

**A FRAMEWORK FOR ASSESSMENT
OF THE IMPACT OF SUPPLY CHAINS
ON THE GROWTH STRATEGY OF SME'S**

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Degree of Doctor in Philosophy by

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ABSTRACT

Small and Medium Enterprise (SME) are facing an ever increasing pressure to think carefully and strategically of ways to compete and grow in what can only be described as a turbulent business environment. This more so for those SME's that have built their growth strategy on the development of new product where the competition is shifting from a company orientation to a supply chain based rivalry. Accordingly achieving qualities such as agility are becoming critical to the success of supply chains. Such dramatic changes make the traditional approaches to business strategy, i.e business growth strategy, which has been based on the company providing a match between its business environment and its internal capability questionable. While, the value of supply chain in determining organization's growth strategy has received some attention a practical perspectives and solution yet to be provided.

This research has focused on studying and exploring the position of supply chain in the growth strategy formulation process in SME's to identify the main factors contributing to the above concept and the relationship among the strategic influencing factors from a market, dynamic capability, and supply chain points of view.

The research was conducted through: an extensive literature review; three in-depth case studies to identify how practitioners think and act with respect to the position of supply chain issues in growth strategy formulation and why it is important to involve the supply chain issues earlier in growth strategy formulation. A mini-survey and semi-structured interview followed the findings of case studies to extract more evidence at a broader scope. From the above study, a conceptual framework is proposed from which a practical approach emerged to assist SME's that develop new product to think about the supply chain proactively thus future proofing their product and securing their growth strategy.

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CHAPTER ONE

INTRODUCTION TO THE RESEARCH

1.1 Introduction

In this chapter, a general overview of the research is presented. The discussions include the starting point of the research, background to it, problems to be addressed, aims and objectives of the research, and an overview of the methodology employed to undertake the research.

1.2 The starting point of the research

The research presented in this thesis builds on previous work. The researcher and his supervisors carried out with respect to manufacturing based SMEs in the area of agile supply chains (Ismail and Sharifi, 2006). As part of that research a pilot study was carried out to identify the critical issues that SMEs face when developing new products.

Companies were asked if they had faced one or both of the following situations:

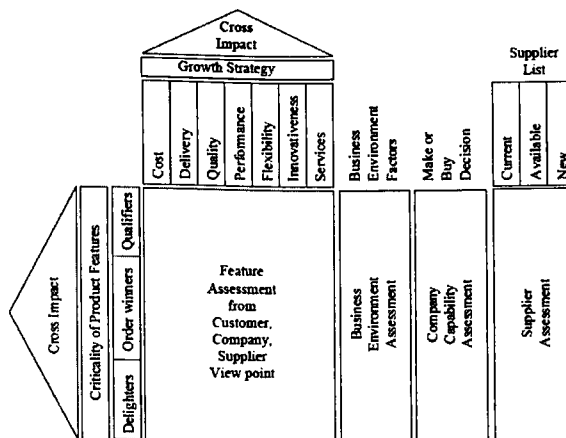
1. Whether , with hindsight, the company would have changed its product design to overcome supply chain issues currently faced

- Whether it was the case that after the initial product launch, the company had had to replace one or more of their original suppliers

The companies responded that they have often faced one or both of the above situations.

The cost of changing a supplier is high and specifically in cases where the supplier contributes to product knowledge. For SMEs this can be prohibitive and often constrains their ability to grow. As a result a conceptual framework (figure 1.1) was proposed that develops an agile supply chain by adopting the simultaneous design for and design of supply chain.

Figure 1.1 Agile supply chain development framework

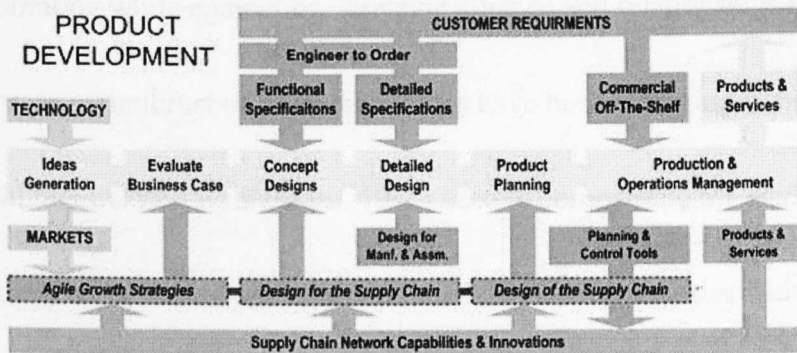


Source: Ismail and Sharifi (2006)

The aim of this framework is that there is a fine balance between the selection of necessary product features that can rapidly meet market demand on the one hand and the potential company growth strategy on the other. Its strength is derived from the

ability to integrate market, product, and company and supply chain points of view under one assessment structure. The resulting product is therefore a compromise that fulfils market needs from one end and supply chain current and future capability at the other end. The concept is more important to SMEs who, by the nature of their limited capabilities, outsource a large proportion of their new product and who as a result are at the mercy of their suppliers. This becomes more evident when the product is complex requiring input from the supplier in terms of knowledge or manufacturing capability. The approach also offers a degree of future proofing both from a product and strategic prospective. The proposed framework introduces two new complementing viewpoints to the product development process while maintaining a strategic view of current and future market and customer needs. The first is a “design for the supply chain” (DfSC) viewpoint by where the product features are prioritised and designed taking into account current and potential supply chain network capabilities. The second is the “design of the supply chain” (DoSC) viewpoint that involves the selection and alignment of a supply chain network to meet product, customer and company needs. Figure 1.2 below depicts the point at which these approaches are applied with respect to traditional product development stages.

Figure 1.2 The impact of the supply chain process on product development



The framework, however, did not specify the approach at each stage. The concept was also based on empirical evidence that required further verification and analysis. With this in mind, the role of this research is aimed at providing an understanding of growth strategy and the role the suppliers play. The researcher will try to solve the problems of how SMEs can take advantage of the simultaneous design of and design for the supply chain to contribute in formulating a sustainable growth strategy that is based on the introduction of new products.

1.3 The changing nature of the business environment, competition, business strategy, and the supply chain

Under increasing turbulence and uncertainty the nature of business competition has seen dramatic change during the last few decades. Business and organisation strategy models and approaches have evolved with such changes. New concepts and models have

emerged as a result. The turn of the unit of competition from single entities to supply chains, collaborating while competing, strategic alliance and relationships management, and innovation as main thrust of business success have been emerging as new ideas.

The traditional hierarchies (Williamson, 1975) used to compensate for market failure under uncertainty as well as to harmonise relationship between parties within an organisation have been replaced by hybrid and complex network based models.

The trend in strategy management is shifting from formulation to implementation (Feurer and Chaharbaghi, 1995). With the new challenges of the new millennium, strategy development is becoming an on-going activity with shorter horizons rather than an annual planning process where simple frameworks are the norm (Horwath 2006).

Traditional strategic management models and in particular an organisation's growth strategy was focused on defining the determining growth direction in response to the market's needs and requirements if also considered the internal capabilities needed to provide the required responses. It appears that traditional thinking of strategy bypassed the evolution of supply chains, where external and internal factors were entered into chain thinking. With evolution of the supply chain paradigm, relationship management as a strategic priority has increasingly been accepted into traditional management approaches (Christopher, 2000). Tamas (2000) has reported correlations between

profitable growth strategies and supply chain initiatives. Extended view on agile supply chain have offered new perspectives on the need for different approach in determining the growth strategy for the supply chain (Ismail and Sharifi, 2006; Sharifi *et al.*, 2009).

The theory and tools required to accommodate these new approaches have yet to be developed. This research argues that an appropriate growth strategy should be a triangulation of strategically influencing factors from the three perspectives of market/industry structure; dynamic capabilities of the organisation; and supply chain.

This research attempts to answer the following research questions:

- Does the old strategic thinking fit in with supply chain based competition?
- What kind of strategic thinking is needed to confront the new forms of competition?
- What impact does proactive thinking on supply chains have in growth strategy formulation?
- What is the attitude of SMEs to the involvement of suppliers in the product design process?

1.4 The research objectives

Preliminary investigations resulted in the recognition of a need to understand growth strategy while taking account of supply chain issues. This not only provides an operational capability to enhance implementation of growth strategy, but also makes growth strategy more agile and resilient to change. To address this issue, this research has focused on investigating strategic influencing factors found in the supply chain. It aims to provide an approach that involves the supply chain in the formulation of growth strategy.

The main objectives of this research are:

1. To identify the main factors constituting the above concept and the relationship among the strategic influencing factors from market, dynamic capability, and supply chain points of view.
2. To develop a framework that accommodates these strategic influencing factors
3. To provide an approach that assists the practitioners in SMEs to think about the supply chain proactively and to involve the supply chain dimension in the formulation of a growth strategy

1.5 The research method

Considering the problems and backgrounds for the research discussed in the previous sections, and based on the nature of this research, a five-phase methodology was chosen:

- Literature review
- Developing a conceptual model
- In-depth case study
- Mini-survey and semi-structured interview
- Developing an approach that assists practitioners in SMEs think about the supply chain proactively and which involves the chain into the formulation of growth strategy

1.5.1 Literature review

The review of literature started from the development of business systems over the last few decades. This was followed by a review of relevant works on business strategy management, supply chain management, product development, and SMEs. Chapter 2 provides a full description of the results of the literature survey.

1.5.2 Developing a conceptual framework

Based on the literature survey and review of previous case study research, a conceptual framework was developed to involve the supply chain as a new dimension in the formulation of growth strategy.

1.5.3 In-depth case study

Three in-depth case studies were conducted to extract rich data from practitioners in an attempt to understand how they think about supply chain issues in growth strategy formulation and why it is critical to involve them earlier in the formulation of growth strategy. Three companies were selected for case study. Each faced different supply chain problems in the product design process. There are two reasons for the researcher in choosing three cases. First, the researcher felt quite confident for the data after analysing the collected data, which is strong enough to build up the framework. Second, the availability of resources and time restrictions restricted from analysing more cases. The researcher involved himself of the day to day work in the three companies. The work field provided a chance for the researcher to understand how practitioners thought of the position of the supply chain in growth strategy and what they actually did at an operation level. By analyzing the data and behaviour of the three SMEs in the cases, the

researcher was able to formulate an approach that assists the SMEs to proactively consider the supply chain in growth strategy development.

1.5.4 Mini-survey and semi-structured interview

The mini-survey that followed the findings of the case studies was used to extract more evidence of a broader scope and help the researcher to find suitable companies on which to conduct semi-structured interviews. The semi-structured interview was conducted in order to extract the reasons behind the survey answers and gain an understanding of how practitioners thought of supply chain issues in growth strategy formulation. The results from the mini-survey and semi-structured interview provided more evidence and support needed in building the final approach.

1.5.5 Developing an approach for assisting practitioners in SMEs

From the findings of the in-depth case study and literature review, the author transformed the conceptual framework into a practical approach that allows SMEs to proactively think of the supply chain and integrate the supply chain into the formulation of growth strategy. As a practical approach, two tables concerning the product feature selection and growth strategy selection help practitioners not only choose the correct

product feature for the supply chain design, but also carry out an implementable growth strategy.

1.6 Organisation of the thesis

The thesis follows the pattern of how the research was conducted. Chapter Two provides a review of the literature on business strategy, supply chain management, product design, and SMEs.

Chapter Three details the methods used to support the research. Case study was selected as the main method to collect data. Mini-survey and semi-structured interviews were used to provide broader view.

Chapter Four reports the conceptual framework proposed and based on the literature review and review of previous cases. The conceptual framework provided a general structure for the researcher to carry out the research needed to answer the research questions.

Chapter Five reports the three in-depth case studies. For each case, the content is obtained through questionnaire. To analyse the data it was clustered into growth strategy, market, product design, supply chain design, and implementation issues. A

cross-case study was then undertaken to provide comparison between the 3 case study SMEs.

Chapter Six reports the results of the mini-survey and semi-structured interviews. The mini-survey presents the content in the same sequence as the questionnaire. The mini-survey provided the chance for the researcher to contact a broad range of SMEs and choose suitable companies for semi-structured interview. The interview discovered the reasons underlying the disconnection between thinking about supply chain strategy and how it actually used in everyday operation. The conversation with the practitioners also provided the researcher with a first chance to investigate test the key research question and proposed approach.

Chapter Seven reports the final approach developed from the research. A framework is presented to show the decision process. Two tables concerned with product features and growth directions are created as a guide needed to assist the practitioners conduct the process. Finally one case is reviewed to show how the framework works.

The final chapter presents the conclusions of the research, limitations of the research, and ideas for future work.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Literatures associated with the subject of this research will be reviewed in detail in this chapter. A wide range of literatures pertaining to business strategy management, supply chain management, product development, and SMEs will be analysed and reviewed.

This will allow the researcher to gain the necessary background to carry out the research.

The chapter comprises seven sections. In the first section a brief outlining the structure and contents of this chapter is presented. In the second section, issues relating to the evolution of various aspects of the business environment are investigated. They show that the business environment has recently become extremely turbulent. In this turbulent business environment, the paradigm of strategy management and supply chain management evolved. Section three reviews the literature on strategy managements and concludes that a new way of thinking is needed for strategy management in more turbulent business environments. To gain competitive advantage the modern company increasingly needs to involve supply chain management in product development. This is discussed in section four. In section five, the evolution of supply chain management is

reviewed and highlights the importance of strategically thinking supply chains. In section six we discuss the convergence of business strategy and supply chain in competitive business environments. This section integrates the ideas expounded in previous sections and discusses the connections between them. Finally, literatures related to SMEs are reviewed. SMEs have their own characteristics. This differentiates them from larger firms. They need a simple, straightforward tool to guide them to think more strategically.

2.2 The turbulent business environment and changes in the nature of competition

The increase in turbulence and volatility in markets is a major challenge for the new millennium. It is important for a firm to swiftly respond to change and the speed with which a firm can respond to it can be a potent competitive weapon for the supply chain manager (Lancioni, 2000). It has been argued that turbulent environments are associated with high levels of inter-period change. Turbulent environments create uncertainty and unpredictability and dynamic and volatile effects on demand and growth rates.

Temporary competitive advantages are created and eroded and barriers to entry/exit continuously change the competitive structure of the industry (Calantone, *et al*, 2003).

Today, the speed of change and the magnitude of shocks are greater than ever. This is not what was normal in past. This is the new normality and goes beyond disruptive

innovation to include major shocks. (Kotler and Caslion, 2009) and the increasing significance of volatility in the business environment is likely to continue to be a prominent feature of the supply chain landscape for the foreseeable future (Christopher and Holweg, 2011)

Fine (1998) argues that competitive pressures and technological innovation driven by rapid scientific discovery has increased the rate of change in product, process, and organizational structure. “Clockspeed” is referred to as the speed of change. It means that the decision-maker must be alert to the increasingly rapid changes in customers and competition, the business climate, and the science and technology that underpin their business and the industry. Sharifi (1999) summarises the causes of the upheaval witnessed by business and especially manufacturing. He points out that:

- The rate of change of the business environment is dramatically increasing;
- Uncertainty and unpredictability have become characteristics of change in today’s business;
- Prevailing theory, methods, systems, and models are not going to satisfy the requirements of the new era.

Critical factors that create chaos in the turbulent business environment are identified by Kotler and Caslion (2009). These include:

- 1) Technological advances and the information revolution;
- 2) Disruptive technologies and innovations;
- 3) The “rise of the rest” (Rising industrialized nations in Asia and the rest of the emerging world)
- 4) Hyper-competition;
- 5) Sovereign wealth funds;
- 6) Environment;
- 7) Customer empowerment.

From the factors listed by Kotler and Caslion, it can be predicted that the business environment would be more volatile in the future as the factors come from an increasing number of sources.

From the review, turbulence and uncertainty of the business environment is the major challenge faced by firms. In a turbulent and uncertainty world, it is very difficult for a single company to deal with all the uncertainty. Companies have to align with their business partners together to build up organizations that are competitive. Inevitably the

nature of business competition has changed. Competition is supply chain based instead of single company based. Various researchers have noticed the change in competitive nature and presented their own comments.

The view of one company competing against other companies for consumers is replaced by the concept of a variety of distinct supply chains competing for final customers (Balsmeier and Voisin, 1996). The supply chain perspective of competition is shifting from firm versus firm to supply chain versus supply chain; and supply chain management is the approach to designing, organizing, and executing these activities (Vonderembse *et al*, 2006). Companies will not seek to achieve cost reductions or profit improvement at the expense of their supply chain partners, but seek to make the supply chain more competitive as a whole. In short, the contention that it is supply chains and not single firms that compete is a central tenet of supply chain management (Croom, *et al*, 2000). Cost and service improvements that are not achievable by individual firms can be attained by the companies acting together (Lancioni, 2000). Increasingly supply chains are the dominant vehicle for competition (Hoek, *et al*, 2001)

The turbulent business environment has changed the nature of competition. It is reasonable to reconsider how the companies plan their strategy in these circumstances.

2.3 New thinking needed for Strategy management

Let us begin the review of this section with Mintzberg's book "*Strategy Safari*".

