained the reason why her role as manager was easy. *"It is very easy to manage them (R&D technicians) because I don't need to think of me as their boss; we work quite closely as a team and there is never any disciplinary issues ... so it's very easy to work together as a team."* The interest and enthusiasm within the team was felt to stem from the R&D Manager, creating a feeling within R&D that *"it is something that we are all interested in."* The role of the R&D manager was described as *"to over see everything and to use her knowledge to dip into and if we are going off down a route that through her experience she doesn't think is going to work she can drag us back"*, as well as *"coordinator to possibly move you in the right direction to understand what sales we want"*. The team felt that in general, Julie the R&D Manager

*“shields us from”* the board and their decisions. Supporting the R&D Manager and providing a clear link between R&D and marketing was the Product Manager. Together they both worked tirelessly developing new product concepts. Both managers were dedicated to the Pertex concept and pushed the concept internally within Perseverance Mills and externally with existing and new customers.

#### **7.5.4 Culture**

The acceptance of the changes being made to the way in which Perseverance Mills operated was proving to be aiding change. This was especially so with the people who worked in the factory, and was attributed to the fact that *“we are a very old established business; we were started in 1900 where generations of the same families in some cases have worked at the factory”*, creating certain *“preconceptions about what Perseverance Mills is.”* The people working in production were familiar with the processes associated with producing NIF and from their perspective, changes were sometimes hard to understand, with questions such as *“I get asked well why can’t we sell more NIF.”* Perseverance Mills endeavoured to inform and educate the employees, but it was felt that *“there is still a long way to go”* with the acknowledgement that *“I wouldn’t claim that everyone fully understands the need to change the way we work and the products that we produce.”* There was an understanding that due to the heritage of the company, whilst it *“is nice to have, it brings a lot of baggage.”* Fundamentally it was conceded that *“you are always going to have a core of people that are a bit stubborn and traditional.”* This was not thought to be the norm and in the majority *“people are quite keen on it.”*

In terms of creating a culture to inspire innovation within the firm, and specifically the R&D department, it was conceded, *“I don’t know if the company consciously does anything.”* It was stated that there was an openness to new concepts that possibly would not have existed previously, in that the Board *“is accepting of the ideas that we come up with and any ideas are a little bit more possibly off the wall would be looked into to see if it is the right direction for the company.”* The interviews indicated clear support of the two people involved directly in managing the R&D team, making it *“clear that R&D is important”*, crystallising the importance of R&D, and ensuring that *“Julie (R&D Manager) and her team are at the fore-front of our thinking”*.

In their bid to move up the value chain, the commitment and energy of the R&D team in their attitude towards innovation was important for Perseverance Mills. This was reflected in the way that the team operated, which involved *“regular meetings where ... all four of us, regardless of whether you are involved in that project or not you still have to go, you still put your own input into it.”* This created a sense of shared responsibility for the work that was being carried out, which was especially important as *“Katherine goes to college on a Tuesday we will be able to do her trails for her.”* This was reflected in the closeness of the way the team worked; *“three of us in one office and Julie is in the next office”*, creating a culture of sharing. It is therefore evident that the structure enabled a relaxed, friendly and helpful environment – where everyone on the teams felt that they could have input into the projects. *“We are aware of what is going on at all times,”* and furthermore supporting the younger team members *“if you are not sure of something or you just want to run something past someone then that is the best part of our team because we all work so closely even though Julie has got her own office she is only a knock on the door”*.

#### 7.5.4.1 Communication

In an attempt to inform about and gain acceptance of new product development, communication at all levels was viewed as essential. *“You have got to explain to people that if the thing isn’t changed then if we don’t have new products, if we don’t raise the performance the business could disappear.”* Perseverance Mills understood that the route to change and the successful creation of a new product development capability depended on ensuring that all employees within the firm appreciated the situation. This was achieved through *“a series of presentations”* in which costs were explained, along with the need for *“a series of redundancies at the back of last year.”* Furthermore, the presentations set out the future plans so that everyone was aware of the changes and the new strategy *“budget over the next year and what we are planning to do with Pertex and parachute.”* The presentations were *“not just manufacturing... its being run for other people as well where the brand has been explained and discussed and their views have been listened to.”*

The R&D team had also been proactive in the way that they communicated with manufacturing in a bid to change their perceptions of R&D, *“mainly talking to people and explaining to them why we need to do this and after time it does being to sink in ...*

*they do begin to understand the logic behind it.”* In addition to talking to employees, the R&D team were involved in taking *“the end product down and say look you know it was extremely painful doing this and it was hard to do but you take them the finished product down and a photographs of the art exhibition stands and our customers and you begin to build that trust up really so I think that is really what it is, they trust you.”* The rationale for showing them the end product was that *“once you see that in loom stage to see it like that you would never believe that it was the same fabric and like wise in finishing, if they know what it is going into it, if they then see a fault.”* This approach appeared to be reaping some positive rewards, with manufacturing accepting the need to change.

#### *7.5.4.2 Education*

Perseverance Mills actively encouraged members of the R&D team in furthering their education. During the case study two members were at college studying for their first degrees, with one member studying for an MBA. The rationale for this enthusiasm and willingness within Perseverance Mills was *“basically they are keen to get young people involved and back into textiles because in this country it is a dying trade”* and it was something that was matter of fact; *“we are funding them to do it”*. It was felt that the approach to further education was enabling the company to ‘grow’, enabling them to produce products like Quantum, which *“we really put ourselves on the map with that fabric ... giving us an opportunity... we know why we are out there, we have to make sure that we keep up with that”*.

#### *7.5.4.3 Learning*

If the creation of a NPD capability was to be successful, Perseverance Mills accepted that there had to be a change in culture and changes in performance objectives. There was a shift from volume manufacturing to a stance where quality was of key importance. Traditionally, NIF was a product *“where the quality had to be reasonable... it wasn’t really particularly a quality critical product.”* The renewed emphasis on Pertex and its extended ranges meant that customer perception of quality was also changing. People were prepared to pay in excess of £100 to £200 for a jacket or sleeping bag, thereby the quality had to justify the price. This was especially important for Perseverance Mills as they were the *“face fabric you know if there is a flaw in it people are going to be upset.”* Consequently *“there is quite a big culture*

*change that is going on in the company from being an old fashioned industrial business into a consumer company.”*

### **7.5.5 Individuals**

Within Perseverance Mills there was a strong commitment to the individuals whom they employed. They were viewed as being a key way to achieve their desire to move up the value chain and develop new products.

#### *7.5.5.1 New people*

The commitment to NPD and the success of Pertex required an extra person if the marketing of the new Pertex ranges was to be successful. *“We have just recruited a full time marketing person.”* While this was a difficult decision in light of the recent redundancies, it was felt a necessity if Perseverance Mills were to achieve their long term strategy. Furthermore, it had been necessary to bring an extra person into the R&D team to be responsible for the fire-fighting problems encountered with customers. This enabled the rest of the R&D team to concentrate on developing new products, without having their time interrupted.

#### *7.5.5.2 Expertise*

The people in the R&D team were fully involved in the plans and objectives of creating a NPD capability; *“we all work together.”* This willingness to work together extended to other functions of the organisation, especially production, to learn the processes in manufacturing. The knowledge gained from working directly with manufacturing had huge benefits to the R&D department as *“in theory I could run a centre but that is something that I have had to learn when I first started the job,”* providing an understanding of production which could be utilised when developing new products.

In particular, Perseverance Mills benefited from the knowledge and passion of the Production Director who was a *“very forward thinking person and is proactive... he is not a traditional manufacturing manager.”* His expertise and understanding of the development of new products provided Perseverance Mills with a positive future. *“He has been quite keen to develop the production side and so they understand what we are doing.”* As a consequence *“it is beginning to change... its difficult running a development unit within a manufacturing environment; we are reliant on the plant for*

*everything.*” Production felt that it was difficult as *“people don’t like giving their time up”* but their expertise had proved extremely useful in developing the new Pertex products, and had been good sources of information as to what would work and what would not.

### **7.5.6 Marketing**

Perseverance Mills had always had some form of marketing expertise within the firm, but with the introduction of a wider product range and the introduction of Pertex as a brand, the decision was taken to invest *“on the marketing side ... on the Pertex brand name.”* Perseverance Mills had also started to involve marketing in the front end of the NPD process; *“We had done some market research; not a lot because we don’t have a strong market resource.”*

#### *7.5.6.1 Role of marketing*

The strategy of R&D was firmly linked with the marketing department, emphasising the holistic approach to ensuring the success of a new fabric. *“When we first developed the R&D strategy we actually built the marketing strategy in so the R&D strategy around what we wanted to develop.”* The idea was to *“only launch it to so many customers ... to get our fabrics out there but also to promote all this and have them working with us.”* This was supported by *“a big market research programme at the moment to refresh our knowledge of the market that we are in and understand hopefully in more depth the markets we are involved in.”* Perseverance Mills consequently realised the importance of Pertex to their survival and success, as *“the advertising budget is greater, we do far more in terms of marketing; we have just recruited a full time marketing person and we have organised the sales people in such a way that they are promoting the Pertex brand”.* The structure in Perseverance Mills was becoming ever more holistic in nature, as *“Steve (Product Manager) is still our kind of link, he still links from development into marketing in that he will work with marketing with how a product is launched.”*

### **7.6 NPD STRATEGIES**

Perseverance Mills had a strong and dedicated R&D team who were responsible for the development of new products within the company. The majority of the development



was through their in-house R&D team, as has been described in detail in the above sections. However, whilst the team were at the forefront of generating and developing the ideas, there was an appreciation that external alliances were required to help them achieve their goal. The strategy that was used to support their in-house development was through creating key alliances with the major players in the outdoor wear market.

### **7.6.1 Alliances**

The alliances that Perseverance Mills developed were based on mutual need. *“You can say right, we are going to work on that and develop a relationship with them because we can see a need in that business area for what we can do.”* The idea of the alliances was to identify what the major players wanted from the fabrics so that they could use this knowledge to make their products. Perseverance Mills felt that the best way of doing this was to work directly with them and *“form partnerships with X Y and Z companies... it is a relatively small, tight group of people and unless there is good reason for someone else to come on board that’s how it is going to stay.”* A number of benefits stemmed from working with the likes of W. L. Gore and Rab, as it gave them an insight into the new trends and what the market required. These companies often helped with the development costs, providing Perseverance Mills with the necessary financial resources. Finally, Perseverance Mills gained a reputation for working with the ‘best’, which created a focused effect, with other people wanting to buy their fabrics because *“W. L. Gore are.”* Ultimately, through creating key alliances an invaluable insight into the market was gained and allowed Perseverance Mills to innovate accordingly.

## **7.7 SUMMARY**

Perseverance Mills had a long history in manufacturing synthetic yarn used for the parachute market, as well as the computer printing industry. With the decline of the printing industry Perseverance Mills had re-assessed its product portfolio and looked to new markets to ensure its survival. Pertex had been its answer, a product that had been in existence for some years, but which had been neglected. With the increase in the popularity of extreme sports, the decision to develop and create new products under the Pertex brand was considered to be the way forward. Whilst development of customer

products had been done before, the new focus on Pertex required the creation of a NPD capability that had not previously existed.

The external construct (see table 7-2) for Perseverance Mills included:

- Networks

Networks were vital to Perseverance Mills as it added them in creating key alliances and working with experts in the industry. This enabled them to develop innovative materials and to have customers who wanted to use them in their final designs. By developing new products, Perseverance Mills created a barrier against its competitors and a reason for the key designers to want to work with them. As part of the networking activities this involved working with key universities to ensure that they were at the cutting edge of research on materials. Their networks also provided access to talented designers graduating from the University of Derby. The joint organisation of the conference with the Lancaster Business School and the University of Derby provided access to other people interested in technical materials, placing Perseverance Mills at the forefront.

The internal constructs for Perseverance Mills included:

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

Manufacturing was at the heart of Perseverance Mills, attributable to its history. However, it was a function that had seen many changes since the decision to create a NPD capability. The main change centred on the performance measurement system, which was changed to incorporate the development of new products, which had previously been absent. New product development was already being successful, which was demonstrated in the awards that Perseverance Mills had achieved for innovation. As with manufacturing, the NPD process also saw changes through the introduction of

a more formalised process. With strong top management support both from the board of directors and the management of the R&D team, NPD was clearly at the heart of Perseverance Mills' new strategy to survive. A culture of innovation was steadily being created through clear and open communication which had to transcend the decades of history associated with simple manufacturing. In order to create this NPD capability, the strategy that had been utilised was one of development in-house, utilising the experience and passion of the people who worked in the company, and especially in the R&D department. To ensure its success linkages were being made between marketing and R&D through the Product Manager, who bridged the two departments and had a good understanding of the requirements of both.

<b>NETWORKS</b>	<b>Market linkages</b>	Market linkages gave Perseverance Mills the opportunity to have contact with key players in the market, with some key alliances being made. <i>“R&amp;D is what keeps us in the frame as far as those people (Gore, Marmot, North Face) are concerned plus doing joint marketing with them so we are persuading them all the time that it is worth playing a premium for our product.”</i>
	<b>Universities</b>	University of Lancaster and University of Derby
	<b>Conferences/ trade shows</b>	R&D were positively encourage to attend trade shows and conferences as this allowed <i>“them meet to customers so they are not just sitting in a lab so there is quite a lot of interaction.”</i> It was envisaged that <i>“the customers value direct contact with the R&amp;D people because they see them as being objective; they don't see them as trying to sell them something.”</i>

*Table 7-3 Summary of internal construct for Perseverance Mills*

<b>MANUFACTURING</b>	<b>Rationale for manufacturing</b>	<p><i>“Manufacture at the lowest possible cost that we can and we make every effort to make our manufacturing efficient”</i> helped to provide a whole service package to Perseverance Mills’ customers.</p>
	<b>Investment in manufacturing</b>	<p>To create new products investment in new manufacturing processes was required as Perseverance Mills had <i>“ a lot of different weave structures, some are for performance and some of them are for aesthetics, making it look nice as well so we had to invest in new weaving types.”</i></p>
	<b>Role within NPD</b>	<p>Manufacturing played a limited role within the NPD process as in the past they had very different objectives. <i>“Sometimes they can be absolutely fine and they can say we know that it needs doing, ok we will get you on – but that’s everyone isn’t it. I think that as long as you inform them as early as possible.”</i></p>
	<b>Barrier to NPD</b>	<p>Differences in the performance objectives: <i>“Their (productions) budget gets allocated in the same way for plant/commercial work as they do for developments so that would come out of the development budget.”</i></p>
<b>NEW PRODUCT DEVELOPMENT (NPD)</b>	<b>Current NPD capability</b>	<p>Two awards recognised Perseverance Mills’ contribution to the international textile industry as well as the local community. The Innovation Award was giving to Perseverance Mills for the globally successful launch of Pertex Quantum. The second award was the Michelin Development Award for Business Excellence.</p>
	<b>Rationale for NPD</b>	<p>Competition from low cost competitors meant that <i>“to stay ahead we have to compete on performance and innovation so that is a certainly a survival strategy; certainly on the Pertex side we need to keep innovating to be able to compete in that market.”</i></p>

<p><b>NPD process</b></p> <p><b>Idea generation</b></p> <p><b>Lack of resources</b></p> <p><b>Future of NPD</b></p>	<p>A more formalised process was being introduced. <i>"We were becoming more and more dependent on Pertex; it had to become more structured."</i></p> <p>Idea generators in the company were the two people who were involved in the outdoor activities for which the Pertex brand was created <i>"so certainly the ideas and the creative side just comes because of who we are."</i></p> <p>Fire-fighting was still a barrier as there was a lack of resources to deal with the customer problems. <i>"Whatever Julie (R&amp;D Manager) intended to do for the last two to three weeks she has probably spent a lot of the time solving the problem looking after the customers."</i></p> <p>The process of change was still happening. <i>"We are changing, we haven't changed."</i></p>
<p><b>TOP MANAGEMENT (including top management)</b></p> <p><b>Board level support</b></p> <p><b>R&amp;D management</b></p> <p><b>Champion of NPD</b></p>	<p>The board supported the NPD strategy. <i>"We decide that is the cost (of R&amp;D) and that is it and we haven't cut that back,"</i> and was at the forefront <i>"we take two days out to review off site where we are with both primarily it is a marketing and R&amp;D sales meeting so we will revisit that plan and say what happens."</i></p> <p>The R&amp;D Manager and Product Manager were the key drivers in driving NPD. <i>"Julie is the boss but we are very much in the way that we work we are on a level"</i></p> <p>The commitment to the Pertex brand and developing new products came from both the board level through the inclusion in the strategy and the R&amp;D management through their transformational management style.</p>

<b>CULTURE</b>	<b>Communication</b>	<p><i>"We try and make sure that R&amp;D are not the people in white coats that we talk to a couple of times a year ... they are actually helping to run the business."</i></p> <p><i>"You have got to explain to people that if the thing isn't changed then if we don't have new products, if we don't raise the performance, the business could disappear."</i></p>
	<b>Training/Education</b>	Education was actively encouraged, with members of the R&D team studying for extra qualifications, including an MBA.
	<b>Learning</b>	Due to changes in the strategy and a focus on NPD learning was essential, especially as <i>"there is quite a big culture change that is going on in the company from being an old fashioned industrial business into consumer company."</i>
<b>INDIVIDUALS</b>	<b>New People</b>	In marketing, <i>"we have just recruited a full time marketing person"</i> , and in R&D.
	<b>Expertise</b>	Perseverance Mills benefited from expertise throughout the organisation, and it was highlighted that in manufacturing the Production Manager was a <i>"very forward thinking person and is proactive; he is not a traditional manufacturing manager I would say and he has been quite keen to develop the production side."</i>
<b>MARKETING</b>	<b>Role of marketing</b>	There was a new emphasis on marketing since the focus on NPD, and Perseverance Mills had since invested: <i>"On the marketing side we invested a lot in the Pertex brand name, which was quite a change"</i> and <i>"when we first developed the R&amp;D strategy we actually built the marketing strategy in it so the R&amp;D strategy around what we wanted to develop."</i>

Table 7-4 Summary of internal construct for Perseverance Mills

<b>NPD STRATEGIES</b>	<b>Alliances</b>	<i>"You can say right we are going to work on that and develop a relationship with them because we can see a need in that business area for what we can do."</i>
	<b>In-house</b>	There was a strong in-house NPD process that had been formalised.

*Table 7-5 Summary of NPD Strategies for Perseverance Mills*





## **CHAPTER EIGHT – CROSS CASE ANALYSIS AND DISCUSSION**

*This chapter will draw together the analysis of the individual case studies by comparing and contrasting the constructs and sub-constructs across the four case studies taking part in this research. The purpose of the cross-case analysis is to identify the patterns and themes shared across the case studies. The intention is to provide new knowledge regarding the strategies for creating a NPD capability, as well as the enablers required to create such a capability. In the final section of this chapter, a discussion of the cross-case findings in light of the scholarly literature is offered.*

### **8.1 INTRODUCTION**

This research has been conducted in a series of progressive steps (see Section 1.6, Figure 1-5) which have helped to provide support and focus to the research. The first step in the research process was to undertake a detailed review of the literature. This helped to understand current thinking in and around the research aim and to identify gaps in knowledge. From the review two research objectives were generated which guided the overall research aim to be investigated. Succeeding the literature review was the empirical phase of the research, with qualitative data being collected from four UK manufacturing SME case studies. Whilst the findings were interesting and informative in their own right, to enhance their value, further interpretation was required by combining and merging the findings from all four cases. This enabled sense to be made of the findings across the four case studies, as well as within the individual case studies themselves. The cross-case analysis is a necessary requirement, as by comparing and contrasting the findings from all the four cases, a consensus of the important constructs and sub-constructs can be identified. It is not the intention of this study to provide generalisations, as arguably this is deemed outside the realm of qualitative research. Rather, it is hoped that this study will provide a form of understanding and meaning to others facing a similar situation, to the case studies in this research. The expectation is that these findings will also contribute to theory and new knowledge.

Specifically, the cross-case analysis was conducted by drawing together the summary tables found at the end of each of the case study chapters (Table 4-2, 4-3, 4-4, 5-2, 5-3, 5-4, 6-2, 6-3, 6-4, 7-3, 7-4, 7-5). Interpretative means were then used to categorise the findings into comparative tables (see Table 8-1 and Table 8-2) which enabled the similarities and differences across the case studies to be identified. The tables were then modified, with the quotes being substituted by simple ticks to represent the fact that the phenomenon was evident within each case study. The findings relating to NPD strategies (Table 8-3) that the firms used to create a NPD capability were dealt with in a simpler fashion. Rather than attempt to synthesise these findings, it was considered valuable to present all of the strategies found, as each of these were valid strategies that others attempting to create a NPD capability could also emulate. The following sections (Section 8.2, 8.3 and 8.4) highlight the cross-case analysis for each of the constructs and the sub-constructs identified in the case studies. In addition, the comparative tables are presented (see Tables 8-1 and 8-2).

The first part of this chapter will focus on the cross-case analysis of the four case studies. This will be followed by a discussion of the findings, relating back to the literature to highlight where the findings have aided in confirming current understanding and where it has provided new knowledge.

## **8.2 EXTERNAL**

The external theme refers to the resources and skills that the firms sought externally in their effort to create a NPD capability. Across all the case studies there was evidence of external networks being used to create a NPD capability. In addition to being involved with external networks, three of the four case studies were involved with government agencies, utilising their contacts and knowledge in some form to create a NPD capability. The results from the case studies were grouped for comparison purposes in Table 8-1 below.

	Hall Stage	MRP	Magnet Application	Perseverance Mills	Occurrence
<b>NETWORKS</b>					
Market linkages	✓			✓	2
Contacts	✓	✓	✓		3
Scouting networks	✓	✓			2
Network forums (e.g. DTI Powder Matrix; Chambers of Commerce)		✓	✓		2
Universities		✓	✓	✓	3
Conferences/trade shows	✓		✓	✓	3

	Hall Stage	MRP	Magnet Application	Perseverance Mills	Occurrence
GOVERNMENT AGENTS e.g. MAS-East, Business Link and Gateway2Innovate	✓				1
Serendipitous process (knowing the right contacts)					
Provide advice	✓	✓	✓		3
Lack of funding during development period	✓				1
Sceptical, wary of cost implications			✓		1
Link between ideas and case company		✓			1
Grants and awards e.g. SMART			✓		1

Table 8-1 Summary of the cross-case findings -- external constructs

### 8.2.1 Networks

In all four of the case studies networks provided external links that enabled the market to be accessed. This provided an invaluable source of different ideas, technologies and skills. In the case of Hall Stage strong networking allowed them to discover the technology that provided the solution to enable the development of their new product DGS (Hall Stage's main new product). The alternative would have been financially more demanding, becoming a much longer and more laborious process of developing the technology themselves, an area in which they would have encountered the unknown. Networks of a different kind were also witnessed within Hall Stage, such as former customers and work associates. These networks played a dual role in aiding Hall Stage in creating a NPD capability. Firstly, these networks enabled the company to demonstrate their reputation and standing within the industry. This was essential to secure the alliance with ASM, the German company providing the core technology for DGS. Secondly, these theatre networks later proved vital in the prototyping stage of DGS, providing Hall Stage with a pool of people from the industry who were interested in DGS and who agreed to allow Hall Stage to use their facilities as a test bed. This was an invaluable asset, as it would not otherwise have been possible for Hall Stage to replicate a full-sized theatre in which to test DGS on their own premises.

The utilisation of long standing networks was also witnessed within Magnet Application. These networks were used either to source information or to get jobs completed when they did not have the necessary resources to complete a job. It provided Magnet Application with ways of finding the answers to technical areas where knowledge did not exist within the company, or where there were resource constraints that prevented them from developing an idea further. In short, for Magnet Application, these networks facilitated the acceleration of the process. Perseverance Mills also exploited networks through the involvement and close relationships with the key players in the technical sportswear industry (the main outlet for the Pertex brand). This provided Perseverance Mills with direct access to customer requirements, enabling them to blend the pull of customer needs with the push of advanced technological development.

In the case of MRP, they utilised networks in a different way from the other three case study companies, mainly due to a feeling of inadequacy to generate new ideas, and recognising that their capabilities did not extend to idea generation. MRP were extremely reliant on finding ideas externally, rather than generating ideas in-house. To overcome this MRP attempted to break into the area of NPD by searching for ideas generated outside the firm, effectively forming an alliance with MRP; an idea generator who lacked the resources necessary to develop the product. To some degree there had been a level of success but this had been plagued by products experiencing problems at the development or prototype stage (such as the anti-theft computer device in Section 5.3.1).

### **8.2.2 Government agents**

Government agents in this context refers to any use of externally sponsored government organisation, such as Business Link, Department of Trade and Industry (DTI) and the Manufacturing Advisory Service (MAS). Of the four case studies, all were in contact with government agents, with the exception of Perseverance Mills. The experiences of Hall Stage, MRP and Magnet Application varied when it came to contact with government agencies, and the perception of the actual aid provided by the government agencies in helping the firms to move up the value chain received a mixed response from the case study companies. In general, across the three case studies, the experience of dealing with any of the government agencies was deemed to be serendipitous in nature, leading to varied points of view. The Managing Director at Hall Stage view commented that *“we had to go around the most obtuse of routes, you know, there was no clear path laid out... we had to find the secret hidden door to DTI’s small firms loan guarantee.”* This sceptical view of government agents offering aid to move up the value chain was relatively common across the three case studies. Magnet Application voiced their concerns when contacted by government agents, and the first thought was *“how much will it cost.”* It appeared that this indifferent view was mainly related to Business Link organisations.

Positive views of government agents were also expressed by the case study companies. In the case of MRP, their relationship with MAS-East resulted in the lean manufacturing project being carried out, which provided beneficial results for the firm. In addition MAS-East provided help and advice on MRP’s plans for the future,

from which stemmed a number of recommendations. One such recommendation for MRP was to consult with Gateway2Innovate. Magnet Application also found the services of the MAS-East beneficial, by providing the company with contacts that could aid their NPD process.

### **8.2.3 Summary of the cross-case analysis for the external findings**

In short, the ability to utilise networks and government agents has led to the realisation within this research that if the firms are to create a NPD capability, then association with the external world is vital. Largely because the firms lacked the required resources and skills, the quickest and easiest way to overcome this barrier was to use external resources, whether through networks or help from government agents. Through contact with different organisations solutions were sought, enabling acceleration of the NPD process. It would appear that the aid of external organisations and individuals is paramount to all the case studies involved in this research.

## **8.3 INTERNAL**

Across all four case studies there is evidence of existing capabilities that were key in aiding the firms in this research to create a NPD capability. It has also been identified that the case study companies were attempting to create new capabilities. The main constructs identified across the case studies were:

- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

By conducting the cross-case analysis, which involved comparing and contrasting the findings from each case study, the findings from the individual case studies are grouped for comparison purposes in Table 8-2.



	Hall Stage	MRP	Magnet Application	Perseverance Mills	Occurrence
<b>MANUFACTURING</b>	✓	✓	✓	✓	4
	Rationale for manufacturing				
	Investment	✓	✓	✓	4
	Role within NPD	✓		✓	2
Barrier to NPD		✓	✓	✓	3
<b>NEW PRODUCT DEVELOPMENT</b>	✓	✓	✓	✓	4
Current capability					
Rationale for NPD	✓	✓	✓	✓	4
NPD process	✓	✓	✓	✓	4
Lack of resources	✓		✓	✓	3
Future of NPD	✓		✓	✓	3
Idea generation				✓	1

	Hall Stage	MRP	Magnet Application	Perseverance Mills	Occurrence
<b>TOP MANAGEMENT (including top management team)</b>	✓		✓		2
	Experience and understanding of industry				
	✓	✓	✓	✓	4
	Champion of NPD				
Rely on management outside board			✓		1
Reputation in industry	✓				1
<b>CULTURE</b>	✓	✓	✓	✓	4
	Culture of innovation				
	✓				1
	Rewards				
	✓	✓	✓	✓	4
	Training/further education				
	✓		✓	✓	3
	Communication				
	✓			✓	1
	Linkages between marketing and R&D				
✓	✓	✓	✓	3	
Resistance to change					
Learning			✓	✓	2

	Hall Stage	MRP	Magnet Application	Perseverance Mills	Occurrence
<b>INDIVIDUALS</b>					
Expertise (qualifications)	✓	✓	✓	✓	4
New people	✓		✓	✓	3
<b>MARKETING</b>					
Lack of skills	✓	✓	✓	✓	4
Extra investment				✓	1
Introduction of innovation in marketing	✓				1
Role of marketing		✓			1

Table 8-2 Summary of cross-case analysis – internal constructs

### 8.3.1 Manufacturing

As a prerequisite to be involved in this research all four of the case studies demonstrated an existing manufacturing capability (as detailed in the research design Chapter Three, Section 3.5.1, Table 3-5). In order to understand how manufacturing firms create a NPD capability, an understanding of the role that manufacturing played in the creation of such a NPD capability is necessary, in order to understand how the manufacturing role may have to change with the addition of a new capability.

The findings from the case studies highlight that the existing manufacturing capability did have a role to play within the creation of a NPD capability, illustrating the importance of its role within the firms, as all four firms were planning continued investment in manufacturing. The investment was recognised as being necessary due to the current situation facing manufacturing. It was conceded by the companies that manufacturing in the UK was becoming increasingly more difficult as a result of low cost competition. The situation was summarised by Perseverance Mills, Managing Director, whose competition was based in China. *“They (China) have very low overheads and we can’t compete simply on the basis of cost”* so *“they are cheaper than us”*, reflecting the situation in the other cases.

The situation facing all four case study companies was one of fierce competition, and for continued manufacturing to be sustained, a move up the value chain was inevitable. This was the case with MRP, as they believed that if they were to survive, then value had to be added, which was realised through the complimentary nature between new product development and manufacturing, like *“a hand and a glove - they go together.”* Hall Stage also realised the mutual benefits of linking the processes together. Manufacturing was *“the metal bashing which will always form the sort of cash cow ... something that people will always want regularly and form the backbone,”* providing the ability to fund NPD projects, for without manufacturing the necessary financial resources may not have been readily available.

The knowledge associated with the existing manufacturing capability provided the foundation necessary to create a NPD capability. Manufacturing provided essential knowledge, and through the ability to manufacture products, the firms in the research intrinsically, and often unknowingly developed an ability to design products. It was

considered that a start-up company with new ideas and the burden of having to develop two capabilities, a new product development and a manufacturing capability, would be a much harder proposition. This was illustrated in the case of MRP, who aided their customers by improving the design to achieve a product suitable for manufacturing. MRP had begun to develop a design capability, albeit one that had been overlooked. At Hall Stage, the individuals in manufacturing also aided the NPD process by providing their input into the development of new products, and by offering this knowledge and expertise, the company gained an understanding of what was and was not possible to achieve.