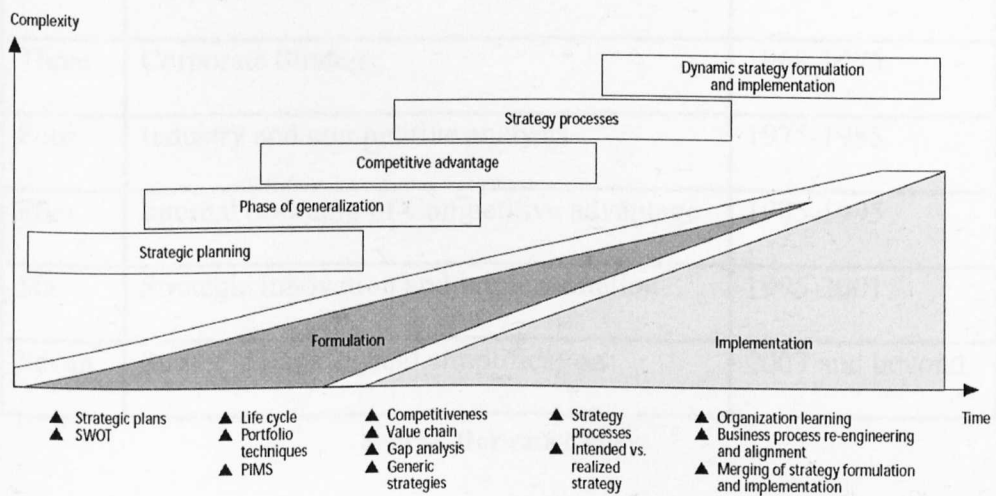
Mintzberg used a fable of, *the blind men and the elephant*, to explain that single strategic thinking (each single blind man) could not depict the strategy (the elephant) for different firms in different business eras. He divided the existing ten schools of thought into three groups. The first group includes the design school, planning school, and positioning school, which are prescriptive in nature. In this group, research is concerned more with how strategies should be formulated than with how it is actually implemented. The second group contains the entrepreneurial school, cognitive school, learning school, power school, culture school, and the environmental school. These schools of thought consider specific aspects of the process of strategy formation, and have been concerned less with prescribing ideal strategic behaviour than with describing how strategies do, in fact, get made. The third group comprises the configuration school, which seeks to cluster various elements of the strategy-making process, the strategy content, organizational structures and their context, into distinct stages or episodes. All these schools have appeared at different stages in the development of strategic management. A few have already come and gone, others are now developing, and some remain as thin but nonetheless significant trickles of publication and practice. As a novice researcher,

the author would like to try putting his own fingers on this elephant and present his own understanding from a supply chain perspective.

Researchers such as Christense *et al* (1982) have argued that “*Economic strategy will be seen as the match between qualifications and opportunity that positions a firm in its environment*”. However, in supply chain based competition, the firm is not the competing unit and resources are not directly controlled by firms. Some researchers such as Aldrich (1976) have argued that the environment has a strong deterministic influence on the strategy-making process of an organization. From a resources-based view (Barney, 1991) it is argued that it is not the environment but the resources of the organization that form the basis of firm strategy. Strategic thinking does not take the supply chain as a unified paradigm, but separates it into external factors (suppliers, logistics providers) and internal factors (supplying management capability). This separation makes the implementation of strategy difficult in a turbulent and volatile business environment. This separation causes the firm to pay less attention to its relationship with supplier. Coordination, cooperation, and partnership are potent weapons in gaining competitive advantage in supply chain based competition. IMP (Industrial Marketing and Purchasing) researchers (Baraldi, *et al*, 2007) argue that as a majority of the resources available to the firm are under the direct control of other actors,

such resources can only be controlled through the medium of interactive relationships and networks. Emphasis focuses on the importance of interrelationships, interaction, and networking when considering strategy. IMP strategic thinking is quite close to supply chain based thinking. But IMP has not set up a clear paradigm to describe the complex network. In this research, the supply chain is chosen as the vehicle to tackle interrelationship, interaction and networking among competing stakeholders.

Figure 2.1 The evolution of strategy management



Source: Feurer and Chaharbaghi (1995)

From figure 2.1, we can see the stages in the evolution of business strategy. Over time the complexity of the strategy has increased. Strategy formulation and implementation have merged into a dynamic approach to strategy development.

Horwath (2006) viewed the evolution of business strategy as a seven-stage process (See table 2.1). We can see from the table that the current phase is strategic thinking and simplification, which is defined by the author as “people learning the tangible skill of strategic thinking and using them in a simple framework that allow strategy development to be an on-going, daily occurrence rather than annual planning.

Table 2.1 Phases of the evolution of strategy

Phase	Emphasis	Time span
One	Budgetary Planning	1950-1960
Two	Corporate Planning	1960-1968
Three	Corporate Strategy	1968-1975
Four	Industry and competitive analysis	1975-1985
Five	Internal Sourcing of Competitive advantage	1985-1995
Six	Strategic innovation and implementation	1995-2001
Seven	Strategic thinking and simplification	2003 and beyond

Source: Horwath (2006)

In this thesis, the author argues that we need a new way of thinking of growth strategy in a business environment featuring supply chain based competition.

Ansoff Matrix

After reviewing the evolution of business strategy, review of a classic strategy formulation tool -Ansoff matrix- is now considered. The Ansoff matrix is a simple and easily understood tool for practitioners and is a key tool used in this research.

The Growth vector described in the Ansoff Matrix (table 2.2) indicates the direction in which the firm is moving in respect to its current product-market position. There are four options in the matrix: market penetration, market development, product development, and diversification. Market penetration denotes a growth direction through increases in market share. In market development, new outlets are sought for the firm's products. Product development creates new products that replace current ones. Finally, diversification is distinctive in the fact that both products and mission are new to the firm.

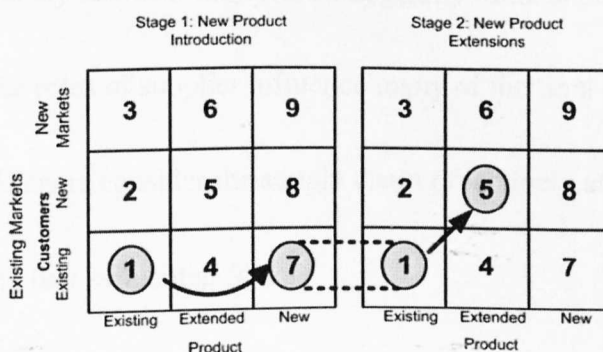
Table 2.2 Growth Vector components (Ansoff Matrix)

Mission Product	Present	New
Present	Market Penetration	Product development
New	Market development	Diversification

Source: Ansoff "Corporate Strategy", McGraw-Hill 1987

Ismail and Sharifi (2006) use an extended Ansoff matrix as a reference point to map out the number of shifts a company can undergo from its existing market position (see figure 2.2)

Figure 2.2 Extended Ansoff Matrix



Source: Ismail and Sharifi, (2006)

Since the extended Ansoff Matrix is the foundation of this research, it is necessary to describe it in more detail. Traditionally, the company extended their sales of existing

products by moving from sector 1 to sectors 2 and 3 through cost and operational efficiencies and where possible by aligning the existing supply chain to meet it.

Extending the product range from sector 1 to sectors 4, 5 and 6 involves a redesign or modularisation of the product to capitalise on new opportunities through customisation and product families. A redesign of the supply chain is often required with a shift of emphasis from cost to flexibility. A new product introduction strategy, represented by the shift from sector 1 to sectors 7, 8 and 9, is the most risky strategy but offers the company the opportunity to fundamentally redesign the supply chain to meet new product needs. However, in this case, it is critical to identify at an early stage the subsequent growth strategy of the proposed new product.

Ismail and Sharifi's extended Ansoff matrix provides options to practitioners on what they can do immediately and how they can strategically think about growth. Whilst, they mention that the roles of supplier influence many of the final choices, they do not mention how practitioners consider the supply chain proactively and how the supply chains interact with other influential factors.

In this research, the extended Ansoff Matrix will be used as a template to formulate growth strategy from a supply chain perspective. The original Ansoff matrix considers only two dimensions of market and product. In this research, a tool based on a three-

dimension extended Ansoff matrix will be created by adding the third dimension of the supply chain. This will be further discussed in chapter seven.

Dynamic capability

In this research, dynamic capability is defined as “the firm’s ability to integrate, reconfigure, gain and release internal and external resources to address rapidly changing environment and even create markets changes as markets emerge collide, split, evolve, and die.” This definition is a combination of the definitions made of by Teece *et al* (1997) and Eisenhardt and Martin (2000). This definition not only relates to the ability to react to the changing environment, but considers the role of proactive thinking in creating new markets opportunities. Since this research aims to show how companies can create an implementable growth strategy in a volatile business environment, the ability to proactively think and react to changes is the key point to be discussed. That is why the dynamic capability is adapted in research since there is a broad consensus in the literature that dynamic capabilities contrast with ordinary capabilities by being concerned with change. (Winter, 2003)

2.4 Product Development

2.4.1 The strategic role of product development

Product development is becoming a source of competitive advantage for many firms (Clark & Fujimoto, 1990). For firms in either fast paced or competitive markets, product development is among the essential processes for success, survival, and renewal of organizations (Brown and Eisenhardt, 1995). Liu *et al* (2005) reported that new product development is one of the most important business activities in helping manufacturing companies to survive and gain market share. Crawford (1983) has emphasized that product innovation is second only to corporate strategy in the way it involves all aspects and all functions of management.

2.4.2 A Brief history of product development and main activities

It was not until 1960s that innovation became a well-known subject. Until that time it was more or less synonymous to R&D, which was later called technological push innovation. The role of the market place in the introduction of new and improved products was studied in the late 1960s and led to the concept of market-pull innovation.

Krishnan and Ulrich (2001) cluster product design and development research into four perspectives of marketing, organization, engineering design, and operations management.

As for the main activities of product development, an operational sub-activity is provided by Cooper and Kleinschmidt (1995):

1. Initial screening
2. Preliminary market assessment
3. Preliminary technical assessment
4. Detailed market study/market research
5. Business/financial analysis
6. Product development
7. In-house product testing
8. Customer tests of product
9. Test market/trial sell
10. Trial production
11. Pre-commercialization business analysis
12. Production start-up
13. Market launch

Different scholars have made their own activities clustering according to their specific research domains. Cooper and Kleinschmidt's 13 activities cover all the operational sub-activities of product development, and are suitable for this research where the focus is on product developments. It concentrates on how suppliers can be involved earlier in the product design process. The detailed activities list provides a clear picture to SMEs how they can better involve suppliers.

2.4.3 New Product development strategy

New product strategy is a master plan which guides new product development. It provides focus and direction and can help mobilize a team charged with developing a specific new product (Barczak, 1995)

Cooper (1984) categorized the strategy element of new product development into four blocks.

- 1) Nature of product development;
- 2) Nature of market sought;
- 3) Nature of technology employed;
- 4) Orientation and nature of the new product process.

Based on the timing of entry of a technological firm into an emerging industry, Ansoff and Stewart (1967) developed a typology of strategies. Barczak (1995) developed Ansoff and Stewart's typology to divide new product development strategy into three categories: first to market, fast follower and delayed entrant.

In this research, the author followed Ansoff and Stewart's model. It allowed consideration of product strategy and encompasses new thinking from a supply chain perspective. The adoption of product strategy should proactively think of the members within supply chain and consolidate the product strategy with supply chain strategy.

2.4.4 Concurrent engineering in product design

Since the mid 1990's, concurrent engineering has been proposed as a response of the challenge to develop high quality products both faster and cheaper in a volatile business environment. Concurrent engineering is a comprehensive philosophy in which the simultaneous design of a product and all its related process in the lifecycle are taken into consideration. (Prasad, 1997) Concurrent engineering has been defined by the Institute for Defence Analysis as "a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support, intended to cause the developers, from outset, to consider all elements of the product

life cycle from concept through disposal, including quality, cost, schedule, and user requirements". (Institute for Defence Analysis, 1986)

In table 2.3 and based on the research of Lawson and Karandikar (1994), the benefits of concurrent engineering are listed.

Table 2.3: The benefits of concurrent engineering

Performance Measure	Benefit
Development time	30-50% less
Engineering changes	60-95% less
Scrap and rework	75% reduction
Defects	30-85% fewer
Time to market	20-90% less
Field failure rate	60% less
Service life	100% increase
Overall quality	100-600% higher
White-collar productivity	20-110% higher
Return on assets	20-120% higher

Source: Lawson and Karandikar, (1994)

Concurrent engineering emphasises the integration of all departments of an organization in developing a product. With the nature of competition changing from single company based to supply chain based, it is reasonable to think of an extension of the philosophy of concurrent engineering from a single organization to an entire supply chain. In the next section, supplier involvement in the product development process will be presented.

2.4.5 Supplier involvement in the new product development process

With the significant trend that companies are increasingly outsourcing parts of their new product development activities to suppliers, research into how to manage supplier involvement in new product development and innovation has also greatly expanded.

The literature on supplier involvement and integration of suppliers in new product development comes from a considerable amount of empirical research carried out over the last 30 years. (Takeuchi and Nonaka, 1986; Clark, 1989; Clark and Fujimoto, 1990; Cusomano and Takeishi, 1991; Lamming, 1993; Nishiguchi, 1994; Kamath and Liker, 1994; Hartley *et al*, 1997; Ragatz *et al*, 1997; Petersen *et al*, 2005; Hillebrand and Biemans, 2004). There is a wide range of supplier involvement from simple consultation on design ideas to making suppliers fully responsible for the design of components, systems, processes, or services they will supply. (Ragatz, *et al*, 1997)

Johne and Snelson (1988) state that “*highly innovative organizations display diverse and informal communication networks both within their internal and external environments that bring a wider understanding of the changing market and industrial scene*”. This justifies the origin of supplier involvement.

Ragatz *et al*(1997)'s study identifies "*supplier membership on the new product development project team as the greatest differentiator between most and least successful integration efforts*". The potential benefits of integrating suppliers into new product development are compelling. The hard benefits include purchased material cost, quality, and reduced product development time. The soft benefits of supplier integration include: closer, more open, and trusting long-term supplier relationships; easier access to suppliers' knowledge and expertise; clearer focus on what's really important to the success of joint development projects; and improved communication. Recent researches into supplier involvement in product design focus on the extent of supplier involvement (ie. how prevalent and in what form suppliers are involved) and on timing issues (i.e. at what stage do supplier become involved). (Jayaram, 2008)

Bonaccorsi and Lipparini (1994) claim the following benefits of early supplier involvement:

- Lower development costs
- Standardization of components
- Consistency between design and suppliers capabilities
- Reduction in engineering changes
- Higher quality with fewer defects

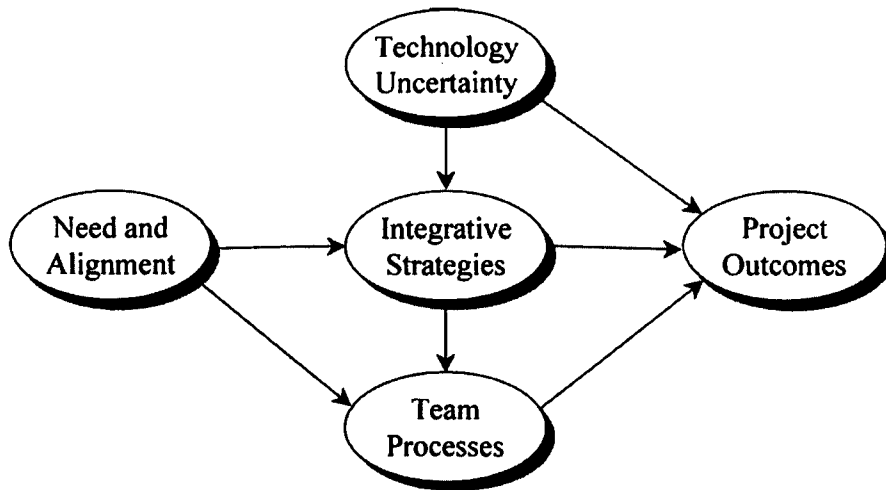
- Improvement in supplier's manufacturing process
- Availability of detailed process data
- Reduction in time to market

Early supplier involvement in the product design process can provide the benefits including more cost-effective design choices; alternative conceptual solutions, better selection of materials, components, and technologies and concurrent assessment on both the design and product process (Ndubisi *et al.*, 2005)

Extensive supplier involvement in product design can cut the complexity of the design project, which in turn creates a faster and more productive product-development process. This involvement can also alert the project team to potential downstream problems early on, at a point where they are easier and faster to fix.

Various scholars have also proposed different models to achieve the involvement of supplier in product development. Ragatz *et al* (1997) proposed the model of supplier integration shown in figure 2.3.

Figure 2.3 Model of supplier integration



Source: Ragatz et al (1997)

In this model, Ragatz defines that the core of the model as integrative strategies. In this research, the studying point is that how to think the suppliers' contribution proactively and extract the positive strategic indicator. This strategic indicator available from the supplier perspective facilitates supplier involvement, and leads to implementable growth strategy.

Jayaram (2008) identifies 12 supplier involvement practices. These are categorized into three groups and are listed in table 2.4.

Table 2.4 Supplier involvement practices

Supplier involvement practices items
<p>Dimension 1: Communication and Information sharing</p> <ol style="list-style-type: none"> 1. Direct communication with key suppliers 2. Communicating with key suppliers during first prototype stage 3. Communicating with key suppliers during full production stage 4. Sharing design knowledge with key suppliers
<p>Dimension 2: Participation/Involvement in different stages of NPD</p> <ol style="list-style-type: none"> 5. Participation of key suppliers in NPD team 6. Involvement of key supplies in defining the architecture of new products 7. Involvement of key suppliers in setting design specifications 8. Involvement of key suppliers in product design
<p>Dimension 3: Joint strategic programs</p> <ol style="list-style-type: none"> 9. Shared education & training programs with key suppliers 10. Common linked information systems (EDI, CAD/CAM, email) 11. Co-location of project personnel and key suppliers

Source: Jayaram (2008)

Researchers such as Cooper (1984), Cooper and Schendel(1976), Foster(1986) have stressed the potential advantages of pursuing a proactive strategy where product technology is moving very fast.

Edwards *et al* (2004) provide a useful summary of the strategic options available for firms wishing to generate higher value and therefore reposition. These include value-adding partnerships, make, and buy or outsourcing.

Noke and Hughes (2010) summarize a number of strategies that involve external relationships with other firms as value-adding partnership, strategic alliances, licensing relationships, and collaboration.

Petersen, KJ *et al* (2005) argue that the idea that better collaborative planning has had a positive effect on joint business outcomes has been studied in relation to supplier alliances, supplier integration in new product development, supplier development, collaborative planning, forecasting and replenishment.

Although the literature shows the positive benefit of earlier involvement of supplier in product development little work has considered the practice of how to involve the supplier; how to think of the supply chain strategically and how to use chain thinking.

The current thinking is reactive – where we think of involving suppliers after strategy formulation. Broader theories are needed to introduce proactive thinking into the supply chain and involve suppliers in product development.

In this research, based on literature of supplier involvement in product development, the author will aim to show how proactive thinking about the supplier involvement can impact on strategic growth. If firms can proactively perceive the benefits of supplier

involvement and abstract their contribution to growth strategy, it will not only provide new growth opportunities, but will make the strategy more implementable.