It is worth noting that despite the benefits offered by a manufacturing capability, in the case of MRP and Magnet Application, manufacturing almost became a barrier to creating a NPD capability. For MRP it was a case of their customers being so varied that they were wary of cannibalising their current customers. Manufacturing thus had the potential to create a mental barrier when developing new products, especially in terms of which product area to develop. Also in the case of Magnet Application, their market was diverse, creating a dilemma of which market to enter. For Perseverance Mills manufacturing created a different barrier to NPD, as the performance objectives that were used to measure the output of manufacturing proved most detrimental to NPD. Changes were put in place to counteract this by changing the budgetary control. *“Their (productions) budget gets allocated in the same way for plant/commercial work as they do for developments so it comes out of the development budget.”* Whilst this was a new situation, in the past production had been *“quite loathe to put developments through”*, and arguably this stemmed from the lack of recognition that they were given for their role in the NPD process.

### **8.3.2 New product development (NPD)**

This construct examines how far the case firms have progressed in their goal to create a NPD capability by understanding past NPD experience (if any), the current success achieved to date, and the process of developing new products, as well as how the firms have organised themselves, and finally, plans for the future.

The beginnings of a NPD capability is demonstrated within all four of the case studies. Hall Stage was in the final stages of prototyping DGS and successfully

repackaging and selling HoldOn. With innovation awards already having been received, Hall Stage had displayed their ability to be innovative and develop new ideas. MRP were at a similar stage with two products at the prototype stage, and with keen interest being shown in these products, regardless of the few teething problems experienced. Perseverance Mills had successfully taken variations of the Pertex fabric to market (Quantum and Equilibrium) and had won an innovation award acknowledging their success. Of the four case study companies, Magnet Application were at an earlier stage of creating a NPD capability than the other three case firms, yet their new product, the detacher, was being sold successfully. Perhaps the most marked change for Magnet Application was their approach to design, which had previously been provided as a free service, but Magnet Application saw the opportunity to be gained from charging for the service.

Past experience of developing new products also played an important role in what the firms were attempting to achieve. MRP's previous albeit limited experience of NPD from their early developments in the 1980s provided useful information and contacts. While these previous developments had ceased before they entered the market, the experience provided a foundation on which to build. Although Hall Stage could not build on past experience of developing new products as this was outside the recollection of the current employees, innovation had always been central to their reputation, and they wanted to regain this reputation. Hence, under new management, they tackled NPD head-on, winning awards in innovation in their industry. Perseverance Mills had no direct link to NPD in the past, but they did have the good fortune to be presented with the idea of Pertex, and although its development was stagnant for several years it was the company's openness to this radically different material that enabled them to be able to develop it. Magnet Application had no previous history of product development upon which to build.

For all of the case study companies, the rationale to create a NPD capability stemmed from the desire to support manufacturing. It was no longer feasible to continue to manufacture to customer specifications, adding little value to the process, in the face of low cost competition (as highlighted in 8.3.1). Therefore for all of the firms in this research, the way to survive involved creating a new product development capability,

allowing them to take “*charge of our own destiny*,” in the words of MRP’s Managing Director.

The four case study firms followed less traditional NPD processes than that often discussed in the literature (such as Cooper’s (1988) stage gate model). MRP sought external help with the front end of the NPD process, as this was where the firm felt that they lacked experience. They did however feel more comfortable with managing the development part of the NPD process as this was a process they had been involved in with their subcontracting customers. Again, the case study revealed the benefits that manufacturing brought to the process of creating a NPD capability. The view within Hall Stage was that the NPD process should follow a less than traditional approach, to enable the creative element to be maintained. Magnet Application’s process was extremely ad-hoc, and arguably this could have been due to their lack of experience in developing products. The findings revealed that Magnet Application had six official projects, all of which were at different stages, with little prioritisation in evidence. However, the formal everyday meetings were aiding clear communication between the six project leaders. Compared to the other case studies, Perseverance Mills approached NPD in the most traditional and formalised way, with clear stages and prioritisation evident, aligned with senior management guiding every step of the project. Perseverance Mills had invested in a new marketing position to aid with the developments in Pertex, demonstrating their commitment to their new brand and an understanding of the importance of the input of marketing.

Throughout all of the four cases, plans for the future of new product development were discussed. For example, Hall Stage were planning to repeat their past success by developing a strategy that would ensure that they won further awards. MRP had already sought ways of continuing to find new ideas from external sources. Furthermore, there was the realisation that they did not have to rely on external ideas, giving them a renewed vigour to attempt a further brainstorming session, involving a wider spectrum of people in order to increase the variety of perceptions and ideas. MRP had also begun to make further changes for the future, with the day-to-day responsibility of NPD being placed under the Engineering Director to ensure dedication to the process and its continuation. Magnet Application sought to bring in the skills of a design student to enable them to work on the aesthetics of their

products and continue with their current projects. Perseverance Mills were dedicated to much of the same, continuing to develop the Pertex brand.

### 8.3.3 Top management

Instrumental to all four firms was their ability and desire to move up the value chain, which was demonstrated in the dedication of top management championing the process throughout each firm. Hall Stage and MRP were both ultimately led by their Managing Directors, although both had a different approach to encouraging NPD. The Managing Director of Hall Stage was very much in control and clearly provided the strength and belief that NPD was the strategy for Hall Stage to pursue. Furthermore, he was instrumental in driving the firm and providing the enthusiasm for NPD. Starting work in a local theatre as a casual, his working life had always been involved in the world of theatre, bringing with it a resounding passion for the industry. It was primarily through the insight of Hall Stage's Managing Director that there was a potential to restore the reputation of the firm, and to try to convince people that *"we weren't dying; that we had bought the company and we were going places... it wasn't just in the shadows and in decline."* Inspirational leadership skills, such as those shown by Hall Stage's Managing Director were key in driving forward the firm and it was even remarked that *"they (top management) are much more personnel orientated."* This was also true to some degree with the Managing Director of MRP, whose guiding philosophy was that it was his responsibility to *"come up with ideas and make it happen, to encourage people to think in that way."* He viewed his role as that of a facilitator and champion of the NPD process to enable the creation of a NPD capability, to provide the entrepreneurial spirit, and to enable the process of NPD. However, the Managing Director relied heavily on his top management team to guide the creation of a NPD capability, and there was a reluctance to involve people outside the top management team.

The role of the Managing Director was far more understated within Magnet Application, where there was a much heavier reliance on the top management team to enable the creation of a NPD capability. The feeling at Magnet Application was that it was the top management team that was driving the concept of new products. It was considered a team effort; this was not an initiative that was being driven from the corporate venture company – rather a willingness of the top management team to see



the company survive. Perseverance Mills were different from the other case studies, with the top management team interested in and supportive of NPD; the drive and the passion for creating new Pertex products came very much from the people in the R&D team, especially the R&D Manager and the Product Manager. There was regular communication and meetings between the senior management team and the R&D team, but it was responsibility of R&D to drive NPD.

#### 8.3.4 Culture

The culture of the firms varied across all the case studies, but ultimately the end point was the same – to create a culture of innovation. The expectation of people to come up with ideas and solutions was found across all four case studies. Within MRP it was perceived that there was already a culture of innovation, in which people were expected to come up with ideas, yet this was a policy that was not universally applied within the firm. MRP were confident in their ability to develop an idea once they had it; the main barrier was to generate ideas internally in the first place. Arguably this was not helped by the fact that engineers were excluded from the NPD process, although they worked on ideas and problems for MRP's existing customer base. The judgement was that the role of innovation was seconded to the realms of the top management team. Specifically at Hall Stage there was the expectation that everybody in the company should generate new ideas; *"we are all supposed to come up with new ideas."* In contrast to MRP, the aim of the top management team at Hall Stage was to create a culture that was driven through *"enthusiasm and drive and buzz,"* which encapsulated everyone, *"even the welders,"* but this was proving to be one of the hardest challenges. Part of the problem, as recognised by the Managing Director, was that while he was enthused by the experience of designing and manufacturing products for the theatre industry this was not always so for all his employees; *"what is important to them, is that they get treated well and fairly and respected by their colleagues."* The experience of people in the factory not being fully drawn into the innovative culture of the firm was further demonstrated with Perseverance Mills, where people in manufacturing often attempted to impede new developments, as was highlighted in Section 8.3.1, which was attributed to the performance measurement scheme.

The four case studies attempted to facilitate a NPD capability in several ways. Hall Stage rewarded innovation and the success of NPD through cash incentives and social events. While this was successful at the start, but the Managing Director was sceptical as to how long it would continue without people naturally expecting rewards for their actions. Conversely, Magnet Application and Perseverance Mills chose a different approach to supporting the culture of innovation with regular communication. Magnet Application had regular meetings between the top management team, which comprised of short daily update meetings, and monthly management meetings to check on longer-term strategies and budgets. These were supplemented with yearly strategy meetings. Perseverance Mills also utilised meetings to bring R&D in line with the company and prevent it from being viewed as those in “*white coats.*” In the case of MRP rewards and communication were not evident from the case study; the people in the NPD process were limited, arguably accounting for the need for rewards. However, MRP did take a developmental role with the people who worked there; they appeared dedicated to their employees, providing training and up-skilling.

Interestingly, of the four cases, there was only one case of attempting to bring marketing and R&D together to generate a more holistic approach to NPD. This was illustrated by Perseverance Mills, who had placed the Product Manager as a bridge between the two departments to ensure that they were pulling together in one direction. However, it must be pointed out that the other case study companies did not have separate marketing departments, if they had one at all.

### **8.3.5 Individuals**

The involvement of individuals in the case studies was observed to differing degrees in the creation of a NPD capability. The fundamental philosophy towards individuals was distinctly different. MRP, who employed over 100 people, involved their staff far less than the other firms in this research, and a holistic approach towards involving them was lacking, although it must be pointed out that MRP did still invest in their engineers’ training. Conversely, Perseverance Mills actively sought to involve people in the NPD process, with the three technicians in the R&D department being encouraged to be fully involved in it. This in turn ensured that they were keen drivers of the new products that they were responsible for developing. This was illustrated through their dedication, often staying late to put ‘runs’ through the machines for new

products, as well as attempting to get the manufacturing people on board with the project. Perseverance Mills were also keen to invest in individuals who would aid them in creating a new product development capability, creating a new position in marketing in order to do so.

This willingness to invest in people was to some degree reflected in Magnet Application. Although people in the factory were not used directly to aid the NPD process, they were still central to the way in which Magnet Application operated. Arguably this could be attributed to the shortage of magnet makers and it was important to retain people and invest in their training. Magnet Application also found that it was necessary to invest in new people where necessary, for example in the area of magnetising boxes; a market which Magnet Application were developing and which was proving relatively successful. But for the success to continue, and for Magnet Application to grow the market, it was necessary to have a person with the right skills – and as a result they appointed a person who was specialised in this field. Instrumental to Magnet Application's ability to develop new products was the experience and expertise of the individuals involved in the top management team. Not only did this impact on the development process by being able to develop products in-house; it was also the external contacts who came with the experience and knowledge of the industry and the benefits that were reflected upon in Section 8.2.1.

The experience and expertise of the individuals within Hall Stage were also key in aiding the development of new products. The Managing Director, along with his top management team, had held of a range of jobs in the industry, which provided Hall Stage with a solid base for developing products in the theatre industry. In order to achieve the objective of developing new products, as with the other case studies, Hall Stage were proactive in bringing new people into the company. It was viewed as essential that Hall Stage grew the company on a firm foundation of people who were qualified, and other people from the industry bringing their own sets of skills, experience and contacts.

### **8.3.6 Marketing**

As a concept marketing was probably the most problematic for all four firms. This was mainly because it was a completely new area for all the firms, and was so far

removed from their previous skill base before their journey to create a NPD capability. The possible exception was Perseverance Mills, who had a marketing department prior to their attempt to move up the value chain, but even so, marketing appeared to be an under-utilised resource until more recently. In most cases the development part of the process was somewhat related to the firms' existing capabilities, namely manufacturing, and therefore there was an understanding of how to make products so that they would work.

The front end of the NPD process involving idea generation constituted a stumbling block for Magnet Application and MRP as the sheer number of markets they could enter was daunting in itself. The prospect of conducting market research to understand the needs and desires of their customers was also an uncharted area. In addition, the back end of the NPD process was also strenuous; never dealing directly with the end customers, it was a completely new area and one that all the firms approached with trepidation. There was a lack of knowledge of what information would be required, how to find that information, and what to do with it once they had it. Hall Stage and Perseverance Mills were in a slightly different situation because their market was much more clearly defined, giving them a clearer understanding of the market they were developing products for. Despite the lack of skills, only Perseverance Mills had made the extra investment to help with marketing, as they felt that it was necessary to invest in marketing personnel to improve the marketing service.

### **8.3.7 Summary of the cross-case analysis for the internal findings**

In summary, the findings suggest that in order to create a NPD capability it is necessary to reconfigure some of the existing internal capabilities, utilising them differently. It would also appear vital to learn new capabilities. It is evident from the case findings that some of the capabilities were harder to develop than others, mainly depending on prior experience and connection to existing capabilities. For example, a synergy existed between the development phase of the NPD process and the existing manufacturing capability, making this element of developing new products easier to learn. On the other hand, there was little synergy between the firms' existing capabilities and marketing, thus making it more difficult to learn marketing skills.

## **8.4 NEW PRODUCT DEVELOPMENT STRATEGIES**

The first of the research objectives guiding this research (see Section 2.11) set out to investigate the actual strategies used by the firms attempting to create a NPD capability. For this reason the NPD strategies have been treated as a separate construct. It was evident from the case findings that there were four predominant strategies that were used to create a NPD capability:

- Alliances
- Licensing
- Outsourcing
- Providing a design service
- In-house

### **8.4.1 Alliances**

The rationale for the use of alliances was that it provided access to knowledge in many forms, such as technology or customer preferences. Through utilising the skills and knowledge developed by others, the NPD process was accelerated for the case firms in that results were achieved more quickly than would have otherwise been possible. In the case of Hall Stage, the experience of the industry and the company's ability to use its networks and external agents wisely provided it with the ability to start to create a NPD capability. Hall Stage's alliance with ASM provided them with the necessary technology, offering Hall Stage a solution when developing DGS. MRP also utilised alliances for the same reasons – because of a lack of an internal capability, in this case the ability to generate ideas (see Section 5.1.1). Perseverance Mills' use of alliances was in close links with some of the major firms in the outdoor clothing market. These close links meant that both parties benefited from the work being carried together on the development of the new Pertex material. Perseverance Mills had a guaranteed buyer for the new material, but with this came the reputation of working with the best in the industry and being innovative, which in turn created further demand. The findings would thus suggest that using alliances and close links creates mutual advantage.

### **8.4.2 Licensing**

In conjunction with alliances, licensing was the formalised agreement that enabled the technology and the ideas to be used in the NPD process. Much the same as with alliances, licensing enabled the firms to reduce the technology gap that they experienced. For example, Hall Stage licensed the technology at the heart of the DGS product. Had they not employed such a strategy, the time taken to develop DGS would have been longer and more complicated. This strategy was also utilised by MRP, who felt unable to generate their own ideas and therefore licensed ideas from external designers. The ability to license ideas and technology reduced the time to market.

### **8.4.3 Outsourcing**

Hall Stage and Magnet Application both benefited from outsourcing elements of their NPD process. In the case of Hall Stage, the strategy involved sourcing a product that had not been designed for the theatre industry – but through the experience of the theatre industry, the individuals within Hall Stage considered that it had the potential to benefit the theatre industry. It was not worth Hall Stage developing their own product, as it was an injection moulded clip – not a specialty of the company, but rather than let the opportunity to generate revenue pass them by it was decided to buy the clips from an external manufacturer, re-package them, and then sell them under the Hall Stage brand; a strategy that was proving successful and generating revenue.

Magnet Application also embarked on outsourcing as a means to keep their product competitive. There was a realisation within the firm that they could not make the component parts of their detacher product as cheaply as the Chinese, and as Magnet Application already had extremely good contacts in China it was deemed to make more business sense to utilise these contacts and take advantage of the cheaper parts, thus outsourcing part of the manufacturing process.

### **8.4.4 Providing a design service**

Part of Magnet Application's strategy to create a NPD capability was to make more of their design service. Previously a service provided for free, it was viewed this was wasting the resources of the firm. Furthermore, because it was free it, they felt that this service was not always taken seriously. By providing a design service it was felt

that the whole process of moving up the value chain would be facilitated, providing Magnet Application with experience of design, and fuelling ideas.

#### **8.4.5 In-house**

In-house development was evident in all of the cases, but to differing degrees. Magnet Application and Perseverance Mills were the only two cases that were attempting to manage the complete development process from idea generation through to market launch, although Magnet Application were attempting to seek help by introducing the skills of a student designer to aid the design phase of the process. This was mainly because as a firm Magnet Application did not believe they always had the necessary skills to develop a product which would look aesthetically pleasing. Perseverance Mills again were managing the whole process, but actively involved the key players to understand the market requirements, as highlighted in Section 8.4.1 above.

MRP were managing the whole NPD process, with the exception of the initial idea generation phase. The rationale for MRP not having an internal design team was that they did not feel that they had a requirement for such a resource and could not justify having their own people internally. MRP's lack of confidence in their ability to consistently generate ideas required them to involve external people at the front-end of the process. However, due to past experience, MRP were confident of their ability to manage the actual running of the project once presented with an idea, thereby managing the remaining NPD process in-house. Such partial management of the development process was also apparent with Hall Stage, who utilised the technology of another company. This was partly due to the prior existence of the technology, and partly due to Hall Stage not having the resources internally, but it is important to highlight that the project management was the sole responsibility of Hall Stage.

NEW PRODUCT DEVELOPMENT STRATEGIES		Hall Stage	MRP	Magnet Application	Perseverance Mills
Alliances		✓	✓		✓
Licensing		✓	✓		
Outsourcing		✓		✓	
Design service				✓	
In-house		✓	✓	✓	✓

Table 8-3 Summary of cross-case analysis – NPD strategies

## 8.5 DISCUSSION OF FINDINGS

The findings from this research in relation to the specific NPD ‘determinants’ as identified in the literature review (Chapter Two) has not necessarily highlighted any surprises with regard to the actual enablers involved in developing new products. This research therefore goes some way to supporting the extant theory in the literature. However, what the findings do suggest is a new understanding of how manufacturing SMEs have to *reconfigure* existing capabilities and *learn* new capabilities in order to create a NPD capability. This research has provided an insight into the actual creation process of developing a new NPD capability. In particular, this was achieved through a new understanding of the *NPD strategies* that were employed to create a NPD capability, such as combining in-house capabilities with external support, which took the form of alliances, licensing, outsourcing and providing a design service. It is this new knowledge of the different NPD strategies and enabling capabilities utilised which, it could be argued, makes a contribution to new knowledge. The main research aim was to understand:

**How do manufacturing SMEs in the UK create a NPD capability to enable them to move up the value chain?**

Through the literature (as discussed in Chapter Two – Section 2.7) further research objectives were identified which aided the research of the main aim of this study:



1. To understand the specific strategies that manufacturing small and medium sized (SMEs) firms utilise to enable them to create a new product development (NPD) capability.

In relation to the second research objective, at the start of this research it was the intention to identify the enablers of the creation of a NPD capability. As the research developed it became apparent that there were constructs and sub-constructs that could not be classified as enablers because they did not support the NPD capability. However, the research identified that there is the potential for this set of constructs and sub-constructs to aid in the creation of a NPD capability, acting as '*qualifiers*', rather than immediately enabling the creation process. Thus the research objective has been modified slightly to incorporate this discovery:

2. Identify the key enablers *and qualifiers* that aided the firms in the process of creating a new product development capability.

The subsequent discussion will allow the academic contribution of this research to be revealed by reflecting on and considering the existing literature as it relates to the findings. This will aid in highlighting the implications for managers of manufacturing SMEs, as well as policy makers, which will be discussed in Chapter 9.

## **8.6 DIFFERENT STRATEGIES FOR CREATING A NPD CAPABILITY**

It is the purpose of this section to relate the findings of the first research objective concerning 'NPD strategies' to the existing literature; 1) to be able to indicate where this research aligns with current thinking, thereby confirming the current literature, and 2) where it contradicts current thinking, providing a new perspective on current thinking, and providing new insights. This study sought to determine and understand the NPD strategies that manufacturing SMEs utilised in order to create a new capability. The findings illustrate that there are six strategies that the firms in this study utilised:

- Alliances,
- Licensing technology,
- Outsourcing,

- Providing a design service, and
- Developing the products in-house.

As this study is exploratory in nature, there is little direct literature that supports the findings in their entirety from this research, particularly as empirical research into how firms with little experience of developing products create a NPD capability is lacking. However, research does indicate that alliances (sometimes called R&D alliances, technological alliances, strategic alliances or strategic partnerships (Zhao and Calantone, 2003) such as the ones witnessed in this research do help organisations to develop new products (Kollmer and Dowling, 2004, Stuart, 1998). Most frequently the motivation for alliance formation is the development of new technologies (Hegret and Morris, 1986, Barley et al., 1992). Interestingly the research on alliances concentrates mainly on large organisations, and it is only recently that researchers have recognised that small firms are also adopting competitive strategies such as alliances (Stuart, 1998).

From this research the findings indicate that for SMEs to gain quick access to technology it is advantageous to create an alliance, as supported by Stuart (1998). Seeking an alliance with another firm is often the most cost and time effective way to achieve a NPD capability. Given the time and financial constraints, arguably it would have been difficult for the firms to develop the internal technological, organisational, and marketing resources required to transform new knowledge into a commercially viable product. In addition, due to the speedy changes in each of the case firms' industries, by the time this has been achieved, the firm may have lost the ability to capture any advantages in relation to its competitors. Thus, by taking advantage of a strategic alliance, a firm may be able to quickly gain access to complementary assets (Pisano, 1990, Schan, 1990, Mitchell and Singh, 1992, Hamel et al., 1989) and in this case, create a NPD capability more quickly. This formed part of the rationale and the attraction as to why the firms in this research entered into alliances; in other words, to obtain resources quickly. Indeed Deeds and Hills (1996) argue that entering into a limited number of strategic alliances to access complimentary assets was often required to help to increase the firm's rate of new product development – a point that this research helps to substantiate.

The alliances in this research tended to be utilised in conjunction with licensing, such as was witnessed in Hall Stage and MRP. The literature has sought to understand the role of licensing within new technology-based firms (NTBFs). These young firms frequently rely on alliances with larger partner firms, often using licensing agreements as a commercialisation strategy to establish their technology and exploit technological innovation (Kollmer and Dowling, 2004). Similarities between the above research and the research described in this thesis are identified, with the case firms using licensing to gain an advantage. However, this research highlighted that more mature SMEs also take advantage of pre-developed technology to combat their technology constraints, and that it is not limited to large organisations or NTBFs. It is worth noting that it was through the use of contacts and external agents that these two strategies of alliances and licensing could be used in the first place. Through external involvement with other organisations, connections with the relevant people were made, forming the basis of these two strategies.

In addition to strategic alliances, the creation of value is also possible through make-or-buy decisions (Leavy 2001), as was witnessed from the findings of this research. Evidence from various industries shows that making the best use of internal resources and capabilities is not sufficient for NPD success (Zhao and Calantone, 2003, Lowe and Taylor, 1998). Therefore outsourcing is viewed as one way to access external resources and capabilities. There are several advantages associated with outsourcing in NPD. Firstly, outsourcing allows a firm to concentrate its “best-in-world” resources and capabilities on a few core tasks to provide unique and superior value for customers (Quinn, 1999). When properly developed, *“strategic outsourcing substantially lowers costs, risks and fixed investment while greatly expanding flexibility, innovative capabilities and opportunities for creating higher value-added”* Quinn (1999). Secondly, outsourcing gives the firm access to resources and capabilities not available or not easily developed internally. As Zhao and Calantone (2003) state, each firm has its own best-in-world core competencies, which would be prohibitively expensive or even impossible for another firm to duplicate. However, in some situations, even if the firm can handle a task efficiently, there may be strategic reasons to externalise it (Zhao and Calantone, 2003). The findings from Magnet Application support this, as they were capable of producing the components for the detacher but could not compete effectively with the manufacturing processes in

China. Therefore it was not cost effective to develop and manufacture their own components.

Furthermore, giving complicated tasks to others is a way to incorporate their expertise into one's own NPD programme, and performance can be greatly enhanced (Prahalad and Hamel, 1990, Venkatesan, 1992). By creating a strategic alliance with ASM, Hall Stage was able to use the knowledge and technology developed by ASM to create DGS. Without this alliance and ability to outsource the motor system to ASM, developing DGS would have been a much harder proposition. By using outside resources and capabilities, the firm can fully implement NPD strategies and enhance its competitive position (Zhao and Calantone, 2003). Survival largely depends on how the firm builds, develops (or strengthens), and protects its core competencies (Day and Wensley, 1988).

The firm seeks to perform certain NPD tasks internally because its specific advantage needs to be protected. In other words, if NPD tasks are closely related to core competencies and externalising them would undermine competitive advantage, the firm should not outsource these tasks (Zhao and Calantone, 2003). Coca-Cola, for example, does not let other firms touch its secret syrup and develops it in-house in order to protect core competencies and maintain competitive position in the marketplace. The literature indicates that many of the resources and capabilities essential to competitive advantage lie outside the firm's boundaries (Doz and Hamel, 1998). Grant (1991b), for example, believes that outsourcing should be considered when necessary resources and capabilities are not available internally. Through outsourcing, the firm can gain "*otherwise unavailable competitive advantages and values for the firm*" (Das and Teng, 2000), such as Hall Stage's purchase of the clip from another firm, which through repackaging and branding became Hall Stage's HoldOn. Thus, Hall Stage was able to provide their customers with a useful product, but not suffer the cost of manufacture. The rationale for utilising a 'buying-in' or outsourcing strategy was that Hall Stage did not have the necessary skills to manufacture the plastic clip that was HoldOn – therefore it was easier and more cost effective to buy in the product.

Finally, Magnet Application sought to provide a design service, a service that had been provided in the past, but offered for free. Charging for the service enabled Magnet Application to fundamentally change their position in the value chain by moving to a position where the service that was delivered would inherently generate more value to the firm, a strategy endorsed by Edwards, Battisti and Neely (2004). Essentially, what Magnet Application was attempting to offer their customers through its service offering was a total solution. It was hoped that by providing a design service, this would support manufacturing and would fuel new ideas within the firm.

The literature has recently concluded that it is believed that manufacturers are beginning to move away from aggressive in-house developments and are seeking the formation of a variety of inter-organisational relationships (Sengupta, 1998). In the constant drive for higher quality, lower cost and faster-to-market products, many firms have begun to learn “how not to make things” (Zhao and Calantone, 2003). Several authors have found that alliances help to reduce the time to market for a new product (Sengupta, 1998) compared with the manufacturing option. This was not necessarily the case in this research, as a balance has been identified in most of the case studies between alliances, licensing and some form of in-house development. Therefore this research does make some contribution to the knowledge of how SMEs develop products ‘in-house’. Section 8.7 will examine the findings relating to the internal development of new products.

## **8.7 ENABLERS AND QUALIFIERS FOR CREATING A NPD CAPABILITY**

The purpose of this section is to reflect on the findings that relate to the second research objective of this study concerning the ‘enablers’ and ‘qualifiers’ required to aid the creation of a NPD capability. Further analysis and interpretation of the constructs and sub-constructs allowed categorisation of the findings to take place, providing further meaning and understanding. Whilst all of the findings were interesting and warranted further investigation, the interpretation was limited to the constructs and sub-constructs that had three or four occurrences across the cases (identified through the summary tables, Tables 8-1 and 8-2). This decision was taken in order to synthesise the findings. Therefore, if a sub-construct was found to occur in three or more of the cases, it is supposed that this would indicate some similarity and

relevance across the cases, whereas the sub-constructs that appeared in only one or two of the cases could be argued to be firm specific, and in which case they would warrant further investigation in subsequent studies. In order to create a more meaningful discussion the external and internal findings are now merged as both categories of constructs were found to be enabling the creation of a NPD process. This is continued to the external constructs, where the decision was taken to merge the network and government agents constructs due the similarities identified between the two.

The constructs and sub-constructs that are to be included in this study are all important in enabling the firms to move up the value chain, but some were not as fully developed as others (as Figure 8-1 illustrates), and would require further development if they are to truly enable the case firms to move up the value chain. Therefore it is necessary to be aware that there is a set of sub-constructs that are already aiding the process of creating a NPD capability – for the purpose of this study this category has been titled ‘enablers’. The other category that has been identified as being relevant and useful, but with which the firms were having difficulty in some way, has been titled ‘qualifiers’. It is worth noting here that the ‘enablers’ and ‘qualifiers’ were identified by interpreting the interview data to establish them from the individuals involved in creating a NPD capability.

The ‘enablers’ that have been identified:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• External Involvement             <ul style="list-style-type: none"> <li>○ Contacts that aid NPD</li> <li>○ Conferences and trade shows</li> <li>○ Universities</li> <li>○ Government Agents</li> </ul> </li> <li>• Manufacturing             <ul style="list-style-type: none"> <li>○ Investment in manufacturing</li> </ul> </li> <li>• New Product Development             <ul style="list-style-type: none"> <li>○ Rationale for developing new products</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Individuals             <ul style="list-style-type: none"> <li>○ Investment in new people</li> <li>○ Champion for NPD</li> <li>○ Expertise</li> <li>○ Training and further education</li> <li>○</li> </ul> </li> <li>• Top Management             <ul style="list-style-type: none"> <li>○ Senior management team</li> <li>○ Leadership support</li> </ul> </li> </ul> |
|---|---|

The *'qualifiers'* identified in this study:

- Manufacturing
  - Barrier to NPD
- New Product Development
  - Current capability
  - Process NPD
- Culture
  - Innovation culture
- Marketing
  - Missing marketing skills

The inspiration for the concept of 'enablers' and 'qualifiers' which has helped to categorise the results from the case studies came from the field of operations management. Hill (1993) identified that "*a particularly useful way of determining the relative importance of competitive factors is to distinguish between 'order-winning' and 'qualifying' factors.*" Order winning factors are those which directly and significantly contribute to winning business. Customers in particular regard them as key reasons for purchasing the product or service. This is a similar principle as with 'enablers'. Particularly, these were identified as constructs that were already directly and significantly aiding the creation and development of a NPD capability. Whereas 'qualifying' factors, as described in (Slack et al., 2004), may not be the major competitive determinants of success, but are important in other ways. They are those aspects of competitiveness where the operation's performance has to be above a particular level just to be considered by the customer. Performance below this 'qualifying' level will possibly dissatisfy the customer. This principle is again similar to the 'qualifying' constructs identified in this research in that they were below the expected performance level of an enabler. In other words, they were not yet enabling the creation of a NPD capability.