2.5. The evolution of supply chain management

2.5.1 Supply chain management

According to Tan(2002) the current supply chain management originated from two separate paths. The first is called the purchasing and supply perspective of supply chain management; whilst the second is called the transportation and logistics perspective of supply chain management. Many manufacturers and service providers seek to collaborate with their suppliers. This is the basis for the purchasing and supply perspective of supply chain management. The transportation and logistics perspective of supply chain management originated from wholesalers and retailers needing to integrate their physical distribution and logistics functions to enhance competitive advantage. With the complexity of the market environment, the two perspectives merged into a single strategic approach to operations, materials and logistics management, which is now commonly referred to as supply chain management. But in academia, supply chain management embraces more than these two main strands outlined by Tan (2002).

Croom *et al* (2000) provides a brief and non-exhaustive categorisation of literature subject areas associated with supply chain management. These include:

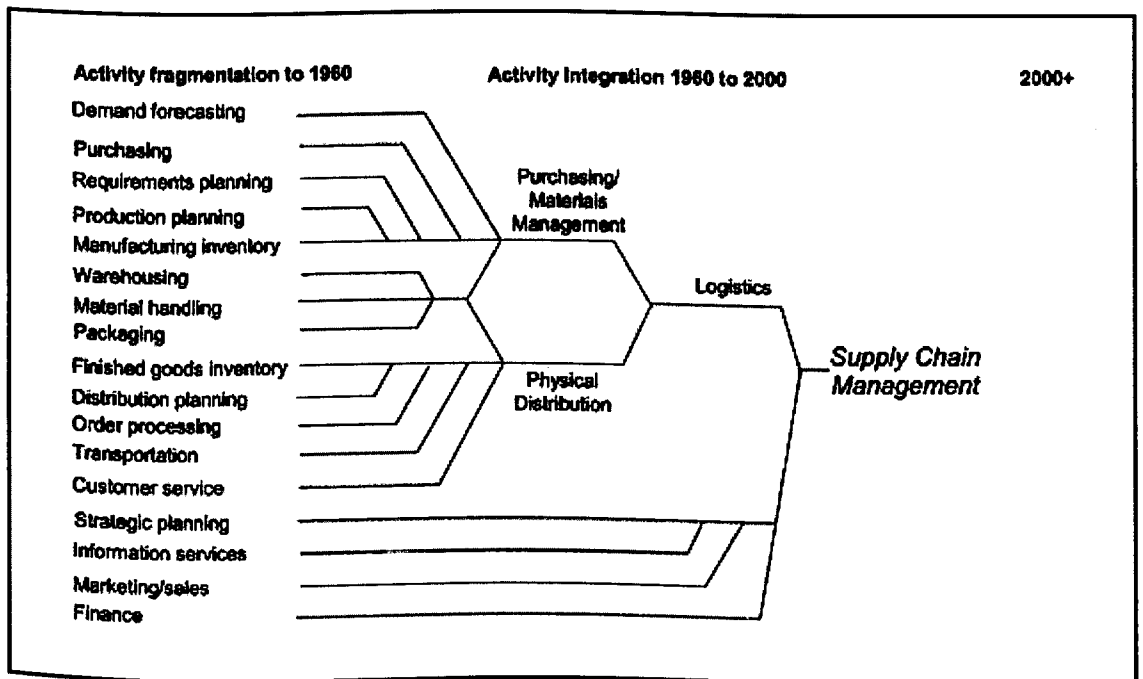
1. Purchasing and supply
2. Logistics and transportation
3. Marketing
4. Organisational behaviour, industrial organisation, transactions cost economics
5. Contingency theory
6. Institutional sociology
7. System engineering
8. Networks
9. “Best practices”
10. Strategic management
11. Economic development

Croom *et al* (2000) also defines what is meant by the terms “supply chain” and “supply chain management”. These are often labelled as purchasing strategy, supplier integration, buyer-supplier partnership, supply based management, strategic supplier alliances, supply chain synchronisation, network supply chain, value-added chain, lean

chain approach, supply pipeline management, supply network, and value stream (Croom, *et, al*, 2000).

Ballou (2007) compared the two perceptions of logistics and supply chain management and used it to devise a chart showing the evolution of supply chain management (See figure 2.4).

Figure 2.4 Evolution of supply chain management



Source: Ballou (2007)

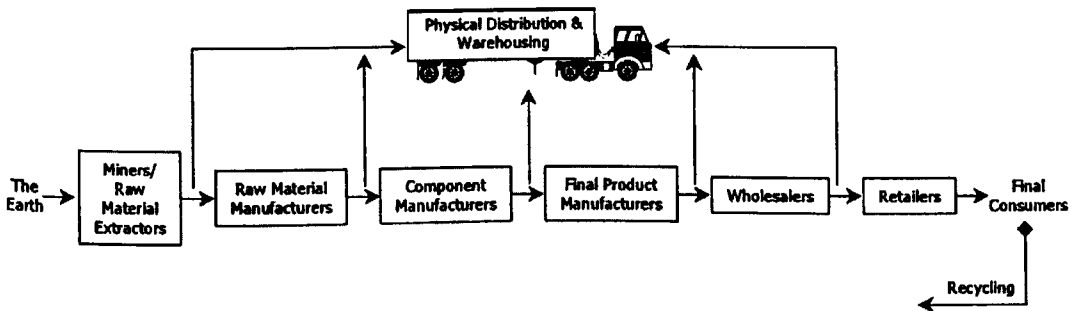
Chen and Paulraj (2004) have stated that the term “supply chain management” has not only been used to explain logistics activities and planning and control of materials and information flows internally within a company or externally between companies; but also to describe strategic, inter-organizational issues.

Cooper *et al* (1997) points out some commonalities in the various definitions of the term “supply chain”

- “It evolves through several stages of increasing intra- and inter-organizational integration and coordination; and, in its broadest sense and implementation, it spans the entire chain from initial source (supplier’s supplier, etc) to ultimate consumer (customer’s customer , etc)
- It potentially involves many independent organizations. Thus, managing intra- and inter-organizational relationships is of essential importance.
- It includes the bidirectional flow of products (materials and services) and information, the associated managerial and operational activities.
- It seeks to fulfil the goals of providing high customer value with an appropriate use of resources, and to build competitive chain advantages”

New and Payne (1995) detail the activities and parties involved in a supply chain. These are shown in figure 2.5.

Figure 2.5 Activities and firms in a supply chain



Source: New and Payne (1995)

The Global Supply Chain Forum identified eight key processes that make up the core of supply chain management:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfilment
- Manufacturing flow management
- Procurement
- Product Development and commercialization
- Return

In practice, the Supply-Chain council has developed a process reference model, the Supply-Chain Operations Reference-model (SCOR), as the cross-industry standard diagnostic tool for supply chain management. SCOR enables users to address, improve and communicate supply-chain management practices within and between all interested parties.

The SCOR spans:

- All customer interactions, from order entry through paid invoice
- All product (physical material and service) transactions, from supplier's supplier to customer's customer, including equipment, spare parts, software, etc
- All market interactions, from understanding of aggregate demands to the fulfilment of each order.

SCOR contains three levels of process detail. These comprise the top level (process types), configuration level (process categories), and process element level (decomposition process).

The SCOR model is based on five core management processes including: plan, source, make, deliver, and return. The processes are further divided into process elements, tasks, and activities.

SCOR is a strategic planning tool that allows senior managers to simplify the complexity of supply chain management.

In this research, an attempt is made to integrate the SCOR model in the framework to make it simple and straightforward for practitioners to understand and use.

Marquez (2010) points out that in order to provide a higher service level, to be faster to market; to become more flexible in responding to demand changes and to achieve lower costs; that many companies have turned to external suppliers to provide them with capabilities that they themselves can no longer provide.

Chandra and Grabis (2007) summarise key supply chain issues and related issues. These are reported in table 2.5.

Table 2.5 SCM issues, related problems and suggested problems-solving approaches

Supply chain issues and related problem	Problem-solving approach
Distribution network configuration	Network flow optimisation
Inventory control	Forecasting and inventory management
Supply contracts	Global optimisation
Distribution strategies	Warehousing and transportation cost management
Supply chain integration and strategic partnering	Collaborative planning, Forecasting and Replenishment
Outsourcing and procurement strategies	Managing risk, payoff tradeoffs with outsourcing vs buying
Information technology and decision support systems	ERP implementation and Decision support systems
Customer value	Statistical process control, total quality management and service level maximisation

Source: Chandra and Grabis (2007)

As regards the role of procurement change within the evolution of supply chain management, Giunipero and Brand (1996) argue that there are four levels of development in purchasing roles. These are as follows:

1. Traditional; emphasizing vendor selection and lowest possible price;
2. Partnership/relational; building closer relations with a supplier to reduce total cost and minimize risk in an atmosphere of trust;
3. Operational (material logistics management), coordinating material and information flows to improve quality, inventory levels, and overall cost;
4. Strategic (integrated value added), applying flexible business processes to a given situation, and thereby achieving speed, flexibility, and competitive advantage in the marketplace.

In order to achieve the strategic role of supplier in a supply chain, integrated supplier management (ISM) is proposed. Implementing integrated supplier management (ISM) can help manufacturing companies utilise their suppliers' processes, technologies and capabilities to enhance their own competitive advantage, and effectively coordinate manufacturing logistics, materials, distribution and transportation functions between manufacturing company and its suppliers (Huang, *et al*, 2010)

Huang, *et al* (2010) argue that three factors motivated the strategic shift to ISM. First, manufacturing companies have become increasingly specialised in their products and technology. Second, the strategy of involving the supplier during the product development and production process is recognized as a significant practice in reducing

costs and improving quality in the production life cycle. Third, and from the manufacturing operational perspective, the performance of key suppliers directly influences a manufacturing company's performance.

Christopher and Holweg (2011) advocate that the era of turbulence demands a new mental framework to designing and managing a supply chain the "Supply Chain 2.0", which is characterised as one with high structural flexibility.

In this research, we focus on the supply chain from the perspective of strategic management and try to find out what kinds of contributions to growth strategy come from the supply chain and how they are interrelated with market and dynamic capability.

Based on the findings of this research, a practical tool will be proposed to help practitioners implement the formulation of growth strategy when it involves a supply chain dimension.

Supply chain management (SCM)

Mentzer, *et al* (2001) classified SCM into three categories: management philosophy, implementation of management philosophy, and a set of management processes. In this research, the author applies the supply chain management as a set of activities to

implement a management philosophy. In table 2.6, we summarise SCM activities of Mentzer, *et al* (2001).

Table 2.6 SCM activities

1	Integrated behaviour
2	Mutually sharing information
3	Mutually sharing risks and rewards
4	Cooperation
5	The same goal and the same focus on serving customers
6	Integration of process
7	Partner to build and maintain long-term relationship

Source: Mentzer, *et al* (2001).

2.5.2 Agile supply chain

2.5.2.1 What is agility?

Agility was coined by a group of researchers at the Iaccoca Institute, Lehigh University, in 1991 to describe practices observed and considered important aspects of manufacturing. A new concept in manufacturing was then born. Agility is a business-wide capability that embraces organizational structures, information systems, logistics processes, and, in particular, mindsets. To become more responsive to the needs of the market requires more than just speed. It also requires a high level of manoeuvrability that today has come to be termed agility (Christopher, 2000).

Cooper (1984) predicted that the next generation of process models would be fluid, adaptable, conditional, situational and flexible. Supply chain management and other similar terms, such as network sourcing, supply pipeline management, value chain management, and value stream management have become subjects of increasing interest in recent years, to academics, consultants and business management alike (Croom, 2000). When facing a turbulent and volatile business environment, how a company can survive and prosper is a topic of interest for both academic and practitioner. Christopher

(2000) suggests that the key to survival in these changed conditions is through agility, and in particular by the creation of a responsive supply chain.

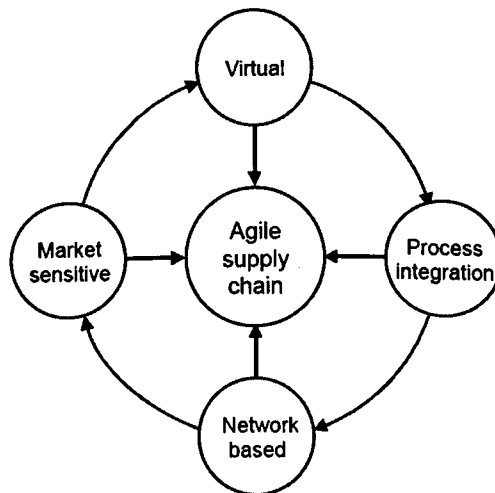
Surviving and prospering in this turbulent world will only be possible if organisations have the essential capabilities to recognise and understand their changing environment and respond in the correct way to every unexpected change (Sharifi and Zhang, 1999).

The ability to cope with unexpected change, to survive unprecedented threats from the business environment, and to take advantage of changes as opportunity is called agility (Sharifi and Zhang, 1999).

Before the agility paradigm was born, the supply chain management focused primarily on lean supply chain and JIT manufacturing strategies. With the birth of the agility paradigm, supply chain management and agility combined are significant sources of competitiveness in the business world. Thus, it is no surprise that they are favoured research areas in the academic research world (Jain, *et al*, 2008). Agility in a supply chain, according to Ismail and Sharifi (2005), is the ability of the supply chain as a whole and its members to rapidly align the network and its operations to dynamic and turbulent requirements of the customers. To achieve a competitive edge in global markets, companies must align with suppliers and customers to streamline operations and work together. It allows them to achieve a level of agility beyond the reach of

individual companies. And this concept is now termed agile supply chain (ASC) (Lin, 2006). An agile supply chain focuses on promoting adaptability and flexibility and it provides the ability to respond and react quickly and effectively to a changing market. Christopher (2000) suggests that there are four distinguishing characteristics of an agile supply chain. These characteristics include market sensitive, virtual, process integration and network based, which could be depicted in figure 2.6.

Figure 2.6 Agile Supply Chain



Source: Christopher (2000)

Agile supply chain analysis concerns change, uncertainty, and unpredictability within the business environment and provides appropriate response to changes. Lin *et al* (2006) continue that to become a truly agile supply chain, key enablers should be classified into of the four categories. The four categories are:

- 1) Collaborative relationship: as the supply chain strategy,

- 2) Process integration: as the foundation of the supply chain,
- 3) Information integration: as the infrastructure of the supply chain,
- 4) Customer/marketing sensitivity: as the mechanism of the supply chain.

While agility is accepted widely as a winning strategy for growth, even a basis for survival in certain business environments, the ideas of creating agile supply chains has become a logical step for companies (Ismail and Sharifi, 2005).

2.5.2.2 Distinguishing agility from Leanness

There has always been significant debate about the relative merits of the so-called “lean” or “agile” approach to supply chain management. Agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace. Leanness means developing a value stream to eliminate all waste, including time, and to enable A level schedule. In order to achieve the merits of both lean and agile, the notion of Leagile is proposed to make the combination of the lean and agile paradigms within a total supply chain strategy by positioning the de-coupling point so as to best suit the need for responding to a volatile demand downstream yet providing level scheduling upstream from the de-coupling point (Childerhouse, 2000). Christopher (2000) makes a clear distinction between speed (meeting customer demand

in the context of shortened delivery lead times), leanness (doing more with less), and agility (responding quickly to changes in demand in term of both volume and variety).

A comparison of the distinguishing attributes of lean supply and agile supply is provided in table 2.6.

Table 2.7 The distinguishing attributes by comparison of lean supply with agile supply

Distinguishing attributes	Lean supply	Agile supply
Typical product	Commodities	Fashion goods
Marketplace demand	Predictable	Volatile
Product variety	Low	High
Product life cycle	Long	Sort
Customer drivers	Cost	Availability
Profit margin	Low	High
Dominant costs	Physical costs	Marketability costs
Stock-out penalties	Long term contractual	Immediate and volatile
Purchasing policy	Buy goods	Assign capability
Information enrichment	Highly desirable	Obligatory
Forecasting mechanism	Algorithmic	consultative

Source: Mason-Jones *et al* (2000)

2.5.2.3 How to achieve an agile supply chain

All companies, suppliers, manufacturers, distributors, and even customers, may have to be involved in the process of achieving an agile supply chain (Christopher, 2000; Christopher and Towill, 2001). Strategic agility planning requires a strong partnership between suppliers and customers and information systems for effective supply chain

management. A responsible supply chain (RSC) can be defined as a network of firms that is capable of creating wealth to its stakeholders in a competitive environment by reacting quickly and cost effectively to changing market requirements (Gunasekaran *et al*, 2008).

It is essential that the agile attributes are transformed into strategic competitive bases of speed, flexibility, proactively, innovation, cost, quality, profitability and robustness (Jain, *et al*, 2008).

Sharifi and Ismail (2005) propose an approach to achieve supply chain agility through simultaneous design of supply chain and supply for chain design. The approach requires advance thinking of the supply chain and abstracts the advantages from supply chain in support of product design. This not only facilitates a quick and suitable product design but also makes for smooth and quick production of the new products.

2.5.3 Partnerships in the supply chain

A company's success in the twenty-first century economy will be determined by the relationships it develops with its supplier and customers (Heinrich, 2003). Companies have to be aligned with suppliers, the suppliers' of the suppliers, customers and

customers' of the customers, and even with the competitors in order to streamline the operations. (Simchi-Levi *et al.*, 2003).

But what is the position of each company in the cooperation network? Heinrich and Betts (2003) argue that companies within the network remain autonomous, but are able to leverage the network's cumulative ability to:

1. Plan and anticipate demand and supply;
2. Execute plans efficiently and effectively;
3. Sense events that affect the plans as those events occur, and analyze them for impact;
4. Respond to and learn from ever-changing business conditions.

Why is partnership so crucial to the supply chain? The researcher would like to review the evidence from a variety of sources.

The benefits of partnership to the supply chain

Partnerships provide the opportunity to quickly gain access to a technology or product, to develop a broader mix of product and services, and to achieve the nimbleness required to adapt to rapidly changing market conditions. Partner firms along the supply

chain form strategic cooperative alliances to acquire needed resources, learn new technical skills, and obtain information.

Li *et al* (2006) summarize the benefits of strategic partnership as follows:

1. Strategic partnerships are entered into to promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products, and markets;
2. Strategic partnerships with suppliers enable organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products;
3. Suppliers participating early in the product-design process can offer more cost-effective design choices, help select the best components and technologies, and help in design assessment.
4. Strategically aligned organizations can work closely together and eliminate wasteful time and effort. An effective supplier partnership can be a critical component of a leading edge supply chain.