As Mosey (2004) highlights that thus far in the literature there has been little empirical research that has examined how a NPD capability can be created, especially in SMEs. The findings from this research begin to provide an insight into that process. They illustrate that as a firm creates a NPD capability, all of the necessary constructs are not developed at the same time. Rather, there are constructs that involve modifying, but essentially little new learning is involved, and they are already

enabling the creation of a NPD capability. These enablers build upon existing organisational capabilities that exist within the firm. The constructs deemed as '*qualifiers*', however, will take longer to develop because of the firm's lack of previous experience. When the findings were compared with the literature review (Chapter Two) there was a correlation with what the literature had identified as success factors (see Table 8-3 for a comparison of the literature and the findings). It is believed that it is too early to state whether the same '*enablers*' and '*qualifiers*' identified as part of this study would lead to success and could be classified as 'success factors' or even 'determinants' of NPD as those identified in the literature. To determine whether the '*enablers*' and '*qualifiers*' in this research will lead to success is beyond the scope of this study, not least because it is too early, as none of the company's products had been measured for success.

The following sections will discuss the '*enablers*' and '*qualifiers*' with specific reference to the scholarly literature. The purpose of this is to draw attention to where this research has confirmed the existing literature, substantiating current thinking or where there has been a new contribution to knowledge. The constructs have intentionally not been separated into the two categorises of '*enablers*' and '*qualifiers*' due to the overlaps in the constructs and sub-constructs. Therefore a holistic approach will be taken for each construct highlighting the sub-construct that was either identified as an '*enabler*' or a '*qualifier*' within the main construct.

### **8.7.1 External involvement**

This section has intentionally merged the role of networks and government agents due to the overlap between the roles played in enabling the firms to create a NPD capability. The government agents were utilised in much the same way as networks, providing knowledge and resources that aided the firms in their desire to develop new products.

Despite contradictory studies relating to the importance of networks, research states that there is little substantiation of a relationship (Freel, 2003). However, this study suggests that the involvement of external organisations is arguably one of the most important enablers in creating a NPD capability. This confirms the link that has already been made between the involvement with external organisations and the



success of NPD projects (Cormican and O'Sullivan, 2004, Ancona and Caldwell, 1992, Mendelson and Pillai, 1999). The findings reveal that it was the ability of the case firms to exploit the knowledge of the external organisations that enabled them to begin to create a NPD capability. Absorptive capacity further confirms that through exposure to knowledge from the firms' environments, decision making can be influenced (March and Simon 1993), as well as the development of future capabilities (McGarth et al., 1995). Importantly Van Wijk et al. (2001) confirm it is the breadth and depth of knowledge exposure that positively influence a firm's propensity to explore new and related knowledge. This was manifested in the case of MRP, who through networking with different designers were able to gain valuable access to ideas. By exploiting external knowledge, the case study firms were able to create and utilise their absorptive capacity, which in turn enabled them to create a NPD capability.

During the different stages of the NPD process it is necessary to incorporate communication with external organisations (Ebadi and Utterback, 1984) as was practised within the case studies. For example, Hall Stage utilised their networks at the development phase and the prototype phase, enabling the technology to be licensed, which aided the development of DGS, and during the prototyping enabled testing to occur. Perhaps the need to be involved with external organisations can be explained through dominant network theory, which supports the need to involve others. Advocates of the theory state that individual firms are seldom capable of innovating independently, and never innovate in a vacuum (Håkansson, 1987, Maillat, 1995, Oughton, 1997, Florida, 1995, Cooke and Morgan, 1998, Baptista and Swann, 1998).

### **8.7.2 Manufacturing**

This research found that the existing manufacturing capability was considered useful in enabling a NPD capability. Initially manufacturing provided the firms with an existing cash cow that a new start firm would not have the resources to benefit from. A further benefit of manufacturing was a basic knowledge of design. Even though design was not fundamental to a manufacturing subcontractor, intrinsically knowledge of design had been accumulated, offering the case firms a solid foundation for developing their own products.

The importance of involving manufacturing in the NPD process has been recognised as offering “*diversity and richness of experience that aids cross-functional commitment*” (Cooper 1983) a point that has been replicated in this study, demonstrated through cross-functional involvement of manufacturing in the NPD process. The formation of a cross-functional team can overcome organisational interfaces (Johns and Snelson, 1988), and therefore should be sufficiently supported (Benedetto, 1999). The most noticeable change was in Perseverance Mills, where the whole performance measurement system was changed to realign manufacturing and the NPD process. This meant that manufacturing began to accept product developments being tested in the plant. Often research has concentrated on the relationship between R&D and marketing, but as Crawford (2003) stresses, the importance of involving different functions, such as manufacturing, should also be included. Through cross-functional involvement complementary technological know-how is crucial in supporting the interdisciplinary nature of developing new products (Dosi, 1988, Mowery and Rosenberg, 1989).

Song et al. (1998) question the benefits of cross-functional integration, as they found that in reality having all functions involved in all stages could be counter-productive. This was not evident in this research, where the benefits were clear, and if it had not been for a proactive and interactive approach between the different functions then the creation of a NPD capability would have been more arduous. The firms’ investment in manufacturing illustrated their continued support, commitment and understanding of the role played by manufacturing. Thus, this research supports the view that cross-functional development does aid the creation process of a NPD capability.

A cautionary note worth making here is that the categorisation of manufacturing as a ‘*qualifier*’ as well as an ‘*enabler*’ was due to its potential to become a barrier. As Teece et al. (1990) point out, a firm’s capabilities can constrain its strategy, and as proposed by Leonard-Barton (1992), can become a core rigidity. Core rigidities are the flip side of core capabilities; they are deeply embedded knowledge sets that can actively create problems (Leonard-Barton 1992). This was witnessed in MRP and Magnet Application as the knowledge relating to manufacturing had the potential stop the two firms from moving forward and creating a NPD capability. The main barrier

was releasing the security that the firms had tied up in manufacturing and moving into developing new products.

### **8.7.3 New product development**

New product development acted as an 'enabler' as there was a real sense of pressure to change. In all the case studies there was a sense that could no longer they continue to remain competitive by simply acting as a manufacturing sub-contractor, primarily because of the threat from low cost competition. Their current situation provided the impetus for a move up the value chain by creating a NPD capability. Zahra and George's (2002) model of absorptive capacity helps to shed some light on why this might be, and they suggest that certain triggers activate a firm's 'absorptive capacity'. Specifically, these events can either encourage or compel a firm to respond to specific internal or external stimuli, as was the case with the firms involved in this research. Winter (2000) argues that crisis points such as those that these firms found themselves in have the potential to stimulate learning; in this case, to learn the ability to develop new products. Furthermore, the feeling of crisis can lead to firms to exploring, acquiring and internalising external knowledge (Kim, 1997).

New Product Development was categorised as a 'qualifier', mainly because of the embryonic stage of the development process within the firms. Perseverance Mills were probably the most advanced in terms of developing a product and taking it to market, but they felt that they had a long way to go to develop their 'research and development' capabilities. Within the other cases there was evidence that that there was certainly potential for them to develop products; Hall Stage were experiencing success with HoldOn and DGS was in the final phase of testing; MRP were at the prototype stage but experiencing development difficulties, and Magnet Application had been successful with their detacher, and other projects were in the pipeline. Furthermore, both Hall Stage and Perseverance Mills had received awards for innovation.

As stated in the review of the literature (Chapter Two), the existence of a formal new product development process has been found to yield positive results (Cooper and Kleinschmidt, 1995, Rochford and Rudelius, 1997, Bessant and Francis, 1997). Success is particularly evident when the process is comprehensive and characterised

by professionalism (Ernst, 2002). However, as was illustrated in Chapter Two, the literature on SMEs indicates that the NPD process is more informal (Roper 1997); an aspect found in this research. Despite the agreement with this body of literature concerning SMEs, the construct relating to NPD process is categorised as a 'qualifying' factor, simply because the interpretation of the findings indicated that the firms were still developing and experimenting with their NPD process and it had yet to be a process that the firms were comfortable with. As the firms evolve in the future and become more competent and knowledgeable regarding the NPD process, a more formalised process could emerge. Zirger and Maidique (1990) argue that the NPD process should provide managers with a game plan or blueprint for action, aiding in improving the effectiveness and time efficiency of the NPD process; the way that these firms are conducting their NPD process arguably does provide them with a game plan, but probably not one that would be effective in a larger mature firm.

#### **8.7.4 Top management**

Within the new product development process, top management has been identified as critical to successful product development (Rothwell et al., 1974, Cooper, 1988). This is not only supported by the findings of this study, but emphasised as being arguably the most important of all the enablers. This study indicated that top management support was instrumental to the creation of a NPD capability, noticeably; it is the 'drive' and 'passion' of top management supporting NPD process which was key. Fundamentally, it was the overall vision and "*entrepreneurial dynamism*" (Davenport and Bidy, 1999) that was evident from the case studies – arguably without the leadership within *all* of the case studies the move up the value chain and the vision to create a NPD capability would not have come to the forefront.

It was the passion and dedication of the Managing Director of Hall Stage who was the most charismatic of the leaders of the case studies. He provided a deep belief in what the firm was trying to achieve and it was his desire to instil this passion into the whole company and a love for the theatre industry – ultimately he was providing the vision and the "*entrepreneurial dynamism*" (Davenport and Bidy, 1999). Within MRP, the Managing Director also took a similar role to that of Hall Stage providing the vision – although his style was different, he was less charismatic and more reserved in his approach. But the desire was the same. As the owner- manager of the company it was

evident that this interest was a driving factor in developing a NPD capability to ensure the survival of his company as is often confirmed in the literature (Hoffman et al., 1998, Hale and Cragg, 1996). The effect of the owner-manager relationship on the objectives of the firm was witnessed in all the case studies, with all the support from top management being inspired through their own personal skills in the industry or personal hobbies and passions, with all the managing directors either owning or part-owning. This was particularly so in the case of Hall Stage, whose Managing Director had been in the theatre industry all his working life (and this was part of his rationale for purchasing Hall Stage), as well as MRP's Managing Director, who sparked the idea for one of their initial product developments (the Electronic Personal Identification Radio Beacon (EPIRB) – Section 5.2.2). It is evident from the research findings that without top management support, none of the firms would have embarked on developing new products, as they acted as a catalyst for the process of creating a NPD capability.

The management style within Magnet Application was different to the other case studies. The findings illustrated that the strategy was being driven by the management team, which was cohesive and passionate about their desire to create a NPD capability. However, Managing Director did confess that it was his role to "*I am the facilitator of actions,*" perhaps underlying the fact that he did see his role as providing inspiration and drive to the firm and in fact that his management style was understated. With Perseverance Mills the top management team were involved in encouraging innovation but were not identified as being the driving force behind their strategy. Instead it was the R&D manager and Product Manager that provided the inspiration and the vision. Ultimately, it was their lifestyle that involved 'outdoor activities' which was directly related to the pertex and its market – this provided them with a unique understanding of the market and the requirements of the material that they were creating and developing.

It has been identified that top management support could take the form of an individual, as was the case of Hall Stage. Alternatively, the top management team collectively was inspirational in driving the concept of creating a NPD capability in the case of Magnet Application and MRP. As previously identified in the literature, top management support is a particularly important factor. Specifically, the literature

and the findings from this research illustrate that this comes about by providing access to resources (Cooper and Kleinschmidt, 1995) as well as providing inspiration and support (Maidique and Zirger, 1984, Brown and Eisenhardt, 1995) for the NPD process. In terms of top management support, it was the ability of the top managers to provide guidance and determination through their advocacy that creating a NPD capability was the right direction for the firm. Ultimately, the role of top management was to spark enthusiasm and belief in the process, which then inspires the employees in the firm.

### **8.7.5 Culture**

The propensity to be innovative is thought to be influenced by a culture of innovation (Voss, 1985). Interestingly, in Section 2.7, four of the five aspects of an innovative culture were identified in the case studies; 1) core values and norms, 2) freedom and openness 3) risk and 4) critical roles. However, the analysis and interpretation concerning critical roles was deemed to play a significant part in the case studies, creating a NPD capability and therefore becoming a separate construct – individuals and will be dealt with in Section 8.7.6.

In all of the cases culture has been identified as a key determinant in the firms attempting to create a NPD capability. As Booz et al. (1982) identified, successful innovative firms have an operating philosophy that incorporates a commitment to growth through NPD, much the same as was observed in the case studies. However, a true culture of innovation was arguably still being developed, and therefore was relegated to being a 'qualifier'. Schein (1985) presents core values and norms as being the grounding of any culture of innovation, which over time becomes expected behaviour, and is known as 'the way that things are done around here'. This was not yet present in the findings, arguably because the necessary time had yet to pass for norms and values to be set in place. For example, Perseverance Mills had experienced issues with trying to gain support from manufacturing. MRP isolated the culture of innovation to the top management team and some of the engineers.

Further substantiation between the research findings and the existing literature was discovered, and the element of 'openness' was found in the case firms, and is a factor advocated by Kanter (1988). The research findings conveyed that actively

communicating with employees helped to support the objectives of the firm. The literature supports the finding that communication such as the daily and monthly meetings witnessed at Perseverance Mills and Magnet Application is necessary for successful NPD (Cooper and Kleinschmidt, 1995).

### **8.7.6 Individuals**

Whilst the subject of 'people' or 'individuals' is usually dealt with under the heading of culture, one exception is Tushman and Nadler (1986), who determine that individuals are essential in organising for innovation. In agreement with Tushman and Nadler (1986) the case analysis highlighted that the 'individual' and people element of NPD deserves closer attention. It was evident from the case studies that individuals were of paramount importance to the firms that were creating a NPD capability, playing a critical role in supporting the objectives of top management. Particularly, this was seen in Perseverance Mills, where the technical staff stayed late and were committed to getting manufacturing involved – aiding the success of the relationship between the R&D department and manufacturing.

Often it was the expertise of the individuals in the firms that allowed them to embark on the journey of creating a NPD capability in the first instance. Whilst the importance of critical roles has been highlighted through the work of many authors (Tang, 1998, Cormican and O'Sullivan, 2004, Rothwell et al., 1974, Chakrabarti and O'Keefe, 1977, Maidique and Zirger, 1984, Cooper and Kleinschmidt, 1995, Tushman and Nadler, 1986, Song et al., 1997a, Barczak, 1995), the exact role of people in starting to build an NPD capability has never before been pinpointed. In the case of this research it was the ability to 'open doors' to networks that was seen to be extremely useful; a role that resembles what the existing literature describes as a 'gateway' champion (Tushman and Nadler, 1986). In this research it was also evident that there were champions of the NPD process, i.e. of creating a NPD capability. These individuals or group of individuals were strongly supportive of the process and drove the necessary changes to ensure its success. In the case of MRP, Hall Stage and Magnet Application, it was a joint passion between the senior management team, or in the case of Perseverance Mills, the R&D team. A role not specifically highlighted in the literature, Tushman and Nadler (1986) describe the role of developmental sponsor or mentor as: "*senior managers who provide informal support, access to*

*resources and protection as new product or ventures emerge. Without sponsors and mentors, new products and processes get smothered by the organisational constraints.*” Arguably this is probably a more appropriate definition for a firm with a more mature NPD process and even a larger firm, but the concept is still aligned with the evidence from the case studies, that a champion of the process is required to drive and protect the idea of a NPD capability.

Evidence of the importance of the ‘individual’ was witnessed through the investment in new people by all of the companies except MRP. Whilst MRP understood the need to grow and introduce new people, they did not feel in a position to do so as they were unsure who would be able to carry out the role that they felt was necessary to bring in to the company. The importance of expert individuals was such that training and further education was actively encouraged in all of the case studies. Tushman and Nadler (1986) advocate education as it introduces new methods and disciplines, and acts as *“an effective tool for influencing innovation”*. Even large corporate organisations such as IBM and PepsiCo actively encourage further education to aid innovation. By embarking on such ventures it became apparent from the case studies that a form of personal commitment to both the firm and the NPD process was generated through a sense of commitment from the firm to the individual, giving a sense of appreciation, which in turn benefits the firm, as a committed individual is more likely to give more to their work.

### **8.7.7 Marketing**

As with manufacturing, the integration of marketing in the new product development process has been identified as being important (Cooper and Klienschmidt, 1996). The findings from this research agree, as all the firms were attempting to create a marketing resource that could be utilised in the NPD process. Interestingly this research has illustrated that the main issue was the fact that these firms had never previously, or at least little experience of being involved in direct marketing, especially contact with end-users. Therefore being able to develop their marketing skills to support a new NPD capability was proving difficult for most, if not all of the firms.



Despite the difficulties faced by the case study firms, the literature does advocate a strong market orientation, particularly when conducting the predevelopment activities (Cooper and Kleinschmidt, 1995, Maidique and Zirger, 1984, Rothwell et al., 1974). For MRP and Magnet Application this aspect of marketing was especially difficult because their potential markets were so wide and all-encompassing, and identifying a market and potential customers was onerous. Yet research suggests that failure to ground products using ineffective product marketing and poor market research is one of the principal causes for failure of a product (Cooper, 1975, Hopkins, 1981). Further problems ensue with inadequate assessment of market potential, poor understanding of competitors' strengths and weaknesses, and inaccurate product pricing.

The work of Cooper and Kleinschmidt (1996) acknowledges that successful new products arise from the recognition of a need of one sort or another; a point that was illustrated by the knowledge that the Managing Director of Hall Stage had accumulated in the theatre industry, which had sparked the ideas for DGS. Marketing know-how is important, for if new products are to be successful they have to be designed to best serve customer needs (Stalk and Hout, 1990). Perseverance Mills illustrated that through close working relations with their key customers, which enabled them to understand the requirements of the end consumer. As such, the customer can frequently be the main source of innovative ideas (von Hippel, 1978). Presumably due to the acknowledged importance of marketing, all of the firms involved in this research attempted to improve their marketing skills. Magnet Application, MRP and Perseverance Mills were involving their sales teams in the NPD, which Cooper's (1988) research supports as being positive; as having regular contact with the customer and their problems, can help in identifying potential new opportunities. However, only Perseverance Mills had a separate marketing department and were involving them with the launch stage, which Cooper and Kleinschmidt (1995) suggest is important, as marketing can guide the implementation of the plan. Arguably, however, firms such as Hall Stage and Magnet Application were too small to have such segregated resources.

## 8.8 ACKNOWLEDGEMENT OF THE DIVERSITY IN THE FINDINGS

As exploratory research this section deals with the findings that were not included in the main cross-case analysis. The rationale for examining these findings is to acknowledge the diversity in the findings and the richness this provides in enabling understanding how SMEs have attempted to create a NPD capability. The findings that had an occurrence of 1 or 2 have been summarised in Table 8-4 followed by a discussion of these findings.

<b>Construct</b>	<b>Sub-construct</b>
<b>Government</b>	Serendipitous process
	Lack of funding
	Sceptical, wary of costs
	Link between ideas and case company
	Grants and awards
<b>Networks</b>	Market linkages
	Scouting networks
	Network forums
<b>Manufacturing</b>	Role within NPD
<b>New Product Development</b>	Idea generation
<b>Top management</b>	Reliance on management outside board
	Reputation in industry
<b>Culture</b>	Rewards
	Linkages between R&D and marketing
	Learning
<b>Marketing</b>	Extra investment
	Introduction of innovation in marketing
	Role of marketing

*Table 8-4 Summary of findings not included in cross-case analysis*

### **8.8.1 Government Agents**

As stated in the cross-case analysis the nature of government involvement has been received with a degree of scepticism, with the less frequently identified constructs highlighted in Table 8-4 serving to support this view. Particularly, these individual findings confirm the frustration of the case firms when dealing with government agents. Either because people did not know who to approach for which service (serendipitous nature of the process), or they were wary of the cost implications that the SME would be charged for using the government agent's services.

The findings that are specific to the individual case studies also underline the benefits of using government agents that were arguably not highlighted in the main cross-case analysis. One such benefit was to provide access to other organisations that could help with idea sources, as was witnessed with MRP. As the literature highlights one issue relating to SMEs is their lack of access to resources (McAdam et al., 2004, Hoffman et al., 1998), it would appear that government agents help to bridge this gap. The role played by government agents helped the SMEs to access resources they lacked and aided them in creating a NPD capability. Further evidence of this was observed in the way that Magnet Application utilised the grants and awards run by government agents to overcome financial resource constraints. Accessing money for awards and grants enabled them to fund certain projects that would otherwise not have been possible.

### **8.8.2 Networks**

Networks were identified as being vital in creating a NPD capability in the cross-case analysis (see Section 8.2 and 8.7.1), with further evidence provided here of the importance of networks by these less frequently mentioned constructs. These single or double occurrence constructs illustrate further how and why networks were used. In the case of Hall Stage it was the ability to use its networks to make linkages with the market and find the solution. This was the case when Hall Stage were given a recommendation which enabled them to work with ASM who supplied the necessary technology to develop their first product DGS. Hall Stage and MRP employed networks for other purposes which were not found in the other two case studies – this was to 'scout' and locate solutions or ideas to use within their firms. This enabled a diversity to be sought that did not exist within the firm. Other forms of networking

and seeking external association were illustrated through joining forums or groups such as the Chamber of commerce. These proved useful for Magnet Application in gaining access to companies that otherwise would have been difficult for an SME to establish contact with, such as the association with company wishing to work with Magnet Application on their oven catch.

### **8.8.3 Manufacturing**

The analysis of the findings reveals only one construct that occurred less frequently than the other case studies, which was the role of manufacturing within new product development. This sub-construct was found only to apply to Hall Stage. Manufacturing were deliberately used within the NPD process to help with the design of products. This clearly demonstrates the importance of developing products across different functions and the benefits of using knowledge and experience of people that come into daily contact with the products. To repeat Cooper (1983) from early in this thesis the purpose of involving different functions is to benefit from the *“diversity and richness of experience that aids cross-functional commitment.”* Utilising the knowledge of manufacturing brings about learning that helps to create adaptability and a responsiveness to change (Dodgson, 1993) which was required to create the new capability.

### **8.8.4 New Product Development**

The concept of idea generators illustrated the role of ‘innovation champions’ that the R&D and product manager at Perseverance Mills took within the NPD process. As Tushman and Nadler’s (1986) idea generators, highlighted that within the NPD process there are key individuals who creatively link diverse ideas, which is role that was witnessed in the case study. These creative and internal champions were central in seeing new approaches and linking technologies to markets, and products to new processes. A key part of their role involved actively linking local colleagues to external information sources, through acquiring, translating and distributing the external information as described by Cormican and O’Sullivan (2004). The difference in their role within in NPD process that was not encountered within the other case studies was they were relied on as the sole ‘idea generators’ by top management, which is examined in Section 8.8.5.

### 8.8.5 Top Management

The case study of Perseverance Mills highlighted an occurrence that was not present in the other case studies, which was reliance on management outside of the board. Whilst the top management were supportive of innovation, the inspiration did not come from the Top Management Team. Rather the top management relied on the idea generators (the R&D manager and Product Manager). It is argued that innovation is driven through personal curiosity of individuals, rather than being market led (Humble and Jones, 1989), thereby this can be partly explained as to why it became the role of the idea generators and not the top management, as the idea generators were keen outdoor people that helped to drive their passion for the product they were manufacturing – which was not the case for the Top Management Team.

One interesting sub-construct that emerged from the Hall Stage case study was the importance of the ‘reputation of the Managing Director in industry’ whilst this could be argued to be related to the theatre industry. It validated the business in the eyes of the customers, providing them with the confidence that Charles was from the industry and a man that would ensure “*the job was completed.*” This research findings is sustained by Majchrzak et al. (2006) who argue that reputation is indeed one of the four keys to managing emergence particularly within new product development.

### 8.8.6 Culture

As organisations develop culture in different ways and the case studies in this research were at different stages of creating a NPD capability. There were a number of constructs that were either unique to a particular case study or two. These less frequently mentioned findings related to rewards and linkages between marketing and R&D (cross-functional involvement). Rewards were found to be an active part of encouraging innovation within Hall Stage, yet were somewhat problematic for the Managing Director, in terms of understanding their effect on the workforce. However, despite these issues it is argued in the literature that innovative ideas from employee’s must be back through timely rewards (Ghobadhian and Gallear, 1997) demonstrating that Hall Stage had arguably made a positive move in introducing rewards.

The area of cross-functionality is one that has been debated in the literature and regarded to positively effect on NPD. Yet evidence this there was only one instance of

marketing and R&D working together. This has to be explained in the way that the SMEs were structured with the other case studies not having individual departments. As Raymond et al. (1998) states that cross-functionality occurs naturally within SMEs. Very often, employees occupy different positions at the same time, the organizations are flat, and though the entrepreneur is in charge of both operational and managerial functions, he/she usually neglects the managerial activities (Marchini 1995).

Learning whilst present across all the case studies, as all four were involved in adapting and changing in order to create a NPD capability, it was only Magnet Application and Perseverance Mills that identified it as a phenomenon. These two SMEs recognized that a change in strategically direction and a change in culture required elements of learning and adaptation. Demonstrating that a climate in which individual members were encouraged to learn and develop was present, which aligns to Pedler's (1989) understanding of organizational learning as a process of organisational transformation that helps to bring change and better ways of working (Dodgson, 1993) as demonstrated within this research.

### **8.8.7 Marketing**

Investment through employing the skills of an extra person in marketing was felt necessary by Perseverance Mills, yet this was not evident in the other case studies. However investment in a different guise was apparent in Hall Stage, who chose to invest in marketing through providing an innovative financial service to support their DGS product. Arguably the lack of investment in marketing can be rationalised that at the level of SMEs, investments on intangible resources and the creation of capabilities are quite problematic (Pil and Holweg, 2003).

## **8.9 SUMMARY OF FINDINGS**

The findings from this research provide an encouraging sign that SME manufacturers can move up the value chain by creating a NPD capability. Interestingly, it is the admission of the firms' limitations at the outset that has provided useful insight into this move up the value chain. Rather than attempt to develop the product totally in-house Hall Stage, Magnet Application, Perseverance Mills and MRP utilised different

strategies to aid them in creating a NPD capability. Supporting these strategies, the firms have all sought to leverage both internal and external capabilities in their transformation up the value chain, as well as developing new capabilities.

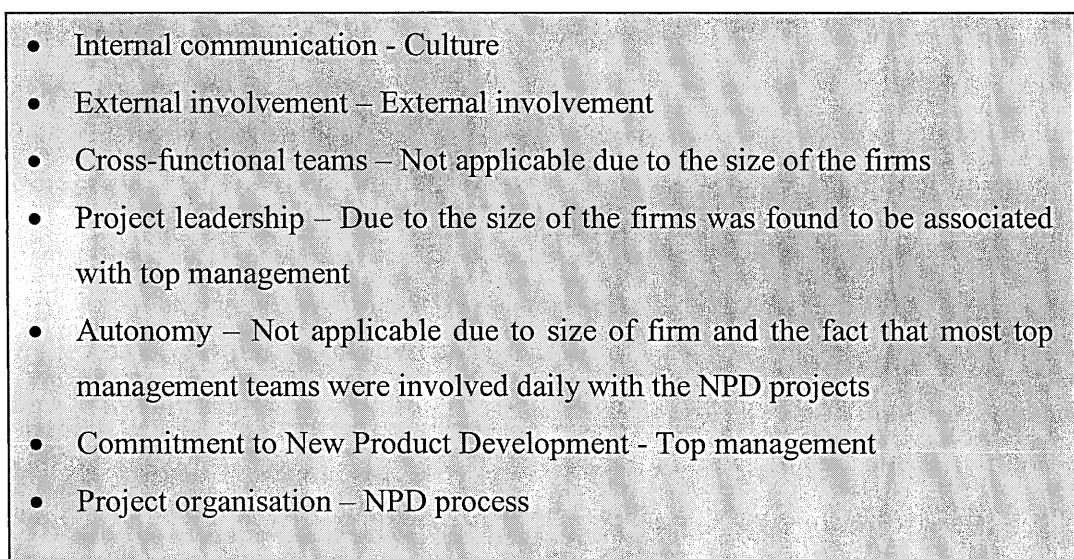
The case studies provided insight into how it was necessary to reconfigure and operationalise key activities in order to create a NPD capability from a position of relatively little experience. The findings illustrate an alignment with the dynamic capabilities theory, which focuses its attention on the firm's ability to renew its resources in line with changes in its environment. Specifically, dynamic capabilities refers to the firm's ability to alter the resource base by creating, integrating, recombining and releasing resources (Eisenhardt and Martin 2002). For example, in all the firms, it was necessary to create a marketing capability, and for Magnet Application and MRP it was a case of integrating previous knowledge gained from their experience of designing for manufacture.

Already highlighted, but an important point to reinforce, is the concept of core rigidities (Leonard-Barton, 1992) impeding the creation of a NPD capability. The findings identified in relation to manufacturing that there were instances where manufacturing acted more as a barrier than an enabler for the creation of a NPD capability. In the case of MRP and Magnet Application, there was the potential for manufacturing to impede the creation process. This was mainly due to the deep rooted association with manufacturing as the revenue generator, and any move away from this involved change.

The literature review in Chapter Two earlier criticised the current research on new product development 'good practice' for not exploring how organisations go about creating a NPD capability from a point of little or no previous experience. Through this research the findings highlight strong links to the literature examining 'determinants' of NPD success (see Table 8-5 for a comparison of the literature and the research findings), illustrating that those firms at the beginning of the process of creating a NPD capability do in fact share the 'good practices' of firms with a more mature NPD capability. However, it is worth noting here that the 'organisational' determinant (discussed in Section 2.6) was found to merge with and align more closely to other constructs identified in the findings. Figure 8-1 illustrates the key

elements of the organisational determinant that were identified from the literature as being key to success compared to the construct with which they aligned in this research. Perhaps one argument for the diversion from the literature is that due to their size, SMEs do not organise in the same way as larger organisations. The findings highlight that whilst the elements of the organisational determinant were identified they were aligned more closely with other constructs. In the case of external involvement this became a separate construct as it was so important to SMEs creating a NPD capability.

This is not to say that simply because ‘enablers’ and ‘qualifiers’ were identified as being similar to the NPD determinants from the literature, the case firms have achieved a NPD capability. The process is believed to be more complicated, and as Mosey (2005) points out, capabilities cannot be directly transferred by simply copying ‘best practice’ from exemplary firms. Rather, the creation of a new capability involves the intricacies of learning and reconfiguring existing capabilities. Instead it involves each firm, requiring them to find their own journey up the value chain, path dependent, where firms begin their capability development from different starting points (Eisenhardt and Martin 2000).

- 
- Internal communication - Culture
  - External involvement – External involvement
  - Cross-functional teams – Not applicable due to the size of the firms
  - Project leadership – Due to the size of the firms was found to be associated with top management
  - Autonomy – Not applicable due to size of firm and the fact that most top management teams were involved daily with the NPD projects
  - Commitment to New Product Development - Top management
  - Project organisation – NPD process

*Figure 8-1 Comparison of literature and findings for organisational determinant*

If this is the case then how do dynamic capabilities provide firms with a competitive advantage? Eisenhardt and Martin (2000) suggest that it is the way in which the dynamic capabilities are deployed, for example “*using them sooner, more astutely, or*



*more fortuitously than the competition to create resource configurations.*” Therefore it is not the capabilities themselves that necessarily creates the advantage but the configuration in which they are used. As Barney (1991) states, there are many different ways in which a firm can achieve a competitive advantage, two of the most important in a dynamic market being innovation and strategic flexibility. Indeed Eisenhardt and Martin (2000) suggest that long term advantages are infrequent and competitive advantage is to be gained through *“creating a series of temporary advantages.”* It is at this point where a firm’s ability to utilise its absorptive capacity, or as Cohen and Levinthal (1990) describe it, the ability to learn how to learn, that becomes valuable. The firms who took part in this research all demonstrated the ability to acquire and absorb new knowledge and were able to *“recognise the value of new, external knowledge, assimilate it and apply it to commercial ends”* (Cohen and Levinthal 1990), as well as learning to utilise existing knowledge differently, facilitating the creation of a NPD capability.