Tait (1998) argues that companies that make supplier relationships a priority are rewarded with better financial performance and greater customer satisfaction.

Corsten and Felde (2005) argue that supplier collaboration has positive effects on buyer performance. Suppliers may contribute to firm innovation by performing R&D of its own and thus absorbing some of the R&D costs the buying firm would have to normally incur. Moreover, suppliers often have valuable knowledge of production and fulfilment processes that influence a firm's performance. Finally, suppliers can transfer ideas for better products and features that could enable the buying firm to enhance products (Corsten and Felde, 2005).

The driving force for partnership in the supply chain

As product life cycles shrank and global competition intensified in the 1990s, many manufacturers collaborated with their suppliers to improve product quality and lead time (Tan, 2002). Operational strategy involves major decisions about, and strategic management of: core competencies; capabilities and processes; technologies; resources; and key tactical activities necessary in any supply network; in order to create and deliver products or services and the value demanded by a customer. The strategic role involves blending the various building blocks into one or more unique, organisational-specific, strategic architectures (Lowson, 2003). Companies are now pursuing more intensive and interactive relationships with their suppliers, collaborating in new product development, integrating key business processes and cross-functional information

sharing on a range of issues (McIvor *et al*, 1997). Design and development not only has to be managed within one large organisation, but it is also involves managing relationships between many companies in an extensive chain of buyers and suppliers (Bidault *et al.*, 1998). As organizations seek to develop partnerships and more effective information linking with trading partners, internal processes become intertwined and span the traditional boundaries of firms. The truly strategic nature of supply chain management thus becomes apparent for participating companies, with successful implementation becoming a source of competitive advantage. Without a foundation of effective supply chain organizational relationships, any efforts to manage the flow of information or materials across the supply chain are likely to be unsuccessful.

Spekman *et al* (1998) discuss the nature of cooperation and why it is needed. They argue it enables firms to establish close, long-term working relationships with suppliers and customers who depend on one another for much of their business; to develop interactive relationships with partners who share information freely; to work together when trying to solve common problems in designing new products; to jointly plan for the future, and to make the success inter-dependent.

However, it is not an easy job to create network strength while meeting customer needs, which requires a higher and deeper level of coordination among the companies in order to ensure they create unique value. (Marquez, 2009)

From the above, it is obvious that partnership within the supply chain is important to strategy and contributes benefits to all members of the supply chain.

2.6 The convergence of business strategy and supply chain in the new competitive business environment

Lummus and Vokurka (1999) suggest that by linking the supply chain to business strategy there is the potential to improve a firm's competitiveness. Supply chain capability is as important to a company's overall strategy as overall product strategy. By linking supply chain objectives to company strategy, decisions can be made between competing demands on the supply chain. Incorporating supply chain goals and capabilities in the strategic plan of the company can lead to the use of the supply chain to obtain sustainable competitive advantage over competitors.

Cox (1997) argues that there are five key points to understanding business success:

1. Business success is linked to the scope for entrepreneurial action that exists within the structure of supply chain, not in the markets which develop to contest ownership and control of supply chain value.
2. Markets cannot, logically, be the basis for an understanding of the possibilities for entrepreneurial action, because the market is, by definition, the demonstration of competition rather than the cause of entrepreneurial innovation.
3. Entrepreneurial action is always generated as a direct result of the development of new ways of thinking about supply chain by individuals, either on their own or in companies.
4. Business success is always about the individual (or the company) to link a new supply offering with effective demand, in such a way that control over supply chain value is retained.
5. The most successful will always tend to be those entrepreneurs (or entrepreneurial companies) who understand the need for innovation, but who also know how to leverage it effectively against customers, competitors, employees and suppliers within a specific supply chain.

Cox (1997) argues that demand does not only come from the market, but also comes from the supply chain side. It means that business strategy should pay more attention to the supply chain.

Increased complexity of products and higher levels of outsourcing have moved the level of competition from single companies to groups or chains of firms. For this reason, the literature has widely acknowledged the strategic relevance of supply chain management as a source of competitive advantage (Cagliano *et al*, 2006).

Simchi -Levi *et al*. (2003) assert that strategic alliance can add value to products, improve market access, strengthen operations, add technological strength, enhance strategic growth, enhance organizational skill, and build financial strength.

Supply chain management is a strategic weapon used by companies to develop a sustainable competitive advantage by reducing investment without sacrificing customer satisfaction (Lee and Billington, 1992).

As a result of research carried out by Tama(2000), it is found that there is a strong correlation between corporate strategy and supply chain initiatives. Specifically:

- Firms implementing a profitable growth strategy are very likely to be targeting order management and demand forecasting or capacity, material requirements and production planning initiatives.
- Firms implementing an increased market share or a working capital efficiency strategy are very likely to be targeting inventory policy and management initiatives.
- Firms implementing a reduced time-to-market strategy are very likely to be targeting physical distribution and transport selection/routing and inventory policy and management, initiatives.
- A profitable growth strategy is the only strategy that showed strong or moderate correlation to a majority of the supply chain areas.

Buyer and supplier firms in a supply chain tend to heavily rely on cooperation to survive in an uncertain business environment that is characterized by rapid product obsolescence and evolving customer needs. These firms pursue growth mainly through effective cooperation and working jointly with partners in their supply chain, which in turn results in new product offerings, enhanced skills (Varadarajan and Cunningham, 1995)

The need to see relationship management as a strategic priority within the over-arching business strategy is increasingly accepted by traditional management approaches and tools that are not ideally suited to accommodating the changed requirements of such strategy (Christopher, 2000). The notion of companies positioning themselves strategically within a primary supply chain is an under-developed aspect of thinking in business strategy and strategic management thinking has systematically under-estimated the importance of these types of vertical business-to-business relationships as the basis for a proper understanding of entrepreneurial action and sustainable business success.

Historically, strategy has tended to concentrate on horizontal competitive rivalries around particular supply chain resources, rather than on knowing entrepreneurially where to position the business to own and control particular resources within a specific supply chain in order to appropriate the maximum share of value for oneself. (Cox, 1999)

Profitable growth can only be sustained if organisations are responsive to changeable and volatile market conditions. This means building a supply chain that can deliver the right product at the right time, to the right place and at the right price, with lower costs and at lower risk even when market conditions change.

2.7 The challenges facing SMEs in supply chain based competition

As mentioned in the introduction, this research takes SMEs as its target. SMEs are more easily able to integrate supply chain issues into growth strategy. The managing director of an SME is not only the decision maker at the strategic level, but also the person executes the growth strategy at an operational level by managing the supply chain.

2.7.1 The defining SMEs

The abbreviation SME stands for small and medium Enterprises. The definition varies according to country. Normally a SME is defined in terms of the number of employees employed and turnover. For the European Union (EU) the following definition applies:

Table 2.8 SME definition

SME Definition				
Enterprise category	Cellings			
	Staff Headcount (number of persons expressed in annual work units)	Turnover	Or	Balance sheet total
Medium-sized	< 250	≤ € 50 million		≤ € 43 million
Small	< 50	≤ € 10 million		≤ € 10 million
Micro	< 10	≤ € 2 million		≤ € 2 million

Source: European Commission (2009)

In the UK, sections 382 and 465 of the Companies Act 2006 define a SME for the purpose of accounting requirements. According to this a small company is one that has a turnover of not more than £6.5 million; a balance sheet total of not more than £3.26 million; and not more than 50 employees. A medium-sized company has a turnover of not more than £25.9 million; a balance sheet total of not more than £12.9 million; and not more than 250 employees. It is worth noting that even within the UK this definition is not universally applied.

2.7.2 The pivotal position of SME's in the UK economy

SMEs are the backbone of the UK economy and a major source of entrepreneurial innovation and skills. In 2008, according to figures reported by the Enterprise Directorate Analytical Unit, 99.8% of firms were SMEs. They provided jobs for 40.5% of the total work force and account for 47.9% of total turnover.

Biggs (2003) argues that SME's contribute to the economy in three distinct ways. First, SMEs create the majority of newly generated jobs. Second, SMEs are championed as the "seedbed" for future industrial growth. Third, encouraging the presence of SMEs in an economy increases competition and adds flexibility to industrial structure, promoting

greater economic dynamism and speedier and less costly adjustment to economic shocks.

2.7.3 The characteristics of SMEs

Supyuenyong *et al* (2009) lists the characteristics of SMEs in terms of five aspects as follows:

Table 2.9 The characteristics of SME

Ownership and management structure	Most SME owners act as owner-managers and also play the part of the company's strategic initiator
Customers and markets	SMEs depend on a small customer base and focus on local or regional markets, and a few international markets
Systems, processes and procedures	SMEs have simple planning and control systems, and informal rules and procedures.
Human Capital Management	Limited number of expert personnel, high turnover, less clear employee responsibilities, lower degree of job specialisation
Culture and behaviour	SMEs usually have an informal, organic, and unified culture.

The practice of SMEs differs from that of a large organisation due to their unique characteristics. The following sections will discuss the difficulties this creates for Supply chain management, strategy management and product design.

2.7.4 Supply chain management in SMEs

As Qualye (2003) argues in his research on UK industrial SME supply chains that although SMEs are viewed with interest as suppliers, by customer firms who have coherent supplier development programmes, purchasing and supply chain managements within smaller firms receive little attention.

Vaaland and Heide (2007) conclude from their research that compared with large enterprises, SMEs are: less satisfied with methods applied today and less optimistic about the future requirement fit; less concerned with methods supporting supply chain management on product quality, rationalisation of operations and capital cost rationalisation; less focused on system integration with other actors in the supply chain; and less focused on EDI and e-based solutions both upstream and downstream in the supply chain. Since SMEs do not implement SCM as deeply as large enterprises, they receive few advantages from other actors in the supply chain. SMEs view supply chain managements as the exertion of power by customers and is consequently seen by them as a one-way process. (Quayle, 2003) He concluded that developing SME supply chain expertise is essential to achieving and sustaining the competitive advantage. Quayle (2003) advocates that supply chain management provides opportunities for SMEs to align the supply chain with business strategy; to understand time, costs and value

drivers; to develop and maintain relationships and, equally important, to identify skills and competences, thus allowing it to focus on life-cycle costs.

As regards how the SME can be integrated into the supply chain, Smeltzer (2002)

identifies four primary requirements for a SME. These are

- 1) Low, predictable cost;
- 2) Minimal change in behaviour;
- 3) Compelling benefits over alternatives;
- 4) Easy, rapid, technical adaptations.

Archer, *et, al* (2008) notes that SMEs are not able to make independent decisions of the supply chain operation without considering their impacts on business partners. This is emphasized by the finding that long-term relationship with business partners is ranked as the one most important to them.

Arend and Wisner (2005) explain why there is a poor fit between supply chain management and SMEs' as follows.

- 1) SMEs do not implement supply chain management appropriately;

2) SMEs do not use SCU to complement the strategic focus and

3) SMEs are not freely choosing to pursue SCM.

Tarn *et al.*, (2002) argue that the survival of individual SMEs is dependent upon their ability to develop internal enterprise control systems, which are aligned with the wider needs of their customers and the supply chain rather than being merely narrowly focussed on producing the next order.

From the literature, we can see that the supply chain is a double-edge sword for SMEs since it gives both opportunities and challenges to SMEs.

2.7.5 Do SMEs think strategically?

In 1985, Sexton and Van Auken (1985) concluded that strategic planning was a scarce, fragile commodity in the small business environment. Planning behaviour had been characterized as unstructured, irregular, and comprehensive, and as incremental, sporadic, and reactive. Shuman *et al.*,(1985) supported the same view by finding that a majority of firms did not have a formal business plan when started, relying instead on personal experience and intuition.

Aram and Cowen(1990) pointed out common misconceptions about strategic planning for small business as: the process is for large firms rather than smaller ones because of the resources required; strategic knowledge must be acquired from individuals outside the organization; the process requires existing planning expertise and must be done in a highly structured and formal manner; the process does not have immediate payoffs; the end result of the strategic planning process is the development of multi-year financial performance.

From the literature, we can see that SMEs do not think strategically even when there are obvious benefits from using it. One of the reasons for this is that SMEs cannot afford the resources to undertake formal strategy formulation. Practitioners need a simple, straightforward method to guide them to think more strategically. Since practitioners in SMEs expend a lot time at an operational level, the supply chain is an ideal concept for them to understand and means by which they can easily collect the data needed to formulate an implementable growth strategy. In this research, the author aims to think of the growth strategy from the supply chain perspective. So the proposed framework is easy for the practitioner to understand and utilize in practice.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In this chapter, the methods underlying this research will be described and discussed.

The chapter starts out by discussing some of the philosophical issues associated with the choice of research method. This is followed by a detailed description of each phase of the research. The design and development of the research instruments used will be presented and discussed in details. Finally, the main methods that are used to analyze the data are discussed.

3.2 Choice of research method

Yin (2009) has argued that the three most influential factors defining an investigator's choice of research methods are:

- The type of questions that are asked by the researcher
- The resources that are available to the researcher
- The extent to which control over events is feasible or even possible.

Generally speaking, there are three types of research: qualitative research, quantitative research and mixed method research. Qualitative research is a means for exploring and understanding the meaning that individuals or groups ascribe to a social or human problem. (McQueen and Knussen, 2002) Qualitative methods usually expressed in the form of words rather than numbers can be a good source of information. The major aim of studying social issues in any context is to increase understanding about the forces that drive our world. (McQueen and Knussen, 2002)

The research topics in this thesis are supply chain and business growth strategy. The supply chain paradigm is a discipline of business and management, which has its own distinctive characteristics. Easterby-Smith *et al* (2002) argue that three factors have combined to provide business and management with a distinctive focus. These are as follows:

- The way in which manager and researchers draw on knowledge developed by other disciplines;
- The fact that managers tend to be powerful and busy people. Therefore, they are unlikely to allow research access unless they can see personal or commercial advantages;

- The requirement for the research to have some practical consequence. This means it either needs to contain the potential for taking some form of action or needs to take account of the practical consequences of the findings.

In this research, the author had the chance to access companies taking part in an existing project between SMEs and the Agility Centre at the University of Liverpool. Since the research carried out in this thesis is designed to explore and understand how the supply chain can influence decision making in relation to growth strategy, a large amount of information is needed in order to draw valid conclusions. As this research was a follow-up of previous research that used a qualitative approach, the author adopted the same qualitative method.

Different from quantitative research, qualitative research employs different philosophical assumptions; strategies of inquiry; and methods of data collection, analysis, and interpretation. Creswell(2009) summarizes the characteristics of qualitative research as: natural setting, researcher as key instrument, multiple sources of data, inductive data analysis, participants' meanings, emergent design, theoretical lens, interpretive, and holistic account. According to Becker and Bryman (2005), qualitative research differs from quantitative research in five significant ways. These are as follows:

1. Use of positivism and post positivism
2. Acceptance of post modern sensibilities
3. Capturing the individuals point of view
4. Examining the constraints of everyday life
5. Securing rich descriptions

In this research, the author use case study as the key method to collect the data. Survey and in-depth interview are also adopted to complement the in-depth case study. The following sections will justify the methodology used in this research.

Case study

As a key method of qualitative research, case study has been widely adopted in operations management. (McCutcheon and Meredith, 1993; Meredith, 1998; Coughlan and Coughlan, 2002; Voss, *et al*, 2002; Eisenhardt and Graebner, 2007)

Yin (2009) distinguishes case study research from other types of social science research as the situation where: how or why questions are being posed; the investigator has little control over events, and where the focus is on contemporary phenomena with a real-life context. Voss *et al* (2002) emphasize that case research is one of the most powerful research methods in operations management particular when developing new theories.

Case studies are rich, empirical descriptions of particular instances of a phenomenon that are typically based on a variety of data sources (Yin, 2009). Eisenhardt (1989) suggests that building theory from case studies is a research strategy that involves using one or more cases to create theoretical constructs, propositions and/or midrange theory from case-based, empirical evidence.

This research aims to explore the position and impact of the supply chain in growth strategy. The researcher establishes the conceptual framework through an intensive literature review and studying previous research. The conceptual framework needs to be further developed and tested from the practitioners view. Rich empirical data is needed in order to establish an overall picture from the practitioners' point of view. Case study is the best suitable method to achieve the goal since it is a powerful research method used to develop new theory by extracting rich, reliable information from a variety of data sources.

3.3 Design & development of the case study procedure

According to Yin (2009) there are six sources of evidence for case study. These comprise documentation, archive records, interviews, direct observation, participant-observation, and physical artefacts. In this research, the researcher will use

documentation, archive records, interviews, and direct observations as the means to collect the data. All of the cases studied in this research are cooperative projects between the case companies and the Agility Centre of the University of Liverpool in which the author played a key supervisory role. These allowed the researcher to become closely involved in the operation of each case company. For each case, two or three managers were interviewed and the researcher attended internal company meetings and meetings with suppliers. It provided an in-depth view of how the companies operated. Those interviewed included supply chain managers, operations managers, CEOs, and managing directors.

3.3.1 Aims and objectives of the case studies

The three in-depth case studies were intended to extract the data from practitioners and allow the researcher to understand how they think about supply chain issues in relation to the formulation of growth strategy.

3.3.2 Procedure overview

i) Developing research instrument and protocol

Based on the literature review and conceptual framework, a questionnaire was designed.

This was seen as the key instrument needed to collect the data. The questionnaire

contained five sections and included questions on company profile, the product selection process, market/industry structure, dynamic capability, and supply chain issues. The questionnaire was sent to the interviewees in advance so that they could prepare themselves properly and obtain answer to those questions they did not answer to. In this research, the data used is based on multiple respondents and viewpoints. Since the interviewees had different job specialisations, specific questions to each individual were also included.

ii) Conducting the field research

The case companies were chosen within the available resources of the University of Liverpool. The main criteria used were that the companies were manufacturing SMEs with product design activities. These companies ran cooperative projects with the University of Liverpool. The researcher visited each case company at least twice a week for two months. An MSc student based in each case company provided a convenient channel to for the researcher to learn about the latest developments in each company and enabled the efficient collection of data. The managing director, supply chain manager, and operations manager were the key contacts. The researcher was also permitted as an observer to attend the case company's business meetings with their suppliers. This gave the researcher the opportunity to ask suppliers relevant questions.