The concept of absorptive capacity and the ability of ‘learning to learn’ (Ellis, 1965, Estes, 1970) was an important notion in this research. When this concept was readdressed and applied to this research, it began to shed light on how these firms learned to create a new capability. The notion of learning to learn to manifest itself in this research through the concept of ‘enablers’ and ‘qualifiers’. The rationale for categorising some of the constructs identified from this research as ‘qualifiers’ was the fact that they had not yet reached the point where they could argue to be truly enabling the firm in creating a NPD capability. However, there was the potential for them to do so, and essentially the firms were learning to learn these new skills. The argument here is that to be good takes practice; you have to learn, which was reflected in the ‘qualifier’ constructs. Thereby absorptive capacity goes some way to explaining why differences were identified in the constructs.

Danneels (2002) argues that studies of ‘best practice’ (those described in Chapter Two) consistently show a positive impact of project-firm synergy (the extent to which the project can draw on existing in-house resources and skills) on new product performance (e.g., Cooper and de Brentani, 1991; Cooper and Kleinschmidt, 1993; Kleinschmidt and Cooper, 1991; Song and Parry, 1997a, 1997b; Zirger and Maidique, 1990). In other words, new products with a closer fit to firm capabilities tend to be

more successful. Despite the contribution of this area of literature, it has only studied the effect of resources on product innovation. New product studies have not considered the reverse direction of the product innovation-competence relation, i.e., the effect that new product projects in turn have on the firm's competences and its trajectory of renewal (Danneels 2002). These studies therefore provide a limited view of the role that product innovation plays in firm renewal. Whilst the companies that are of interest in this research study have had relatively little experience of NPD, their contribution to what makes a NPD successful could be argued to be limited. This study goes some way to readdressing the criticisms of Daneels (2002) by looking at how firms renew themselves through creating a NPD capability, and specifically, how creating a NPD capability has enabled change to take place. In other words, this research has attempted to examine how new product development projects have aided in creating new resources and skills in order to develop a NPD capability to support the renewal of the firm.

This research also took the decision to focus on SMEs, and thus makes some contribution to the SME literature. Often new small firms are associated with a more entrepreneurial spirit, which the literature would suggest that mature firms lose as the mechanisms that allow them to be successful become inhibitors to innovation (Leonard-Barton 1992; Dougherty and Heller 1994; Leifer et al 2000; Leifer et al 2001). The findings from this study do not support this view. Indisputably the firms were found to be becoming 'innovative'. Therefore there is a tendency for this research to agree with Rothwell and Dodgson (1994) that what we do know about the innovative activities of SMEs highlights that they have a behavioural advantage over large firms, which have material advantages, largely due to their ability to innovate by exploiting knowledge created outside the firm (Audretsch and Vivarelli, 1996). This is not to say that it was an easy proposition as they faced difficulties whilst they turned in a different direction. Yet these firms are forcing themselves to become innovative, and slowly but surely, starting to learn new capabilities and adapt existing capabilities that will allow them to move up the value chain. The research findings indicate that these SMEs have had to find different ways to create their NPD capability through a range of NPD strategies. The strategies that the case firms utilised were not mutually exclusive and a combination of strategies was employed. Involvement with external organisations enabled all of the firms in some way or

another, either through the creation of an alliance or through outsourcing elements of the NPD process, to create a NPD capability. In addition to the outward facing strategies and outsourcing the entire development process, all the firms in this study were involved in some form of 'in-house' development. Often the argument for this was cited as being the ability to control the process as well as utilising the key skills and resources the firms had already developed over many years.

In summary, the findings provide new knowledge on the strategies that SMEs can employ to enable change to take place and to facilitate the creation of a NPD capability. As well as this, the research identified the necessary constructs required to support the creation of a new dynamic capability of new product development. Whilst these constructs have been reported before, albeit in a different guise as 'determinants' of NPD success, it is with a different lens that these constructs have been examined here. The summary of the literature compared to the findings in Table 8-3 highlights the contribution that this research attempts to make by confirming elements of the literature and highlighting where differences arise, and due to the different context this study has examined the 'determinants'. Furthermore, firms beginning the arduous task of creating a NPD capability must acknowledge that the constructs can be categorised as 'enablers' and 'qualifiers', recognising that the firm has to 'learn how to learn' the process of creating a NPD capability, as different constructs will take longer to develop; an understanding that has been lacking in the NPD field of research. Ultimately this research goes on to illustrate how manufacturing SMEs can move up the value chain and how to create a NPD capability.

<b>NPD determinants identified from the literature</b>	<b>Comments from the literature</b>	<b>Research findings</b>	<b>Comments relating to research findings</b>
<b>New product development</b>	<p>Link between NPD success and a formal development process, with different models describing the process.</p> <p>Distinction between large and small firms, with small firms tending to be more informal in their approach.</p>	<b>New product development</b>	<p>Overall the development process was found to aid the creation of a NPD capability. It was found that the process was typical of that found in small firms and not the formalised process associated with large mature firms.</p>
<b>Pre-development activities</b>	<p>Preparatory and predevelopment work to assess whether the product has a commercial application, including initial screening, preliminary market and technical assessment is decisive for the success of new products.</p>	<b>Marketing and new product development process</b>	<p>The marketing aspect of the pre-development activities was difficult for the firms in this research. The technological capability was easier because of the previous knowledge and expertise in manufacturing.</p>

<p>Proficiency of market-related activities and technological activities</p> <p>Preliminary market and technical investigation: critical stage including three activities; preliminary market assessment, preliminary technical assessment and preliminary evaluation. Aim to gather information to enable a decision regarding full development.</p> <p>Vital that expenditure is monitored closely at this stage.</p>	<p><b>Marketing and new product development process</b></p> <p>The marketing aspect was identified as a separate construct as it appeared a key driver in enabling a NPD capability. Although difficulties were encountered with this aspect, it has been categorised as a 'qualifier'.</p>
<p>Formal new product process</p> <p>Formal process has a positive effect on NPD.</p> <p>Simplicity of NPD models has been criticised, creating risk aversion.</p> <p>Enables efficiencies to be gained, generating creative problem solving.</p> <p>Concurrent or simultaneous engineering to aid faster development whilst retaining cross-functional involvement.</p> <p>Essential for planning to be incorporated into the NPD process.</p>	<p><b>New product development process</b></p> <p>Informal process, ad-hoc (associated with smaller firms).</p> <p>Still experimenting with the NPD process in order to find what worked for their individual firm.</p>

<p><b>Organisation</b></p>	<p>Organisation is important to NPD, and particular reference has been made to teams.</p>	<p>The literature deals with large organisations.</p>
<p><b>Internal Communication</b></p>	<p>The requirement for internal and external communication to aid NPD as well as aiding interfaces between cross-functional groups.</p> <p>Often the approach to internal communication can lack systematic approach, thereby causing a barrier to cross-functional integration.</p> <p>Provides stimulus for innovation.</p> <p>The effectiveness of communication is dependent on the frequency.</p>	<p>This overlapped with 'openness' which is dealt with in the section on culture. Internal communication was vital in creating the feeling of openness in the firms.</p>

<p><b>Involvement of external organisation</b></p> <p>Linking with external organisations can help to aid NPD success.</p> <p>Searching for external information.</p> <p>Involvement with suppliers early in the process that is sufficiently extensive has been found to aid the process of NPD.</p> <p>Networking can provide external stimulus for innovation.</p>	<p><b>External involvement</b></p> <p>External sources were fundamental in providing access to advice, resources and skills that the case firm lacked. Networks consisted of external firms/contacts and government agents such as Business Link and MAS-East.</p>
<p><b>Cross-functional teams</b></p> <p>Cross-functional teams make a substantial contribution to NPD, bringing various aspects of the organisation together.</p> <p>Clearer communication that has been found in some cases to aid the launch time for a new product.</p>	<p><b>Manufacturing and marketing</b></p> <p>As these firms were SMEs their ability to be cross-functional was greatly reduced as often one person carried out different roles anyway and was shown with the importance of manufacturing to the NPD process.</p>

<p>Project leadership</p> <p>Viewed as a pivotal role within the NPD process that can bridge the gap between senior management and the development team.</p> <p>If project leaders are given 'power' within their teams then this allows a more effective development process to occur.</p> <p>Part of the role of the project leader is to create a social environment for the project team, which helps to stimulate ideas.</p>	<p><b>Top management</b></p> <p>Found not to be relevant to this study as the project leaders were often in the top management team therefore there was no need to bridge the gap. Many of the aspects identified were evident in the top management team.</p>
<p>Responsibility of the NPD team for the entire process - autonomy</p> <p>Creates a sense of ownership of the project as well as buy in.</p>	<p>This aspect was disregarded to some extent because of the size of the firms and the level of the people involved in the NPD process this was a redundant.</p>
<p>Commitment</p> <p>Commitment to a NPD project aids its success, especially from the project leader and the project team.</p>	<p><b>Top management</b></p>



<p><b>Project organisation</b> Debate around the formalisation of NPD projects and whether formalised projects are more effective and efficient.</p> <p>Various ways of organising a NPD project have been suggested.</p>	<p>Due to the embryonic stage of the NPD process within the case firms, and the size of the firms, this was a somewhat redundant discussion as they were still finding the way that suited them and because of their size did not require a formalised process.</p>
<p><b>Culture</b> Creating an innovation friendly climate is essential for innovation to occur. Argued that it can be both a barrier and enabler for innovation.</p>	<p><b>Culture</b> A culture of innovation was still beginning to be developed within the organisations.</p>
<p><b>Core values and norms</b> Values, perceptions within a company that relate to NPD and innovation.</p>	<p>The adage of the way that things are done around here was still in evidence, as the firms were still experimenting and learning the way that things were done.</p>

<p>Freedom and openness</p>	<p>Entrepreneurial climate which supports innovation even in an unofficial capacity.</p> <p>Openness within the organisation is required to enhance innovation, and create a sense of freedom.</p>	<p>Communication through meetings and social events was witnessed.</p>
<p>Risk</p>	<p>Associated with NPD in larger organisations.</p>	
<p>Critical roles</p>	<p>Many different roles have been associated with successful NPD, with the role of product champion being supported conclusively within the literature.</p>	<p>This was identified as a separate construct and was examined separately from culture. This was because it was evident from the research findings that 'individuals' aided the process of creating a NPD capability.</p>
<p>Role and commitment of top management</p>	<p>Increased support from the senior management has been shown to aid the success of NPD and is considered a critical success factor.</p>	<p>Instrumental to the creation of a NPD capability.</p>
<p>Management support</p>	<p>Senior management support includes helping projects to receive the necessary resources required to complete them.</p>	<p>The research findings support that this was the case.</p>

<p>Management style</p> <p>Non-participating, authoritative management style, demonstrating subtle control of projects was found to be most effective.</p> <p>Can have a positive effect by providing support and guidance fostering an innovative culture.</p>	<p>In all the firms the top management were supportive and participative of the NPD process, and often a 'hands-on' approach was witnessed – this is arguably due to the nature of small firms and how necessary the development of a new product was to success, mainly due to the lack of resources.</p>
<p>Strategic decisions</p> <p>Positively effects NPD success and the literature concludes that it includes NPD strategy, market environment and resources.</p>	<p>As the top management were fundamental in supporting the creation of a NPD capability, this was replicated in their role.</p>
<p>NPD strategy</p> <p>Requirement to link to corporate strategy.</p>	<p>A clear NPD strategy was evident – in the form of in-house or partnerships.</p>
<p>Market environment</p> <p>Includes market potential, market competitiveness, market environment.</p>	<p>A capability that was still being created.</p>

**Manufacturing**

Manufacturing capability has been identified as a separate capability required for NPD. This was essential as it provided existing knowledge of how to design and manufacture the new products.

Provided resources and funds that were used to support NPD.

*Table 8-5 Comparison of literature and research findings*

## CHAPTER NINE – CONCLUSION

*This chapter presents the conclusions of this research project. The aims of this chapter are to: (1) to briefly summarise the approach taken to explore the nature and experience of management practitioners' pursuit of moving up the value chain through creating a NPD capability; (2) to make clear the overall contribution to knowledge made by this research; (3) to provide a summary of the limitations of this study, and (4) to provide recommendations for future research.*

### 9.1 INTRODUCTION

This research began with providing a genesis for the research, highlighting the persisting concerns about the basis of the UK's competitiveness (Edwards et al., 2004), which is reliant on both low input costs and an efficient business environment (Porter and Ketels, 2003). Arguably integral to this repositioning is the creation of higher value along the value chain. Notably, both the UK government and scholars argue 'innovation' as the way forward. As Chapter One highlighted, the importance of understanding how manufacturers, and more specifically SME manufactures, can achieve this move is vital, as the longevity of SME manufacturing is of the utmost importance to the UK economy. Despite this little has been done to address *how* manufacturers can or indeed *are* creating a NPD capability to enable them to move up the value chain. Thus this research proposed to investigate the following:

**How do UK manufacturing small and medium sized enterprises (SMEs) create a new product development (NPD) capability to enable a move up the value chain?**

Through the literature review (Chapter Two) it was identified that further gaps in the scholarly literature existed and prevented a full understanding of how to create a NPD capability. Dynamic capabilities offer an underpinning theory to this research, advocating that it is "*the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organisation's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions*" (Teece et

al., 1997). Yet there is a lack of empirical evidence to offer an insight into how a firm can create a capability from a position of relatively little experience. Turning to the literature on new product development, Chapter Two attempted to illustrate the large body of literature that aids our understanding of the determinants required to successfully develop new products. Whilst this was found to be useful in providing an end point for the firms at the centre of this research, two issues were raised: 1) there is little evidence of how firms develop these determinants from a position of little experience, and 2) much of the literature focuses on large organisations, leaving SMEs to debate whether these determinants apply to their own firm.

The use of a qualitative research design employing interpretative means enabled an exploratory approach to be taken. This research sought to explore the phenomenon that occurred rather than test and validate, because, as with all research, the investigating researchers are required at some point in their studies to make a choice between breadth and depth of study - as straddling the two presents significant challenges (Adams, 2004). Thus it was important to have open and versatile research techniques available.

## **9.2 CONTRIBUTION TO NEW KNOWLEDGE**

The primary objective of the thesis was to *explore how manufacturing SMEs created a NPD capability from a position of little prior experience*. As shown in Chapter Three (the research design), this investigation was carried out by examining four in-depth case studies. The findings from each case study, as well as the across the four cases, contribute to the understanding of how manufacturing SMEs create a NPD capability. With varying degrees of novelty to the existing body of academic theory, the case studies both individually and together contribute to the theory of practice and scholarly literature.

Arguably, the exploratory nature of this research creates difficulties when using traditional, statistical measures of reliability to assess the findings of this investigation. It is also impossible for the outcomes to be viewed as facts or objective truths, as they are the result of an interaction between the researcher and the researched (Silverman, 2000). Thus, the value of the findings, in terms of their

generalisability and validity, results from their degree of credibility to those with an interest in the research area (Wyatt, 2001). The findings presented in this thesis are grounded in a real world investigation and have been evaluated by the industrial partners involved in the research as having a high degree of relevance. As a result this research has generated new knowledge that can contribute to an enhanced understanding for future theory development. These contributions are summarised below.