The company also provided the researcher with access to relevant company data such as the strategy plan, marketing plan etc. For each case company, the researcher carried out two or three in-depth interviews lasting around one and half hours with key contacts; attended one or two meetings with suppliers; and spent at least five days in the company to observe and ask casual questions with relevant staffs. The researcher also collected data and information from the website of each case company.

iii) Data documentation and coding

Following the research protocol structure, the data collected in each case study was written up after each company visit and interview. Documentation included typing up notes made during observation, recalling informal discussions with staff, and transcription of recordings made during the interviews. A draft of the documentation produced was then sent to the key contacts to confirm its authenticity and the accuracy. The data documented was then categorized into four perspectives of growth strategy, market information, company internal capability, and supply chain.

iiii) Analysis

Two levels of analysis were carried out in for each case study. These comprised within case data analysis and cross-case data analysis. In the case analysis, the first step is to

analyse the patterns of data. The second step is to look for explanations and causality of the data. Through looking into events and their explanation, the researcher tried to map out the reasons and interactions taking place behind the data.

In this research, cross-case data analysis was conducted to increase the internal validity of findings..

3.4 Deign of the mini-survey and semi-structured interviews

Mini-survey

A survey questionnaire including ten questions was posted to 120 manufacturing SMEs in order to gain richer data. The ten questions used were based on the literature search and findings from the three in-depth case studies. The researcher was able to use the survey to validate findings in the literature. If the survey results were found to be in disagreement with the literature, the researcher would required undertaking further survey work and investigate further. If the results were found in line with the existing literature, then the researcher would be able to use this survey to find suitable companies to undergo semi-structured interview. This was the main function of the mini-survey.

Semi-structured interviews

In order to understand the reasons behind the answers given in the survey questionnaire and to gain more accurate data, five companies were selected for semi-structured interview. The respondents' answers to the mini-survey formed the basis of each interview.

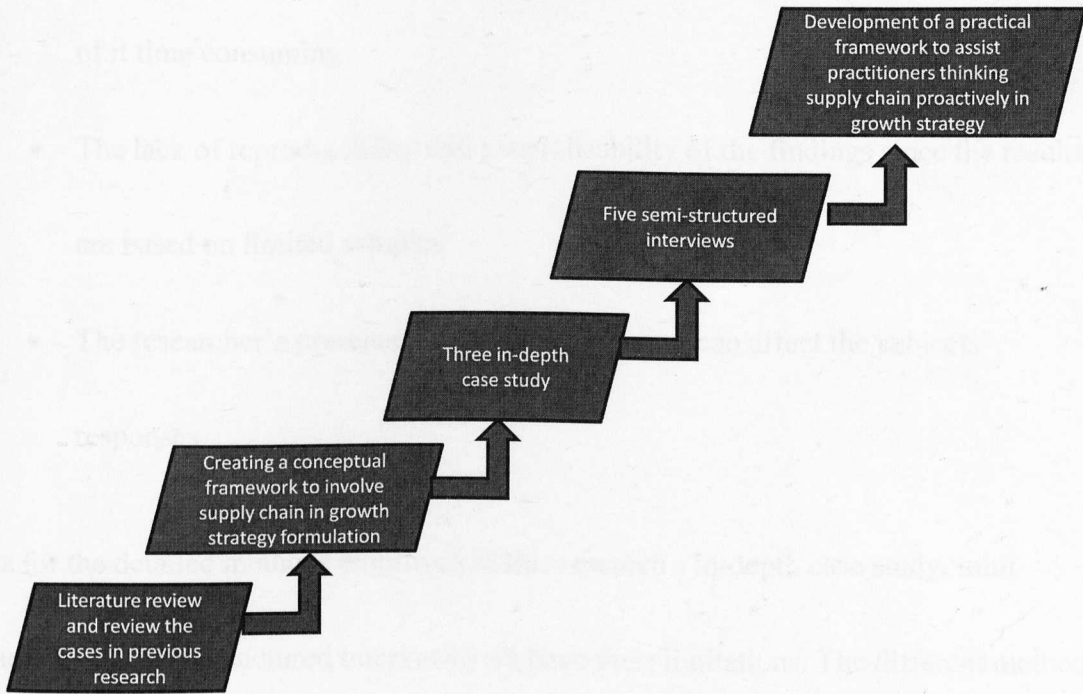
For each company, only one interviewee was chosen. The interviewees were either managing directors or purchasing or supply chain managers.

The documentation and coding adopted followed the same procedure as used in the case study research.

The analysis of the data was also carried out using the same methods those used as in the case study research.

The methods used in this research are summarized in figure 3.1

Figure 3.1 An overview of the research methodology



3.5 Limitations of the research method

The adoption of a qualitative technique has its limitations. The common criticism of the qualitative research method can be summarized as follows:

- It is subject to researcher bias since research quality is heavily dependent on the individual skill of the researcher

- Analysis is weak since there are significant difficulties in analysing qualitative data rigorously. The volume of data generated makes analysis and interpretation of it time consuming
- The lack of reproducibility and generalisability of the findings since the results are based on limited samples
- The researcher's presence during data gathering can affect the subjects' responses

As for the detailed methods employed in this research - in-depth case study, mini-survey, and semi-structured interview - all have their limitations. The different methods employed in this research can complement each other and reduce bias. The in-depth case study provides consolidated information to tackle the research questions. The mini-survey provides broader samples to categorize the findings of the case study. The semi-structured interview following-up the mini-survey provides detailed reasons behind each answer given in the mini-survey. It helps the researcher establish a clear picture of the behaviours of company and the reasons behind them.

Summary

In this chapter, the author explains and justifies the methods adopted in this research.

The detailed procedure behind the data collection is also described. For the research questions asked, the qualitative research method was chosen as the most appropriate.

The in-depth case study was the key method used to collect the data. Case study is a powerful research method in developing new theory as it extracts rich, reliable information from a variety of data sources. The mini-survey and semi-structured interview employed as complementary methods were adopted in order to help the research gain a broader scope and understand the reasons behind answers to the survey questions.

CHAPTER FOUR

A CONCEPTUAL FRAMEWORK FOR A GROWTH STRATEGY THAT INVOLVES THE SUPPLY CHAIN DIMENSION

4.1 Introduction

In this chapter, a conceptual framework for a growth strategy that involves the supply chain dimension will be presented. The proposed conceptual framework is a result of the literature review and evidence from previous research. Further development of the conceptual framework will be carried on through the remaining phase of the research in order to finally develop the framework into a more practical methodology.

The basic building blocks of the conceptual framework are identified from the discussion of major issues in strategy, supply chain, and product development that were discussed in the literature review.

With the building blocks and evidence ready, the conceptual framework is then introduced in more detail. The interrelationships and connections between the different parts of the framework are then discussed. It is then argued that it is necessary to transform the conceptual framework into a practical tool to assist practitioners formulate

a more implementable growth strategy involving the supply chain dimension. The framework initiates from strategic influence drivers originating from market/industry structure, dynamic capability, and supply chain. An extended Ansoff matrix is employed and used as a decision tool to indicate the strategic growth direction. The growth strategy is the final output of the framework.

4.2 Linking the supply chain to growth strategy: the literature perspective

The review of literature relating the management of strategy and supply chains shows that the evolution of business has resulted from the emergence of these two paradigms.

In order to achieve cutting-edge competitive advantage in the turbulent world of business, organizations need an implementable growth strategy that involves a supply chain dimension. This can enhance their flexibility and the dynamic capability needed to respond to the changes of turbulent markets. Proactively thinking of the supply chain in the growth strategy formulation process reinforces the SMEs dynamic capability and results in an implementable growth strategy.

Product development is a key dynamic capability needed by firms to survive, grow, and succeed in fast paced, competitive markets. The vital position of the supply chain in product development has been acknowledged by both practitioners and scholars alike.

How to involve suppliers in product development has been intensively investigated.

Cost-saving and reduced product development time are the two key benefits from involving suppliers in product development. The benefits of building up closer, more open, and trusting long-term supplier relationships, and providing easier access to suppliers' knowledge and expertise will, however, have a strategic impact on the firm.

If these attributes from the supply chain can somehow be collected and perceived proactively, then they will give a new thrust to the formulation of the growth strategy.

An implementable and flexible growth strategy could be formulated with the new thrust coming from the supply chain.

4.3 Building blocks of the conceptual framework

The review of the literature leads to a number of conclusions relating to growth strategy and the supply chain. Some building blocks that will be used to establish a basis for involving the supply chain dimension into growth strategy will be drawn from this review.

Adopting classic concepts from strategic management and resorting to the more recent literature on supply chain management the building blocks of the strategies framework can be defined as follows:

Dynamic capability: the firm's processes that use resources –specifically the processes that integrate, reconfigure, gain and release resources – to match and even create market change.

Industry structure/market: the extended rivalry that results from the rivalry among existing competitors, the threat of new entrants, the threat of substitute products or services, the bargaining power of suppliers, and the bargaining power of buyers.

Industry structure drives competition and profitability.

Supply chain: the network of suppliers and suppliers' suppliers, customers and customers' customer, and logistics providers, which constitute a unit of competition to survive and prosper together in the new turbulent business environment.

Emanating from these dimensions and their interaction are factors which define strategic aspects. Generally we refer to them as strategic influencing factors and define them as features which strategically influence business growth and contribute to strategy formulation. In order to distinguish between different strategic influencing factors, they are categorized as follow:

Strategic drivers: a set of forces from the business environment and industrial structure which compel the company to reconsider its growth strategy in order to respond to market and industry structure.

Strategic impetus: a set of forces emanating from the dynamic capability of the company and which lead it to reconsider its growth strategy in order to best utilise resources and capability.

Strategic enablers: a set of forces from the supply chain which enables the company to review its growth strategy in order to better collaborate with partners to integrate their productive processes.

Finally we can define the “strategic growth movement map” which indicates the company’s movement options within the extended Ansoff Matrix. The map offers indications of the expected growth benefits from each move and supports the decision in the company for adopting a given direction or position.

4.4 A 3-D Framework for developing growth strategy

Following on from the findings of the literature review, we present in this section a 3-D conceptual framework for growth strategy. Convergence of business strategy and supply chain is an observable trend in the new volatile competitive business environment. The

proposed framework attempts to involve the supply chain perspective as a new dimension in determining growth strategy. Based on the classic “fit” or “match” theory of Slack and Lewis (2008), the supply chain is added as a new dimension to interact with existing dimensions of external environment and internal resources. Partnerships and relationships within the supply chain will be regarded a key performance measures that interact with business environment and dynamic capability. The product design process will be a platform where we can consider the contribution of the supply chain to growth strategy. The contribution of the supply chain will be carefully considered in order to achieve swiftly implementable product features that support the growth strategy.

The conceptual framework is graphically shown in figures 4.1 and 4.2. Figure 4.1 displays a general view of the model and its constituent parts whilst figure 4.2 presents the framework in its fully detailed form. The proposed 3-D framework for growth strategy is devised to accommodate all strategic influencing factors. The growth strategy emerging will be a result of a triangulation of these.

Figure 4.1 Conceptual Framework of Growth Strategy

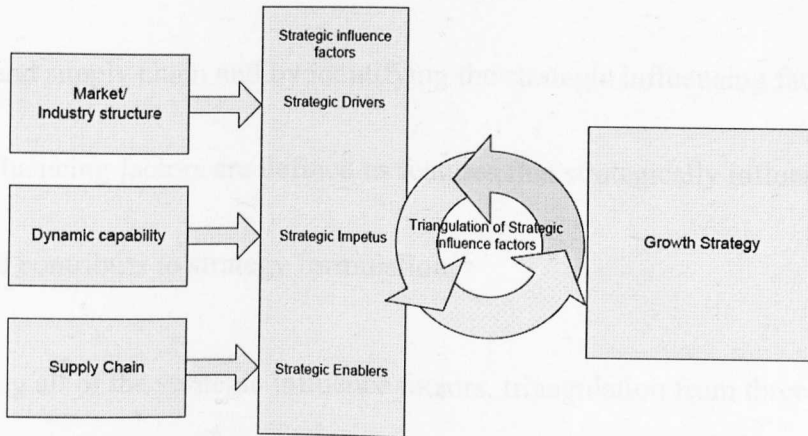
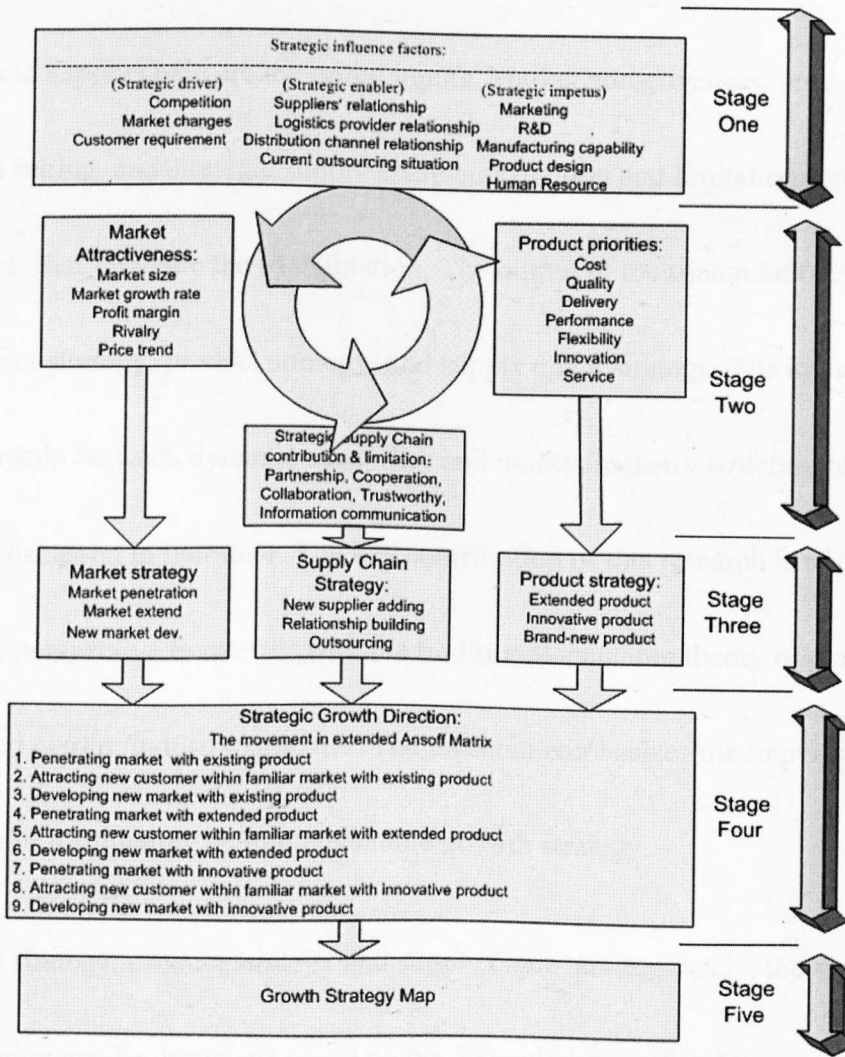


Figure 4.2 The Proposed Conceptual Framework of Growth Strategy



The framework begins by looking at the three aspects of industry structure, dynamic capability, and supply chain and by identifying the strategic influencing factors. The strategic influencing factors are defined as features that strategically influence the business and contribute to strategy formulation.

After auditing all of the strategic influence factors, triangulation from three perspectives is carried out in order to find out the interactions and inter-relationships between them.

The audited strategic influence factors from market/industrial structure, dynamic capability, and supply chain are the initial inputs. Market attractiveness, product features and setting, and strategic supply chain contribution and limitations are the linkage points that facilitate the triangulation. The output of the triangulation will include market strategy, product strategy, and supply chain strategy. The interaction and inter-relationship between dynamic capability and market/industry structure has been extensively discussed in literature. The key contribution of this research is to allow the supply chain perspective to interact with the traditional matching theory of dynamic capability and market/industry structure. The research emphasizes the important of the supply chain in formulating an implementable growth strategy.

With market strategy, product strategy and supply chain strategy ready, the strategic growth direction can be drawn off based on the Extended Ansoff matrix.

Finally, the practitioners can make their own decisions based on the available strategic growth directions, profit expectation, and risk evaluation.

CHAPTER FIVE

IN-DEPTH CASE STUDY

5.1 INTRODUCTION

Based on the conceptual framework developed in chapter four, three case studies were carried out to investigate supply chain involvement in growth strategy from the practitioners' point of view and to further develop the conceptual framework. Voss *et al* (2002) have pointed out that case research is very important for operations management since the explanation of quantitative findings and the construction of theory based on it ultimately have to be based on qualitative understanding of it. In this research, in-depth case study is utilized as the main method to investigate why supply chain involvement in growth strategy is needed for practitioners and how the supply chain can be incorporated into the growth strategy.

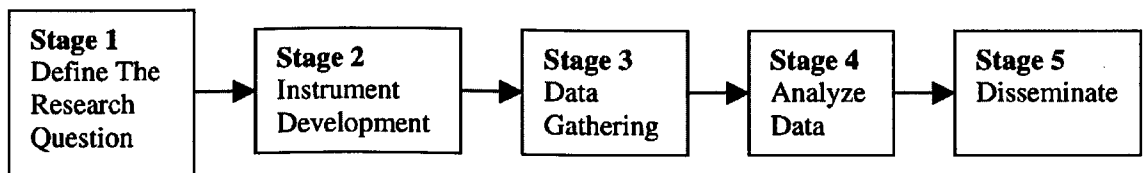
This chapter will report the results from three in-depth case studies. For each case company considered, a brief introduction or company profile will be presented. This will be followed by in-depth analysis of its data. Once this has been done, a cross comparison of all four companies studied will be undertaken to investigate similarities between them.

5.2 Design of the case study

Yin (1988) recommends that the case study is the main method needed to undertake detailed investigation and provides answers to how and why questions.

Stuart *et al* (2002) summarizes the research and dissemination process of case study in terms of a five-stage process. This is shown in Figure 5.1.

Figure 5.1 The five-stage research process model



Source: Stuart *et al* (2002)

In chapter three where methodology was considered, the concept of the case study was introduced. In what follows we present a brief description of the case study design we use here. We also show how it can be connected with the conceptual framework.

The case studies were conducted by semi-structured interview, participant observation, and analysis of documentation and archive records. A five-section questionnaire was developed to investigate company profile, market/industry structure, dynamic capability, and supply chain issues. The interviewees were many and differed according to the case being analysed. They included managing directors, operations managers, and supply chain partners. The researcher visited each company on a regular basis for about two

months to undertake participant observation, and to collect documentation and archive records. The researcher also had the opportunity to attend meetings and interview key suppliers.

The case studies were undertaken to answer the following questions:

- How practitioners think about role of the supply chain in the formulation of growth strategy;
- How practitioners think about the role of the supply chain in the product design process;
- What detailed contributions are needed from supply chain in order to facilitate a better implementable growth strategy;
- What are the inter-relationships among supply chain, market requirement, and dynamic capability of the company;

The questionnaire used in the interview consisted of five sections.

Section 1 provides basic information on the company. This is designed to provide a profile of the company, and detail its general growth strategy, and recent growth record.

Section 2 concerns the product selection process. This is designed to ask the interviewee to choose on product based on the complexity of the product design and contribution to the turnover.

Section 3 concerns market and industry structure. This provides data on competition, market trends, opportunities and barriers to growth.

Section 4 concerns internal capability. This is designed to investigate the company's manufacturing capability, product design, and supply chain management.

Finally, section 5 investigates supply chain issues by looking at the current situation and perception of how an "ideal" supply chain could be built.

The questionnaire is attached as appendix A.

5.3 Studied cases

Three cases are presented sequentially in this section. For each we provide the company background. Next we consider the case study design for each in isolation. Finally we consider the results. This is done in three stages. First we report the results of the questionnaire based interview. Second, the data from the suppliers' perspective is presented. Finally we present an analysis of growth strategy, market, product design,

supply chain design, implementation issues etc. based on the data collected including that from participant observation and documentation research.

5.3.1 Case study company A

Company background

The case company is a specialist in providing sputter based technical solutions to the vacuum thin film deposition industry. The company also provides advanced solutions to customers in PVD (physical vapour deposition), semiconductor, web, precision optics and rapid metalizing industries. The main products are manufactured in small batches according to each order's detailed specifications. The company operates in a moderately competitive environment and is a typical market-follower. It outsources most of the manufacture of its product components. Final assemble, testing and despatch to the customer is carried out in-house. As for its internal capabilities, the company is still in its evolution from small firm to medium size company. The company has both a R&D team and a product design team. However, the R&D of the company is under-resourced and the company has a limited new product development capability. The R&D team mainly focuses on designing the size and structure of each product according to the specification requirement of the customer. Supply chain management was considered a

bottle-neck problem as the majority of the quality problems and delivery delays were the result of poor performance of its suppliers.

Case study design and result

Case study design

The case study followed the procedure outlined previously. The operations manager and supply chain manager were interviewed. The production manager and purchasing coordinator were informally interviewed. It was hoped that casual talk would catch more information. The researcher was also fortunate to attend a one-day all-supplier conference and have the chance to talk to some of the company's main suppliers.

Archive information was obtained from the company's website and the dissertation of an MSC student based at the company for a two-month project.

Case study results

Interview Based Questionnaire.

Profile of the company

Company A is a manufacturing firm providing sputter based solutions for the vacuum thin film deposition industry. The main product lines are magnetron sputter cathodes; process monitoring and reactive sputter gas control systems; and linear plasma sources.

The company had been in existence for a period of 13 years. From the very beginning, it was a consultant based firm and was used to producing one-off products. Its customers were drawn from the research community and from universities in particular.

There were 3 marketing staffs, one of whom was based in USA. There were 2 procurement staffs. The product development team comprised 6 product design staff (one KTP associate) and 3 R&D staff. On the manufacturing line, there were 10 line workers. Distribution was carried out by the agent. Finally there was one person responsible for HRM and another responsible for finance.

The turnover was £2M in 2007, £3.5M in 2008, and expected to be £5M in 2009.

Product selection process

As the questions in the questionnaire were designed to focus on one specific product, the operations manager was asked to choose one product based on its complexity of manufacture and contribution to turnover. The manager chose magnetron sputter cathodes as the product to be discussed in the interview. The selection of magnetron sputter cathodes as the research product was based on the fact that magnetron sputter cathodes contributed 90% of turnover to the company and provided the potential for growth.

Market and industry structure information

The case company was in a slow growing market environment and faced medium competition. There were only a handful of competitors in the market, and they were located in Europe, USA, and far-east Asia. The case company was a market-follower instead of first-mover. The company as a whole was very reactive. The main factors that made magnetron sputter cathodes such a success were product quality, product innovation, and resource advantage. As regards barriers to future growth, availability of suitable skilled/qualified staff, environmental regulations and suppliers/ supply chain issues were all mentioned by the operations manager. The driver behind product development was competitors' behaviour. The market attractiveness was level as medium with regards to market size, the profitability of customer and the competitive nature. The relationship with its main suppliers was low strategic. From the operation manager's point of view, the supply chain could not provide a vehicle for growth. The current growth strategy was in pursuit of development of products for existing customers.

Dynamic capability

The case company used specialised technology to manufacture the product. All the technologies were based on in house R&D. Much of the production was one-off and in

small batch sizes. For the latest designed product, the same manufacturing process was employed using same the materials. For its manufacturing, staffs needed only general skill training. All the designs were completed in house. The company had a well-managed and structured product design process. However, supply chain management and product design management could act as a barrier for the success of this product. As for the compromise between product feature and company capability, the company's capability matched the originally proposed product feature. The design of the new product took a long time. Since competition in the industry was not strong, the speed of getting the new product to market did not hinder its success. The case company did not consider building a relationship with suppliers during the product design and production process and did not benefit from its main partners' capabilities either. The case company invested heavily in R&D (15%-20% of turnover). But the operations manager still thought that the company was under resourced in terms of R&D, and this made it impossible for it to compete with the market leader. However, the strength of its design team allowed the company to catch up with its competitors very quickly.

Supply chain issues

The general strategy used by the case company in choosing its supplier was based on quality, responsiveness, and delivery time. The criteria were ranked by the supply chain

manager in terms of importance as: product conformance, responsiveness, and delivery on time. The company had recently reduced its supplier base from more than one hundred to less than twenty-five providers. For each component needed, there were generally at least 3 suppliers able to provide it. Almost all the contracts with suppliers were for individual orders. The case company applied a bidding system to select the supplier for each order. The suppliers' relationship with the case company was described as high trust, high commitment and high cost transparency, medium communication, medium dependence, and medium information share. The case company thought that working with suppliers would help them open up new product ranges for the company and allow it to achieve improvements in product design. As regards the selection of suppliers for the future, the following criteria in terms of importance would be applied: quality; delivery; cost; technical support; consultation leading to better product design; and earlier involvement in product design. As the supply chain manager had only been in post for less than 3 months, it was difficult to ascertain what was planned for the future. It appeared to be the case that he planned to enhance supply chain management and try to make the supply chain contribute more. The priorities for future supply chain design were how to make suppliers contribute

more to the product design, and how the relationship building could contribute more to the competitiveness of the company.

The data from the supplier perspective with meeting with suppliers

The researcher was fortunate to have the opportunity to attend a one-day conference held by the case company with its suppliers. It was the first time the case company had held a suppliers conference. The newly appointed supply chain manager proposed the conference. The objectives of the one-day conference were threefold.

- 1) Enhancing communication of information to suppliers and building up stronger relationships.

All the suppliers invited had been the recently approved suppliers. The company had recently reduced its supplier base from more than hundred to less than twenty-five. The supply chain manager showed a strong indication that the company would like to build up stronger links with suppliers within the new approved supply base.

- 2) Introducing a formal procedure to integrate the quality control system with its suppliers

The supply chain manager introduced practical tools including flowcharts and fishbone diagrams to representatives of its suppliers. It was also emphasized that

the root-cause of suppliers' poor quality would need to be more quickly identified in future. Suppliers would need to provide reasons for poor quality and put in place measures to reduce future production problems.

3) Emphasizing the revised bidding system

A revamped bidding system was recently introduced recently. The supply chain manager emphasized the importance of the responsiveness of suppliers to bidding.

The researcher also got the chance to talk with several representatives of the suppliers during the lunch break and after the conference. The information collected from them highlighted three key issues:

1) Relationship

The suppliers expected a more collaborative relationship instead of a bidding system. They were happy that the case company had reduced the supplier base and had improved the bidding system from one based on price to one based on responsiveness. However, suppliers expected a higher level cooperation in future. It would make them feel more secure and as a result they would show more commitment to the case company.

2) Communication

The supplier liked the idea of all-supplier conference, as it not only provided the chance to communicate with the case company, but also to communicate with other suppliers. The suppliers expected that in future more communication would take place with its design and production staff. They used issues of poor quality and long delivery times to show that the problem came from the lack of communication between technical staffs. If technical staffs had communicated earlier, the majority of the problems could have been.

3) Involvement

Suppliers thought they could contribute more if they were involved from the product design period onward. They could reduce lead times and increase product quality.

Sometimes suppliers thought that the company had not made the best decision regarding the specification of a component. Suppliers could have provided more reliable and cheaper alternative components if the company had only asked earlier.

The suppliers thought it was a pity that the case company did not involve them more.

If the case company had the intention to collaborate more, it was the suppliers' pleasure to share in that experience.

Summary of the one-day suppliers' conference for all suppliers

It was a quite successful conference. The newly appointed supply chain manager sent a signal to suppliers that only by engaging in a process of integration could they grow.

The case company had made the first step by strategically building up its partnerships with key suppliers. Feedback from suppliers showed that they would contribute to the case company more if the case company actively involved suppliers in the product design process. The response from suppliers also highlighted the importance of relationship building and communication.

Analysis of growth strategy, market, product design, supply chain design, and implementation issues in the company

In this section, the data collected from various sources in the case company will be put together to analyze the interrelationship between growth strategy, market, product design, supply chain design, and implementation issues.

Growth strategy

As a market follower, the case company's growth opportunities mainly come from the increasing demands of the market and its existing customers. The company had, however, identified a new opportunity in the emerging solar panel market. This would

have a great influence on the company's strategic growth. The company's growth strategy relied heavily on the success of their customers as they argued it was the success of their customers that had driven business growth and technology development. While the recent economic downturn affected the company, the firm was still optimistic that growth while slow would continue. At present, the company growth strategy is to attract new customers in their existing markets.

Although growth opportunities exist, the company has not been well-prepared in making use of them. Operational problems forced the company to focus on how to improve operational efficiency instead of considering on how to grow. The majority of operational problems were connected with supply chain issues. So even though chances for growth will appear, it may be very hard for the company to capitalise on them. After the company realised that the supply chain had become a constraint on growth, resources were applied to improve its performance and a supply chain manager was recruited to enhance supply chain management. Supply chain management was considered more strategically after the dedicated supply chain manager was appointed.

Market/industry structure

Company A was in a moderately competitive environment and some growth opportunities existed. Their key selling point was a good understanding of the process

environment and optimisation of different customer needs. The case company attribute this to a heavy investment in R&D (15-20% of turnover) and the many years of experience of key staff members. The case company is very reactive in order to grow in the market. As the manager described it in the interview ‘ *Because we are not developing something breaking new grounds in terms of looking for new applications and looking for new markets and looking for different ways to consume the product, if the solar market stops growing, we will stop growing*’. In their industry sector, the company is a market-follower. The operations manager described it as follows: ‘*We are a little behind the market-leader. We really need to break into that market very quickly because there is great potential there*’. The business model of the company is based on planning responses to customer and market needs and taking the view that it is customers who drive the business growth and technology development. The company described itself on its website in the following way: ‘*A key feature of our success is strong collaborative partnership with customer who set us the aims and expectations as we provide the results they aspire to. These partnerships are the bedrock of the company’s growth and success.*’ (Company website)

Product design

As a typical SME, the case company is under resourced in R&D even though it claimed that 15-20% of turnover was invested in it. The operations manager said: *“We have to do R&D and have to improve the function of the product line in the expectation to outperform the competitors. So the customer wants to improve the target usage, which we have to work it out in R&D. It is not R&D decides”*.

Product innovation is a passive reaction to competitors and customers' requirements.

R&D is focused on how to catch up with the market-leader. The product is engineered to customers' specification for each order. Most of the product designs are focused on changes to the size of the product required by customer. Advanced software tools have been procured or developed in-house. As the operations manager described it *‘We do work closely with our customer on their specification. Every customer's application is different and every product is different. We try what is possible to be around common core design. The customers specify quite clearly what they want, particular with the machine builder to integrate our product into their system. But there is no involvement of suppliers into product design at present. There are not many issues in the design for supplier to contribute to. We actually take the capability of our supplier into our design. The actually situation is that after we design the product, we try to find somebody to*

supply. The fundamental design of the product is not changing hugely from one product to another. They are the same type of parts in their orders. ' Even though there is no involvement of suppliers at present, the operations manager showed an optimistic view for possible involvement in the future by saying: *'if we do more radical R&D, which is distinctive different design, it will be a beneficial approach to involve the suppliers into design process.'*

Rigorous quality control procedures are operated in the company. The website describes them in the following way: *"Systems are in place to plan, track and validate each part of the magnetron manufacturing process. Final assembling is completed in clean-room conditions. Prior to despatch a series of QC Checks are performed on all products."*

Supply chain design

The current supply chain has serious problems that cause difficulties for the company. The increasing non-conformance of components and unreliable delivery times of suppliers have provided a serious obstacle to growth. That was also the reason behind the recruitment of the new supply chain manager. The operations manager described it as follows: *'The supplier takes more work than they can reasonable cope with. Their lead times are actually longer than they quoted. We anticipate be to be able produce in certain period time and, then the supplier let us down.'* The newly appointed supply

chain manager began to visit the suppliers more frequently in order to rebuild relationships with its suppliers. The supply chain manager also reduced the supplier base radically. Although the company still uses a bidding system to select the supplier, the changed emphasis from price to responsiveness had also helped enhance its relationship with suppliers. All measures taken had had intended results. Quality checking of raw material was also delegated to suppliers. The supplier would provide certification of conformance to show that the product conformed to the required specification. As regards the involvement of suppliers in product design, the supply chain manager thought that *‘ If we can work closely with supplier and involve them more in the product design process, it will possible open up a new product range for the company and achieve the improvement to design of the product.*

Implementation issues

The case company confronted a series of raw material non-conformance problems which had affected the company badly. The late delivery of raw material was also becoming a problem. The suppliers' problems made it harder for the company to sustain normal operation, let alone plan for growth. Due to the seriousness of these, the company was taking action to enhance the supply chain management team and a dedicated supply chain manager had been recruited. Before this, there was only one

supply coordinator working with the managing director to deal with supply chain issues. The effective measures adopted by the supply chain manager that included reducing the supplier base, setting up the all-supplier conference, and improving communications with suppliers, quickly improved quality and reduced delivery problems. At the same time as it was building up stronger relationships with its suppliers, the company was planning a more ambitious scheme to work with suppliers by involving them in the product design process. Another implementation issue was production line waste. The high level of customisation was resulting in inefficiencies in manufacture and assembly. However it seemed to the observer that the company had no clear plan to implement a standard modular design approach that would reduce internal component variety while still supporting a degree of customer choice. The perception was that company valued the detailed level of customisation highly and felt that any change to this would threaten its unique position in the market.

Case company A summary

The case study company was suffering from a series of problems affecting its market, product design, and supply chain. The problems restricted growth opportunities. In-depth analysis reveals that many of the problems were caused by poor performance in its supply chain. The case presents a good example of the importance of the supply

chain in developing growth strategy. The case company could not catch up with opportunities coming from the market due to its poor supply chain management. Earlier involvement of the supplier in product design, building up partnerships with key suppliers, effective supply chain management, and the pursuit of a consistent supply chain strategy will have a great impact on the company's growth.

5.3.2 Case study company B

Case study company B shows that without proactively thinking about supply chain strategy, SMEs will suffer long delays difficulties in implementing growth strategy.

Company background

Case company B was a newly established start-up SME, whose parent company specialised in developing innovative energy saving and storage products for industrial and domestic use. The case company had developed a new energy saving product with intellectual property right aimed at the domestic market. Similar technology had been successfully applied in industrial and retail areas by other companies. The company had no manufacturing capabilities beyond a limited technical laboratory for component and product testing. The product was a low maintenance energy saving device for use in domestic residences but required installation by a qualified technician. The product

consisted of a number of standard components, printed circuit boards and specially designed subassemblies and casing. The product had secured EU certification. The low cost base was also a function of the company's philosophy for keeping technology simple and avoiding over-engineering of its products. Mass product components in similar products had been adapted for use instead of developing new component from scratch. The case company shared resources with its parent company. The parent company provided central services covering payroll, IT, and facility infrastructure and office space, as well as key personnel such as CFO and human Resources. The parent company had a track record of identifying high-value opportunities in the alternative energy sector and developing low-cost, robust, engineered solutions for these markets. The original concept and patent were produced by the parent company.

Case study design and result

Case study design

The case was conducted mainly by participant observation and semi-structured interview. An on-going cooperative MSc project between the case company and the University of Liverpool provided a further benefit as it allowed the researcher to become closely involved with the operation of the company. The researcher visited the company twelve times within three months. Each visit lasted a full working day and

benefited from the facility provided by the company to the MSc project. The researcher also participated in key meetings with suppliers. Since it was a small team, consisting of 7 staff, the researcher had the chance to talk with each member of it. The researcher was thus able to fully investigate their views on marketing, product design, quality control and procurement. Formal semi-structured interviews were conducted respectively with the CEO, supply chain manager and quality control manager. The same procedure as for case A was used.

Report the results of interview based on questionnaire.

The report of the questionnaire was based on interviews with the CEO, supply chain manager and quality control manager.

Profile of the company:

Company B was a new start-up SME developing a new energy saving product with intellectual property right aimed at the domestic market. There was only a small team comprising key design staff and marketing staff.

The company had a CEO, product design manager, quality and control manager, product testing staff, marketing manager and sales manager. The company shared its supply chain manager, CFO and personnel team with its parent company. During the

research period, the company had just completed the new products design stage with the help of an external design agent and was beginning to look for a suitable manufacturing company to produce it.

Since the case company was a start-up company, there was no growth history. Its growth strategy plan is shown in table 5.1.

Table 5.1 The growth target and Method

Year	Market	Turnover	Method
2008	UK product launch	£1M	Cooperation with utility company
2009--2011	Penetration of the UK market	£6M-25	Cooperation with more utility companies; massive marketing and diversifying the channel through retail centre
2012	Development of the overseas market	£45M	Licensing overseas agents

Product selection

Currently there was only one product manufactured by the company. The main driver behind the product was innovation. The order qualifiers were chosen as delivery, quantity, flexibility, and service. The order winners were chosen as cost, performance, and innovation.