### **9.2.1 SMEs and New Product Development**

This research has made a clear contribution to the knowledge of how SMEs innovate and develop new products and indeed, how SMEs begin to create a NPD capability. This was evident through three key elements of the research that offers insight into

- How SMEs innovate and develop new products
- How SMEs create a NPD capability, through understanding enablers and qualifiers
- The strategies utilised for creating a NPD capability

- (1) The findings offer a more insightful understanding of how SMEs innovate and develop new products. Revealed by this research was the knowledge that there were important NPD determinants that past research has not highlighted or at least not to the same degree. For instance, it was apparent from the findings that external involvement was a vital part of the NPD capability that the firms were creating. Whilst external involvement is highlighted in the literature, the true importance of its role within SMEs developing new products could be argued to not be as clearly linked. Further, evidence of important differences were also identified with relation to the top management – it was this group of individuals that provided the stimulation, passion and vision for these SMEs to envisage that the firm could adapt and move up the value chain. These important differences in our knowledge and understanding form an important contribution to the new product development within SMEs.

(2) The creation of a NPD capability in SMEs requires similar organisational determinants and factors as those found in the literature concerning larger firms. However, it is the way that the firms reconfigure and utilise existing skills and resources to create a new capability i.e. it is the way that the firms grow and utilise the 'enablers' and 'qualifiers'. Specifically, this study found that the following key enablers and potential enablers (qualifiers) were required:

- External involvement
- Manufacturing
- New product development
- Top management
- Culture
- Individuals
- Marketing

The contribution of this research lies not just in the confirmation of NPD determinants, but in the understanding that as SMEs create a NPD capability these determinants were not all developed instantaneously. As a result, the findings identified what this research terms as 'enablers' and 'qualifiers', recognising the learning process being witnessed. There were aspects of creating an NPD capability that reconfigured and utilised existing knowledge, which were usually identified as 'enablers'. These constructs were ones that the firms found relatively easy to implement and were already identified as aiding the firm to create a NPD capability and move up the value chain. However, there were other aspects that the firms found difficult, either because it went against their previous mindset, e.g. manufacturing, or because they had never attempted anything like this before e.g. marketing. Therefore the findings suggest that although they were not directly aiding the firm in their bid to create a NPD capability, 'qualifiers' were nonetheless identified as being important to creating a NPD capability; it was just that further development of the constructs was required by the firms.

(3) NPD strategies for creating a NPD capability. These findings shine new light on how SMEs combat the resource constraints that they suffer due to their



size. This research illustrates that SMEs utilised different strategies for developing new products, which aided each of the firms to combat particular shortages either in skills, resources or knowledge. The different strategies that were employed by the firms in this research consisted of:

- Alliances
- Licensing
- Buying-in
- Outsourcing
- Providing a design service
- In-house development

The findings suggest that these strategies are not mutually exclusive and often a combination of two or more of the strategies were required. External involvement in different guises was found to provide the firms with the ability to create a NPD capability. The strategies that utilised external organisation offered a way to create a NPD capability despite the lack of knowledge, skills and technology, reducing the resource limitation experienced by the firms. These strategies allowed the firms to concentrate on the key tasks, enabling the product to be developed more quickly and efficiently. Complimenting the external strategies was in-house development. The rationale for using such a strategy was that it allowed the firms to keep control of the process. As well as arguably reducing costs by using internal resources and learning the process themselves, the negative aspect was that it could slow down the process because of the time required to learn new competences and skills.

### **9.2.2 Support of the dynamic capability theory**

Although it was not the aim of this research to contribute to the theory of dynamic capabilities, rather it was the intention to utilise it as an underpinning theory. However, the findings do support and confirm that in order to adapt and remain competitive it is the ability of a firm to learn and reconfigure its capabilities that allows the firm to stay competitive. Particularly, new product development was identified as one such dynamic capability (Eisenhardt and Martin 2001). This research therefore offers further empirical evidence of how NPD can be used by a firm to help it adapt and change in line with its environment. These findings aid in

combating the argument that dynamic capabilities is vague and capable of demonstrating only a tautological relationship between resources and sustained competitive advantage (Priem and Butler, 2001).

Furthermore, this research both supports and has created new knowledge pertaining to how SMEs have approached creating a NPD capability and thus moved up the value chain. In the past this has been argued to have been missing in the literature (Mosey, 2005). Certainly, this research has provided new knowledge with regard to the key NPD determinants SMEs require. In addition, the findings highlight that the creation process is one that involves capabilities that can be reconfigured and adapted (the enablers), whilst other capabilities have to be created and learnt over time (qualifiers).

### **9.2.3 Summary of the contribution to new knowledge**

Relating to the specific research objectives detailed in Chapter Two (Section 2.7) this research has made a direct contribution to knowledge, in relation to the first research objective that set out *to understand the specific strategies that manufacturing SMEs utilised that enabled the firms to create a NPD capability*. This research established that through a combination of external strategies; 1) alliances 2) licensing 3) outsourcing 4) design service and 5) the support of an in-house development, sometimes in conjunction with providing a design service, were specific strategies that the firms utilised to create a NPD capability. These strategies have been reported in the literature previously and linked to new product development. However, the findings from this research offer insight into the strategies that an SME can adopt to begin creating a NPD capability. In support of the 'NPD strategies' this research has contributed to our understanding of the creation process of a NPD capability by confirming that the determinants required to create a NPD capability were similar to those found in the literature that relate to large organisations with a more mature NPD capability. However, part of the contribution to new knowledge was through the explanation that these 'determinants' are created and developed at different rates, hence the identification of 'enablers' and 'qualifiers'.

### 9.3 IMPLICATIONS FOR MANAGERS OF MANUFACTURING SMES

This research could be considered as providing some points of advice for managers of SMEs who seek to create a NPD capability and develop new products.

- 1) *Slow process of reconfiguration and learning.* Whilst it is possible to reconfigure and utilise existing knowledge within the firm, it is also necessary to create and develop new knowledge and skills internally. Often this is found to be a hard and unfamiliar process, requiring determination and patience. In addition there has to be a recognition that creating a NPD capability cannot be done alone, and that a firm has to link into other networks and to tap outside resources. The difficulties of knowing where and how to start to create a NPD capability can often slow the process even further.
- 2) *External involvement.* Part of the learning and creating a NPD capability lies in being able to utilise resources that are not internal to the organisation. Through strong external connections it is possible to move the NPD process on further than would ordinarily be possible if everything were to be attempted internally because many of the resources and capabilities that are essential to a competitive advantage lie outside the boundary of the firm. By creating these connections there is the ability to move up the value chain more quickly and efficiently that would ordinarily have been possible.
- 3) *Manufacturing SMEs require assistance in addressing marketing issues.* Marketing all aspects of a new product was found to be a difficult concept. For manufacturing SMEs whose traditional role was subcontracting it is not always necessary or appropriate to have the skills required in developing a new product. Therefore there is a requirement for SMEs to be supported in the process of marketing, right from the start of the process of market research to establish what the customer requires, as well as towards the end of the process in planning the market launch. In order to maintain a competitive position most firms will need to expand their customer base, requiring help and assistance in learning this new competence.

## 9.4 IMPLICATIONS FOR POLICY MAKERS

In addition to the advice for managers of SMEs, the following points could benefit policy makers in the UK who are responsible for supporting innovation and product development in SMEs having a major impact on the UK economy.

- 1) *Aid with improved management, external networking and marketing skills.* It could be argued that increasing government grants would be limited. Thus, instead of improvement programmes to aid firms to improve the way they create and manage their NPD capability, funds could be better spent on encouraging these firms to develop the vital skills and competences that have been identified as the 'qualifiers' of creating a NPD capability. This was where firms required the most help to create a NPD capability as these competences that were more difficult to develop as they are new to the firms.
- 2) *Limited resources and management skills in developing new products.* Support is required to encourage SMEs in their attempts at being innovative and thinking about their organisations differently. Despite their lack of resources and knowledge, the firms who took part in this research are taking brave steps to become innovative, regardless of their size and lack of resources. Already limited success is being witnessed in this research, with some of the firms winning innovation awards. With the right assistance these firms could be developing innovative and sophisticated products.
- 3) *Understanding of the requirements for creating a NPD capability.* This thesis has demonstrated the end point for manufacturers to combat has been well argued, although providing a rhetoric rather reality perspective. Instead the government needs to provide practical knowledge concerning 'how' SMEs can move up the value chain and become more innovative, aiding them in developing the key skills and capabilities, in addition to providing support throughout the journey.

## 9.5 LIMITATIONS

This study has illustrated that until this exploratory research there had been little understanding of how manufacturing SMEs can create a NPD capability, particularly for those firms that have had little experience in developing products. Whilst these findings have been informative and interesting in their own right, there are ways that the study could have been improved. Some of these limitations also lead to further research in the future, which will be examined in the next section.

- As exploratory research, this study was limited to the four cases, and consequently generalisability is also limited. But as stated previously, a Ph.D. is a limited piece of research, and therefore the Ph.D. student has a decision to make regarding the breadth and depth of the study. In this case due to the exploratory nature the study was limited to the four rich, detailed cases. More case studies could have been incorporated to understand the phenomenon of this study by looking at a larger number of cases, but there is an argument that the resulting data would have been less detailed.
- The four case studies were selected to reflect the criteria of a SME (as determined by the DTI) and being a manufacturing company that had little experience of developing new products. However, the industry was not kept constant, as the four case study companies were not working in the same industry, so that the immediate context of the external forces was not the same for the companies. Whilst it would have been desirable to keep the industry the same (i.e. use companies from the same industry) in the first instance. The argument for why this was the case relates to the issue of access, which prevented keeping the industry the same. Therefore looked at manufacturing SMEs in general, and specifically, those who are intent on creating a new capability. This has provided an interesting insight into the process of how manufacturing SMEs in this position are tackling the transition up the value chain. This is not to say that other organisations cannot attempt to learn from their journeys, for this knowledge of the critical enablers and areas of

improvement provides key learning points for any manufacturer attempting this position, as well as policy makers alike.

## 9.6 FURTHER WORK

All research programmes, especially those involved with qualitative management issues, tend to raise as many questions as they answer, if not more (French and Bell, 1990). Consequently, this section provides recommendations for future research in the field of new product development, innovation and dynamic capabilities.

1. *Wider study within SMEs.* This research has been limited to a small number of cases. Therefore there is scope to work with a larger number of firms in order to further the research findings. A wider study would also serve to validate and extend the study. By extending this study, a mixed methods approach could be carried out, thereby benefiting from the richness of qualitative data techniques as used within this study, as well as quantitative methods such as a questionnaire, which could be used to gain access to a wider range of firms. This further study would be operationalised by building on the research objectives of the present study, with the intention of confirming the existing 'enablers' and 'qualifiers' identified in this study. To increase the breadth of the study a more quantitative approach would be called for, involving working closely with organisations such as MAS-East to gain access to SMEs in order to enable a questionnaire to be administered.
2. *Longitudinal.* This research was a snapshot in time, and therefore it would be interesting to follow the firms who took part in this study to understand more about their move up the value chain. There would also be the possibility of assessing the success of the products, which would allow for a comparison between the firms that did not succeed and those that were successful with their products. Through continued work with the SMEs that took part in this research, a truly insightful investigation into how their 'story' of moving up the value chain could evolve. This would provide a rich understanding of how their journey continued. The operationalisation of this research study would

be to continue the qualitative interviews on a periodic basis to monitor the firms' progress.

3. *Audit tool.* Using the data from this study and further research, it would be ideal to produce an audit tool that SMEs could use to assess the current situation within the firm with regard to NPD. This could also further the work the researcher has conducted in the area of NPD auditing (Radnor and Noke, 2002, Noke and Radnor, 2004). This would provide a practical and useful mechanism by which to disseminate the results. Furthermore, this would be aligned to the government's public policy which is attempting to encourage more innovation in manufacturing firms – and would help manufacturers in achieving this goal. Building on the concept of 'enablers' and 'qualifiers', the audit would involve devising a set of questions that could be used to identify the set of 'determinants' and then be able to distinguish between the two categories of 'enablers' and 'qualifiers'. This would involve further rich case studies which could be used to validate and test the audit tool, in addition to a continued and further review of the literature – to help ascertain the key questions.
4. *Larger organisations.* This study was interested in SMEs but this is not to say that this study does not provide some learning points for larger companies and there is a need for them to move up the value chain as much as SMEs. Therefore there is an opportunity to conduct a similar research study with larger organisations. It would also be possible to carry out a comparison between the ways that SMEs and larger organisations move up the value chain, following much the same route as this study, with the exception that it would involve large organisations. The issue would be gaining access and finding large organisations that would consider themselves to have relatively little experience in the area of NPD.
5. *Concept of NPD aiding the development of firms' capabilities.* This study has partly confirmed the work of Danneels (2002) regarding the product innovation-competence relation, i.e., the effect that new product projects in turn have on the firm's competences and its trajectory of renewal. This is an

exciting concept that would examine the reversal of previous 'best practice' studies which examine project-firm synergy (the extent to which the project can draw on existing in-house resources and skills). This study would examine this role in far more detail by examining the specific relationships among the enablers, of the impact of each enabler on NPD capability, of potential synergistic effects among them.

6. *Re-examine the redundant constructs and sub-constructs.* This includes considering the constructs and sub-constructs that were not included in the final results (items that only were mentioned in one or two of the cases – see Tables 8-1 and 8-2). Whilst these constructs and sub-constructs were not included in this research, this is not to say that there is no merit in these findings. Therefore, further work could examine these sub-constructs in more detail to determine whether they were context-specific or whether they were indeed integral to the creation of a NPD capability. It should be noted that this is not an exhaustive account of future research avenues available for those interested, but areas that the researcher would herself find interesting.

## **9.7 FINAL THOUGHTS**

This final chapter has provided a summary of the thesis, from the development of the research questions to the final interpretation of the results. It has summarised the contribution to new knowledge that this research has made, identifying the 'enablers' and 'qualifiers' of the creation of a NPD capability, in addition to the strategies utilised to create a NPD capability. The findings have helped to provide a unique understanding of the requirements that a manufacturing SME must satisfy to realise their goal of moving up the value chain.

Ultimately, the contribution that this research study has made to new knowledge has been to view the current literature through a different lens. Overall this research provides a more insightful observation as to how manufacturing SMEs move up the value chain by creating a NPD capability. Whilst the strategies the firms used to create the capability were not new revelations, as previous research has already identified them, it is the application to creating a NPD capability that offers a new



understanding, as prior to this research they were not associated with creating such a capability. Furthermore, this research has provided confirmation and adjustment to the current literature by extending our thinking with regard to NPD determinants. This has provided knowledge that was previously lacking, as for SMEs starting to create a NPD capability there were differences in the role that the 'determinants' as discussed in the literature played; hence the categorisation of 'enablers' and 'qualifiers'. This is an important understanding to achieve as it illustrates that for a firm attempting to create a new capability it will involve much the same 'determinants' as associated with NPD success as those discussed in the NPD literature. But they are not instantaneous; rather, they are developed at different rates, with some of the constructs (enablers) being easier to develop than others, as prior knowledge, skills and resources can be utilised and reconfigured. There will inevitably be new constructs (qualifiers) that are required, which the firm did not previously possess, and arguably these will be more difficult to create and develop, simply because they are new and outside their existing boundaries of knowledge and experience – but over time, and through determination and an ability to absorb, transform and exploit knowledge, a NPD capability can be created.

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