Market and industry structure information

The market trend was described as growing. The successful factors for this product were chosen and ranked as:

1. Product/process innovation
2. Finance
3. Market advantage and the government investment in green policy
4. Management of external organization (supplier, customer, shareholders, partnership)

Barriers that would have to be overcome over the next 3-5 year were ranked as:

1. Availability of labour
2. Managerial/leadership capability
3. Availability of suitable skill/qualification
4. Intensity of competition

5. Supplier/supply chain issues.

The company tended to be the leader in product development and first to market.

Competition was low in UK market. In future it would face international competition.

The market attractiveness for this product was described as: high attractiveness for the size of the market, medium attractiveness of the profitability of customer, and high attractiveness for the competitive nature of market place. Overall market attractiveness was high.

The relationships with supplier were described as highly strategic.

However, the CEO believed that the supply chain would not be able to provide a vehicle for growth of this product at the time the researcher was present.

Dynamic capability

The case company focused on product design and outsourced production. The company held the intelligent property right (IP) for this product and developed the product prototype with a design agent. The technology, which was 40% R&D in house, 55% acquired from market and 5% through cooperation with its supplier, and used to produce the product, was described as advanced. The type of production was large batch. For the latest newly designed product, the same manufacturing process using the same

materials was used. The major part was designed in house. Some specialised parts were designed through cooperation between the company and its suppliers. Training was needed for members of the design team. Supply chain management and product design management could be a barrier for the future success of this product. The product design and supply chain design would facilitate the future success of the product. As for the compromise between product feature and company capability, the company's capability did not match the original proposed product feature. The company had to compromise on the feature of size. As for how to solve the problems due to the limited capability, the answer was that *'Limitation of vendor capability had to be supplemented by contacting consulting with higher level experience/ capability/ knowledge/ to overcome the highlighted problems.'* The company thought that relationship building with supply chain members could enhance company capabilities in production and R&D. The company also benefited from the main supplier's capability to design and produce the product.

Supply chain issues

The general strategy used by the case company in choosing its supplier was based on product design capability, scale, and price. The detailed criteria were ranked in order by the supply chain manager as: cost and ease to work with or cooperate (partnership),

quality and technical transfer (for design or production), and flexibility and technical support. Almost all the contracts with suppliers were individual orders. During the period of the case study, the company was using a bidding system to decide the manufacturer to produce its product. The final choice was based on responsibility and product design capability of the supplier. The case company thought that working with suppliers was beneficial as new technology/knowledge was introduced to the company and it allowed the company to improve its product design.

The data from the supplier perspective with meeting with suppliers

In this case, the researcher had the opportunity to attend meetings with suppliers. One interview with the supplier was held after their normal business meeting had taken place. Another was held when visiting the supplier company with the quality control manager. The data based on these two meetings highlighted three issues. These were: communication, earlier involvement, and partnership. Through discussion with staffs from the franchise company it was clear that effective communication and earlier involvement in the project were the two main factors that influenced cooperation. For example, one company mentioned that they provided a wide range of support for potential partners to undertake the product design by providing free trial components and testing kits. The technical team was ready to give customers advice based on the

actual design process. They emphasized that the earlier they were involved the more beneficial it would be. If it occurred too late, the consultant would have little influence on the final design. One example was that the company had designed one of the components with the newest technology. As the newly designed component was proposed after the prototype had been finalized replacement of the component would incur additional cost. In the end the case company had to give up the new component. However, the case company would consider this component in the next generation of the product. Another company put more attention on communication and proposed that effective and close communication between customers and suppliers would create a win-win result. The supplier valued all levels of communication from technical staff to commercial staff. The supplier also thought they could contribute more to the product, especially during the product design process.

Analysis of growth strategy, market, product design, supply chain design, and implementation issues in the company

In this section, the data collected from various sources in the case company are analyzed and interrelationships among growth strategy, market, product design, supply chain design, and implementation issues investigated.

Growth strategy

As a first-to-market company, the company created growth opportunities through innovation. The company focused on the UK domestic market with a potential customer base of 25.2 million households. Their planned growth strategy -to be achieved in a 3 stages– is detailed in table 5.2 below.

Table 5.2 Three-stage growth plan

Stage	Strategy	Timeline
Stage One Product launch	Product launch	Dec. 2009 to May 2010
Stage Two Growth in UK market	Market penetration	From May 2010
Stage Three Growth in EU market Growth in American market	Market extension Launch improved product in new market	From December of 2010 From June of 2011

Stage One: successful launching of the product

The company had reached a collaborative agreement with a key utility company to distribute the product to its end customers as a means of achieving rapid market penetration. A trial was carried out with 3,000 units distributed to customers as part of an initial marketing campaign. The company was also negotiating with other utility companies to establish other cooperative relationships for the next stage. From the

supply chain point of view, the outsourcing partner was based in the UK for swift product supply.

Stage Two: Expanding in the UK market

With the successful launch of the product, the company expected to distribute the product all over the UK through its cooperation with other utility companies. Other routes to market such as cooperation with housing associations, using independent electricians and directly selling to customers would also be developed. At this stage, the company was planning to expand its supplier base by outsourcing its manufacturing to partners in East Europe and the Far East.

Stage Three: Expansion in European and American markets

After successfully expanding its market in the UK, the company expected to develop new markets in Europe and America. For European markets, the product sold on the UK market could be provided with little modification as it was EU certified. The key point that would influence the European market was UK market response. The best marketing weapon in Europe was a success story in the UK. As for the American market, the company needed to develop new products catering to the standards applying there. The growth strategy was concerned with developing new products for a new market.

Market/industry structure

The case company was operating in a booming market for energy saving products.

These products were promoted by government policy. Technology used in the product

had been applied in other industrial areas with success. But the case company was the

first to bring this technology to the domestic market. Saving money and reducing

emissions were the two main selling points. From testing of prototype, it was found that

the typical saving on electricity bills for the majority of households was around 10%.

Less energy use also meant less emission. The payback time for the investment was

around four years. The company was applying for CERT funding. If the company

succeeded in its application then an extra subsidiary available from the energy company

would further reduce the investment payback time of customers. Before we go further it

may be useful to explain what is meant by CERT. CERT(Carbon Emissions Reduction

Target) is concerned with reducing CO₂ emissions, -one of the main causes of climate

change. CERT came into effect in April 2008, and obliges energy companies to take

steps to ensure that domestic CO₂ emissions are reduced.

The company had begun its marketing promotion through nation news papers & TV

advertising.

From the growth strategy, the initial targeted markets included:

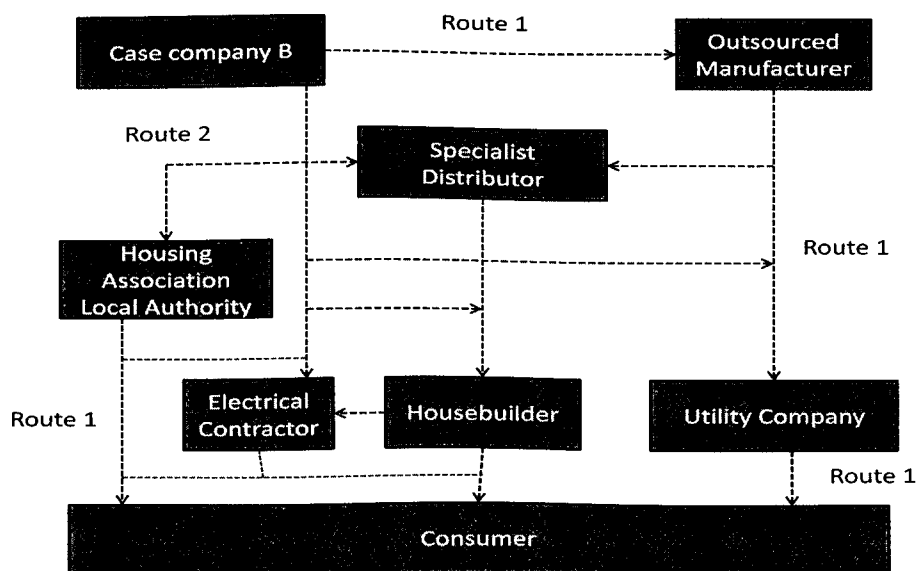
- New housing
- Public housing
- Private housing
- Small commercial (office/retail), new build or retrofit
- Parallel with boiler/fuse box installation

The company would focus on public and private housing, and the small commercial market given uncertainties affecting the new housing market.

There were two routes for the company to reach its final users. These are shown on

Figure 5.2

Figure 5.2 Two routes to reach the final customer



Source: Company data

The first route was cooperation with Utility companies to promote and distribute the product.

This route was considered the way to success for the company following the initial product launch. The company had signed a cooperation contract with a key utility company and negotiations with other utility companies were in the pipeline. This brought two advantages. First, the company could access customers swiftly. Secondly market risks were significantly reduced due to it being able to access the large customer base of the utility company.

The second route was cooperation with local housing associations to promote and distribute the product

By cooperating with local housing associations, the company could provide the product as an upgrade to equipment supplied to the end customer. It could also be supplied as standard equipment in new built properties. This route was based on the established market reputation of the product. It would be a very challenging route if there was no market reputation for the product. Route two would only follow the success of route one.

Product design

The company came up with the technical idea for the product and cooperated with a design agent to design the prototype. The design team consisted of three company staff. They were responsible for electrical design, testing, and quality control respectively. The in-house design team worked closely with the design agent to develop the prototype. It was not a success and resulted in a six-month delay. This was not only late but some parts of the specification had to be sacrificed due to the limited technical capability of the design agent. The result was a final design that was 50% bigger in size than the original specification. The reasons for this poor level of cooperation were due to the following reasons.

First was an arrogant company culture. The case company thought the design agent ignore the valuable suggestion from the company. One member of the design team described it as follows: *'there is more than fifty years experience from our design team, but the design agent thought they got more expertise than us.'*

Then there was the lack of resources provided to the project by the design agent. The design agent did not dedicate to the project enough technical and manufacturing resources.

Finally, there was a lack of belief in the success of the product. The design agent did not seem confident in the product. There would also be further cooperation with the customer after the initial prototype design. However, the attitude of the design agent expressed in the product design process showed a lack of confidence and a low expectation for future cooperation.

5. Supply Chain Design

After the prototype was completed, the company switched activities from product design to supply chain design. The company plan was to outsource all the manufacturing, which meant the supply chain design, was a strategic decision for the company.

The manufacturer of electrical equipment (CEM) was a company whose business was to manufacture other companies' products according to their design and technical specification. The role of the CEM was not only to manufacture the product, but also to act as a partner offering technical support over design, supply chain management, etc.

The design agent had a number of manufacturing capabilities that would make it an ideal partner for the trial production. But the cooperation witnessed in the product design stage made it harder for them to expand it from product design to manufacturing.

It caused a setback for the company because further resources and time would then be needed to find a new partner.

The company finally adopted a bidding method to select its partners for manufacturing the product. The participant bidding companies came from the UK, Eastern Europe, and the Far East. The case company quickly learnt the lessons from cooperation with the design agent that price were not the only factor it should use in selecting the best bid.

The criteria used also covered technical and other factors. These are as summarized in

Table 5.3

Table 5.3 The Criteria used to choose the cooperative partner

Criteria	Detail points
Financial	<ul style="list-style-type: none"> • Price • Price transparency • Consignment stock • Payment terms • Company financial status
Technical	<ul style="list-style-type: none"> • R&D for future product design • Manufacturing capability • Lead time • 3PL (Third party logistics) provider • Flexibility in capability
Others	<ul style="list-style-type: none"> • Value-added services • Exclusively or non-exclusively

This case shows it takes a longer time than expected for a company to set up a supply chain if the company is unable proactively think about the supply chain. The case company was behind schedule due to delays in the product design process. In order to

expedite the process, they decided to make the first bulk manufacturing free issue of material for the outsourcing partners. It meant that the company had to shoulder more responsibility since it involved procurement and transportation of the components. This exposed the company to higher risk, as well as financial and logistics issues. On the other hand, the company enhanced their understanding of the component and gained experience for future management of the supply chain. Components procurement is a time consuming process as different components need to be sourced from a large number of different suppliers who distribute them. The objective at this point was to procure the components from as few suppliers as possible. It was also the case that some suppliers might be able to provide multiple numbers of components needed for the product. This would reduce the number of suppliers needed yet further. However, there were a few high specification components that needed to be purchased directly from the manufacturer. In effect, the company had done a good job by contacting the franchises earlier in the product design process. During the product design process, the company was in constant contact with the franchises and key component manufacturers. The relationship building taking place at that time benefited the company when it came to the procurement process. Through conversation, the researcher found that the management team believed that it was very important to build up close partnerships

with suppliers and keep a good relationship with them. In fact, many of the advantages coming from the supply chain only appear after the establishment of channels of communication with supply chain members. The closeness allowed them to find a much wider common ground than from a strictly transactional relationship. Under such circumstances, the company would be confident that the supplier would deal with any emergent problems in a diligent and professional manner.

The case company finally selected a company based in the UK. There were several considerations underpinning the final decision. Firstly, it was a UK based company with facilities for quick distribution of the product. As the case company was under time pressure, it was important. Secondly, the selected company had a subsidiary focusing on product design and R&D. It had market reputation, which the case company valued. Thirdly, the price offered was moderate and acceptable.

However, this is only the supply chain design for the current process. The company had other plans for the future. One of the companies participating in the bidding was a Hungarian company with a high manufacturing capability and low offer price. The company saw the company as a potential partner as it was planning to expand across the rest of Europe. The company's plan was, therefore, to place the normal high volume orders to Hungary.

Implementation issues

The case company outsourced the design for manufacture and focused on IP design. But cooperation with the design agent turned out to be unworkable with a time delay of six months and significant compromise on specification. The supply chain design implemented without carrying out a proper check of the design agent proved a costly mistake and led to major delays in product development. The poor level of cooperation prevented the design agent from gaining the opportunity to be a manufacturing partner. The case company also had to take time out to find an alternative supplier. A possible win-win partner relationship ended with a loss on both sides. After becoming aware of the unsuitability of the design agent as manufacturer, the company acted quickly to choose a new manufacturer. The company having learnt a valuable lesson proactively took product design capability into account when deciding on final manufacturer. For the first trial order, and due to the delay in the product design process, the case company had to order the material in advance and deliver it to the new manufacturer in order to expedite the production process.

Case study company B summary

The case study company was a start-up SME with an innovative product. The company suffered the delays in the launch of its new product because the supply chain was not

considered strategically in advance. But the company learnt quickly from the lesson during the product prototype development process. They built up a new supply chain by proactively thinking about future product development and growth strategy. The importance of communication and relationship building with suppliers is highlighted by this case. Even though there were setbacks in the product design process, good relationships with component providers were built up during product design process.

5.3.3 Case study company C

Case Study Company C shows that without proactively thinking about the supply chain in terms of technical knowledge and capability, a SME will suffer during the implementation of growth strategy. In this case, we will also see that the importance of supply chain design is related to the need to identify suppliers with sufficient technical knowledge. If that design is poor it will impact on the cost of final product.

Company background

The case study company was a newly established innovation led company in the energy technology sector. The company developed a patented technology for combined heat and power in domestic boilers. The product was highly technical and was designed to be embedded into domestic heating appliances. The target market was the new and

replacement domestic heating appliance market with European sales of 5.5 million units per annum amounting to £8.1 Billion in 2003. The company had therefore to work closely with manufacturers of domestic heating appliances as the product was customised to fit the specification of each appliance. The product provided a clear benefit to the end-user through reduced energy cost. The product would also reduce carbon emissions and reduce electricity losses. Owing to the uniqueness of the technology employed, the company enjoyed an exclusive position where competition was low. There were also government policy and funding incentives available. Furthermore it catered for the increasing environmental awareness of the consumers. The company outsourced key component manufacture and a small number of specific components for supply to its boiler appliance manufacturing partner. The company's current activities involve product development and commercialisation through development of routes to market using European boiler manufacturers and energy utility companies.

Case study design and result

Case study design

The case was conducted mainly by participant observation and semi-structured interview, and was similar to that of case B. Another cooperative MSc project between

the case company and the University of Liverpool was already in existence. The researcher visited the company five times within three months. The researcher was accompanied by the MSC student on each visit. Each visit had an intended objective and goal. The researcher also had the chance to meet suppliers and conduct a number of informal interviews. Case company C had a longer history and more staff than case company B. In this case, the MSc student acted as a facilitator and helped the researcher collect content data.

Case study results

Report the results of interview based on questionnaire.

The report of the questionnaire is based on interviews with the supply chain manager by the researcher and from interviews between the MSc student and the business development manager and technology consultant.

Profile of the company

Company C was an innovative SME developing a compact and lightweight, all mounted microCHP appliance for the UK market. The company outsourced the manufacturing process and focused on product development.

The management team included the CEO, technical manager, business development manager, and project manager. The company shared its financial and personnel manager with its parent company. The product development team included a product development engineer and product testing engineer.

Product selection process

Since there was only one product supplied, the microCHP was selected as the product studied in this research.

Market and industry structure information

Industrial MicroCHP (Micro combined heat and power) systems generate both electricity and heat, and are widely believed to be the next generation of domestic heating appliance. It is a new technology with the aimed at saving energy and reducing carbon emissions. It is a booming market as the public has become increasingly aware of the need to save energy and protect the environment. The main factors that made the product successful were described by the interviewee as product/process innovation, market advantage (niche, competitive position, export), and statutory regulation. The barriers that could affect the growth of this product in the future were listed as: managerial/leadership capability, environmental regulation, and supply/supply chain

issues. As for the drivers behind product development, the answer was that the company tended to be a leader in product development and first to market with a new product.

The level of competition was described as low and the scope of competition was described as national. The market attractiveness for this product was described as high attractiveness for the size of the market, medium for customer profitability, and high attractiveness for the competitive nature in marketplace. The overall judgement of the market attractiveness was ranked as high. The relationship with its supplier was described as medium strategic – our supplier can cooperate with us to support change and improvement. The company thought that the supply chain could provide a vehicle for growth. The growth strategy was described as the company was currently working to bring in new customers for this product.

Dynamic capability

The case company used specialised technology to develop the product. 60% of technologies were based on in house R&D, 30% acquired from the market, and 10% through cooperation with suppliers or customers. The type of production was large batch. For the latest newly designed product, the same manufacturing process using the same materials was employed. For its manufacture, staffs needed general skills training. The majority of the designs were completed in house, with the rest outsourced to

suppliers. The company had a well-managed and structured product design process.

Supply chain management and product design management could, however, provide a barrier to success for this product. As regards the possible compromise between product feature and company capability, the company's capability matched the original proposed product feature. The case company considered relationship building with suppliers during the product design and production process. It did not benefit from its main partners' capability.

Supply chain issues

The general strategy of the case company when choose suppliers was based on product design, responsiveness, and delivery time. The suppliers' relationship with the case company was described as medium trust, medium commitment, high cost transparency, high communication, medium dependence, and medium information share. The case company thought that working with suppliers helped them achieve improvements in the design of the product. The current supplier selection criteria answered in terms of importance were: consultation for better approach to design product; technology transfer; cost; earlier involvement in product design; flexibility. Since the company had completed the product design, a new supply chain strategy was needed with priorities of cost, delivery, flexibility, and technical support.

The data from the supplier perspective with meeting with suppliers

The researcher attended a meeting of the case company with its key suppliers and had the chance to conduct an informal interview with representatives of the suppliers. The results of the interview highlighted two main issues communication and earlier involvement. The suppliers emphasized that communications with suppliers were crucial for successful cooperation. Communication between all levels of staff and all aspects of production from purchase order, technical specification, to product design and business strategy should be well planned and executed. The supplier thought they did very well and expected the case company to be more open to the communication. The supplier often invited the customer to attend its technical workshop to see the new components and technology from the suppliers' point of view. However, from conversations held, the researcher felt that in the case company its relationships with suppliers relied heavily on personal relationships. They emphasized the importance of personal contacts for their business several times during the conversation. It may be related to SME company culture.

Another concern related to supplier involvement in product design. The supplier thought it a pity that their involvement in product design occurred late in the day and only after the case company had met difficulties in its product design. The timing of the

involvement was crucial for product design considering its cost and time cycle. If the timing was wrong, the company could not adapt any better solution proposed by suppliers considering the cost of changing the product prototype.

Analysis of growth strategy, market, product design, supply chain design, and implementation issues in the company

In this section, the data collected from various sources in the case company are analyzed and the interrelationships among growth strategy, market, product design, supply chain design, and implementation issues investigated.

Growth strategy

The case company created its growth opportunities by focusing on producing a robustly engineered product with low technological risk. The target market was for new purchase and replacement of traditional domestic heating appliances. Market surveys suggested a flourishing potential. The European micro-CHP market was predicted to be worth £1.5 billion per annum by 2010. The Society of British Gas Industry predicated that the UK market for domestic CHP could reach 540,000 units per annum by 2015.

The growth strategy for the case company was planned as two stage process. In the first stage, the company launched the product with the help of its core cooperative partner,

one of the Europe's leading boiler producers. It would be a market education process, and would provide a good example for other boiler producers to follow. For this stage, the product design would focus on the specific design for the cooperative partner. The second stage was to expand the number of cooperative partners to include other boiler producers. With a successful launch, the company would be able to demonstrate the value of the product to the boiler industry. At this stage, the product design would focus on how to customise it so it could be produced by many different boiler manufacturers. It was also a strategic issue that a physical supply chain to satisfy the anticipated expansion in demand had to be built up first.

Although the original growth strategy seemed good from the case company's point of view, the actual performance of the case company fell well short of its own expectations. The reality was that the market launch time took place two years behind the original target date set by the company. The company was struggling for the product to kick-off. There were three major challenges, which became the obstacles to growth.

- High technology cost;
- High assembly cost;
- Slow response and low flexibility from the supply chain

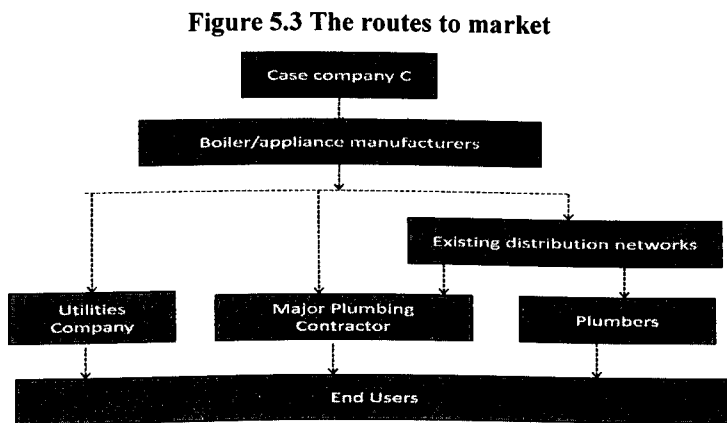
The main reasons for the slow implementation came from an inability to build up a suitable physical supply chain and from problems in product design. The two aspects were interrelated. Since there was no proactive thinking about the supply chain design during the product design process, then the product design could not benefit from any contribution by the supplier. It also took a long time to build up a supply chain. The product design also failed to consider its manufacture and this caused the high manufacturing cost. The high manufacturing cost increased the difficulty in setting up and managing the supply chain.

Market/industry structure

The market potential was quite promising. Under increasing pressure from environmental activists and the government, emphasis turned towards green policies that promoted energy-saving and reductions in carbon emissions. These policies forced energy related companies to think of new ways to achieve them. New ideas and new technologies began to flood the market as interested parties attempted to capture a slice of what was becoming a large and lucrative market. The case company was just one such example of these newly established firms.

The routes to market

The case company chose to cooperate with a boiler company to gain entry into the market. To leverage customers' resources and reduce barriers to the adoption of new technology, the company took advantage of existing customer channels to enter the market. Thus, the boiler manufacturer and energy utilities companies became major targets since they had broad networks that allowed access to end consumers. The routes to market (Figure 5.3) developed by the company helped it shorten the entire supply chain and set them closer to customers.



Source: Company Data

Market challenges

Setting a price that was satisfactory for consumers and at the same time acceptable by the boiler company was the biggest challenge. The boiler company wanted to add extra features to the boiler without significantly increasing the price to consumers. However,

the cost of the micro-CHP to the case company was high. The high price came about for two major reasons - the expensive cost of technology and the high cost of assembly.

In terms of the cost of technology the energy-saving market was under strict regulation and control as a result of government policy. In order to meet the regulatory demand, investment in technology had to satisfy a number of criteria. These were:

- Meet the government environmental requirement to keep environment sustainable;
- Reliability requirements: system had to be safe;
- It was a totally new technology. There were no benchmarks in existence and further cost may be incurred as environmental/government policy evolved.

The second reason was the high assembly cost. This was greater than expected due to a number of factors:

First, there was little consideration in regards of its manufacture or assembly when the product was designed. The original priority was reliability whilst meeting technology requirements so that it could be brought to the market as early as possible. Inevitably the production cost became an issue during the manufacturing process.

Second, the product was a labour intensive. The outsourcing strategy heavily influenced cost.

Finally, there were no benchmarks due to the newness of the technology and product.

So even though the company had identified the lowest cost that cost was still too high to allow the boiler company to integrate it into their boilers except in the case of a very limited number of products. This is the reason why the boiler manufacturing company held a cautious attitude and did not rush to adopt it across their product line.

In this case, high market attractiveness conflicted with the capability of the company to manage cost. The company had the chance to reduce price by leveraging the capability of suppliers. However, the poor performance of the supply chain management eliminated that possibility.

Product design

As an innovative company, the product was technology driven and technically complex. The product, referred to as micro-CHP (Combined heat and Power), generated both heat and electrical power, which was the basis of the next generation of domestic heating appliance. It catered to the increasing energy-saving requirements of energy utility companies and the government.

The design process

The company did not manufacture or assemble the modular product but designed the key components and outsourced them to external suppliers. The customer (the boiler company) bought the manufactured components and assembled them according to the design of the case company. The product was flexible as the boiler company could decide by itself the internal layout of the boiler. The product was then designed to fit into it alongside the other boiler components. If the boiler manufacturer was not capable of assembling the components, they could purchase the integrated parts from the case company or from a designated supplier.

So the key design task for the case company was how to employ the least components to achieve the desired technology gain and how to integrate them into the assembly of the boiler.

The product development process was an iterative process due to the novelty of the technology and its high performance requirement. The general policy adopted by the company in product design was to focus on functionality and reliability. While this was a correct decision in view of the novelty of the technology used, it was taken at the expense of minimising cost and increasing manufacturability. The company took for granted that they could reduce material and manufacturing costs by building up a

suitable supply chain. However, by passively thinking of supply chain it created huge problems in implementation of growth strategy

At the interview, the company claimed that product modularisation characteristics enabled the micro-CHP to be integrated into most boilers. However, this was far from true. The ideal product should have been small enough to be accommodated into the boiler box and simple enough to be assembled whilst the other modules were assembled. The actual prototype design put on-view in the show-room was about half the size of the boiler itself. It turned out to be the key reason why the micro-CHP could not be widely adopted by the boiler company.

From a breakdown of costs, it was found that pipe and metal work accounted for 45% of the total product cost. But pipe and metal work was not the selling point of the product. It was not the expertise of the case company to design the pipe and metal work. If the company could find a design partner, that had the necessary expertise in such work, then it would be a totally different story.

In this case, the case company had not thought in advance of how it could leverage the suppliers' capability to compensate for the weakness in its own capabilities. Proactively thinking about and involving the supplier in product design would take time and might distract the design team. However it would save time for the implementation of growth

strategy. The reason was obvious in this case. A growth strategy without support from the supply chain would never achieve its planned targets.

Supply chain design

The supply chain of the case company was controlled and managed by the parent company, which owned three similar technology companies. There was no separate supply or procurement function in any of the sub-companies. It was an efficient model for the parent company as a synchronized supply chain under the central control of the parent company could result in low operational cost and high efficiency. This was especially so for newly set-up company, as it could benefit from rapid access to resources and a supply base with lower administration cost. Meanwhile the combined demand of the three sub-companies increased the company's negotiating power with suppliers.

Although in theory the case company could build up an ideal supply chain, it was in practice difficult to achieve. From interview and from observation, the case company did not have a short or long-term supply chain strategy. The supply chain manager was only involved in procurement and lacked the ability when it came to supply chain strategy. The company did not consider properly the question of how to cope with the high volume of demand and future market requirements. They took it for granted that

the supply chain would evolve smoothly. The lack of a clear proactive operational strategy meant that the case company had no specific guidance or measures in place for managing suppliers and building a supply chain capability. A sustainable supply chain could not be built up easily in a short time. The case company was under the false impression that there was sufficient time after prototyping to engage suppliers and meet the anticipated demand. The technical difficulties they faced eroded any slack time they had planned for.

As for its relationship with its suppliers, the case company experienced reduced level of control. Suppliers with stronger power dominated the process at both a business negotiation level and in provision of technical support. The result was that the case company could not control costs, technology or upstream suppliers.

As an example, one of the components, called a PCBA, was designed by the supplier according to the requirement of the case company. Apart from the software used, the case company had no intellectual property rights over the PCBA. For any changes and new technology requirements it had to rely on the supplier. Since the supplier benefited from its dominant position, it was reluctant to carry out any changes to the component. The supplier was obviously taking advantage. Even if there was a large demand for this component, the price would still be high. As regards the lead time for this component, it

was also much longer because the supplier needed to appraise the benefits of each order before any manufacture took place. This was only one example. Similar situations existed in its relationship with other suppliers because of the bespoke nature of some of the components.

Implementation issues

The issue about implementation in this case was how to build up a partnership supply chain and evolve it. From the market side, the product was very attractive for the company. The route to market was quite accessible with the established relationship with boiler's company and utility company. However, how to design the product so that it could be easily integrated into another company's boiler became a big problem. This obstacle made the company to be stuck in the period of trial order period too long and far from the massive production scale. The design team was struggling with reducing the size of the key component and design the smart layout of prop component. These were key points for boiler companies to massive integrated into all range of product lines. The high cost of the finished product also was a big problem facing the company. The actual cost was up to three times that expected. As for the supply chain issue, the case company needed to build up a reliable and sustainable relationship with its suppliers.

Case company C summary

The case company could not fulfil its growth strategy due to its poor performance in supply chain design and supply chain management. As a company offering new and innovative technology, it is very strange that the majority of the cost went on accessory parts needed to support the new technology element. The company did not proactively think about how to complement its capability by leveraging supplier expertise. As a result, they had to face high products cost due to its poor product design. A lack of short and long-term supply chain and operational strategies to meet high volume demand and market requirements forced the company to spend time catching up with the time schedule defined by the growth strategy. Poor relationships management in the supply chain made them lose their power to negotiate with key suppliers.

The case shows us that how important it is to simultaneously think about product design strategy and supply chain design strategy in order to achieve an effective implementation of growth strategy.

5.4 Cross comparison study

In this section, a cross comparison case analysis is presented. The cross comparison analysis is considered from five perspectives: growth strategy; market/industry structure; product design; supply chain design; and implementation. Each of these will be investigated in turn. This will be done to identify similarities/differences and will allow us to extract the key elements needed to build the practical framework that is described late in this thesis.

Growth strategy

The growth strategies of the three case study companies were quite different and due largely to the fact that each company was at a different stage in its growth trajectory.

Case company A was a SME that had been in existence for some time and was growing to maturity after years of development.

Case company B was a new set-up company that was about to launch their new product and create what would hopefully be a new market.

Case company C was a new company having to re-launch its product after an unsuccessful launch two years previously. It too hoped to create a new market.

The key points of their growth strategies are presented in table 5.4

Table 5.4 the growth strategy of the three case companies

Case company	Growth strategy
A	<ul style="list-style-type: none"> ● Growth opportunities come from the market ● Reactive to growth opportunities ● Targeting of new customers in existing markets
B	<ul style="list-style-type: none"> ● Creating growth opportunities through innovation ● High market risks with new product aimed at a new market ● Targeting new markets by providing new products
C	<ul style="list-style-type: none"> ● Innovation in supplying a new product to a new market ● High market risk with a new product aimed at new market ● Re-launching the product with iterative product design ● Target the new market with a modified product

Although the three case companies had different growth strategies and different market scenarios, all of them met with problems in the supply chain. These held up or impeded the implementation of growth strategy. In case A the company did not pay enough attention to supply chain strategy and relationship building, and as a result was always troubled by quality and delivery problems due to a lack of loyalty from its suppliers. Case company learnt quickly about strategically involving the supply chain in the product design process and began to gain its benefits. These came from the contribution of its new supply chain partner's product design capability. The company in case C designed the product without thought for the manufacturing and cost and thought that a reactive supply chain based on the designed product could easily be built up. The company then had to suffer a long delay in its product launch and persistent high manufacturing costs, even though they tried hard to build up a relationship with the

supplier. The reason was simple the design product prototype had been created without advance consideration of the supply chain. This dictated the high cost.

Market/Industry structure

All three cases involved were technology-led companies. The company in case A was in a moderately competitive environment. As a market-follower, it was reactive to the market and its competitors. Company B and C were new setup companies aiming to compete in new markets. The key points are presented in table 5.6

Table 5.5 Market/industry structure for the three cases

Case No	Market / industry structure
A	<ul style="list-style-type: none"> ● Limited competition. Only a handful of competitors located in Europe, USA, and the Far East ● Growth opportunities from new industry sectors ● Market follower, reactive to market requirements and competitor behaviour
B	<ul style="list-style-type: none"> ● First to the market ● Secured support from environmental agencies ● Three routes to the consumer: utility companies, direct marketing, and through retailers
C	<ul style="list-style-type: none"> ● First to market ● Booming energy-saving market with environmental concerns ● Entry to market via existing customer channels (power utilities and heating appliance producers)

From all three cases, no matter whether market follower or first to market, they all had to align themselves with their supplier partners in order to react to market change or to create new markets. However, different market and industrial structures need different supply chain architectures. The company in case A needed a reliable and committed

supply chain. The companies in cases B and C needed more innovative and responsive supply chains. Although there was no evidence that a new market had been created through cooperation with their suppliers, each of the managers interviewed believed that it was possible if their relationship with suppliers was strong enough.

Product design

The product design process in the three cases varied. For company A, there was no involvement of the supplier in the product design process. Company B learnt a valuable lesson from its previous cooperation experience with its design agent and paid more attention to the role of the supplier in the product design process. For company C, product design was a disaster due to poor supply chain management.

Table 5.6 Product design for the three case studies

Case No	Product design
A	<ul style="list-style-type: none"> ● Opportunities for product redesign along a modular structure to reduce variety caused by product customisation ● Limited input from suppliers ● Under-resourced R&D function
B	<ul style="list-style-type: none"> ● Commercialise (domestic version) design in house ● IPR centred ● Potential changes needed for new market with IPR implication ● Actively involve suppliers in the product design process and gain its benefit through the manufacturing process
C	<ul style="list-style-type: none"> ● Design and produce IP ● Product configuration and size is highly dependent on customer requirement ● Outsourcing production & delegating assembly ● Future need for volume & components mass production and logistics during product design and sourcing stages ● Changes in design have implications for product cost and manufacturability

From the three cases studied in this research, we see that it is inevitable that SMEs will meet problems if they do not think about supply chain issues in advance and do not involve the supply chain members in product development process.

Supply chain design

In each company studied, supply chain design was treated differently. The emphasis in case company A focused on quality, responsiveness and delivery time. The emphasis in case company B focused on price, product and capability. The company in case C had no clear focus. As a result, it suffered a lot setback from the supply chain perspective.

Table 5.7 Supply chain design for the three case studies

Case No	Supply Chain design
A	<ul style="list-style-type: none"> ● Criteria for choosing supplier: quality, responsiveness, and delivery time ● Had recently reduced its supplier base from over 100 to around 30 ● The relationship with its suppliers was based on high trust, high commitment and high cost transparency
B	<ul style="list-style-type: none"> ● All components and assembly outsourced ● Supplier in three categories: replaceable standard component manufacturers; be spoke sub-assemblies and casting: assembly ● The supply chain operation was outsourced ● Selection criteria: manufacturing capability, managing after sales support, flexibility in scale of production.
C	<ul style="list-style-type: none"> ● Raw material and components are main factor in product cost ● Criteria for supply chain design: technical support capability, responsiveness and flexibility future priorities ● Poor supply chain design during product development: single supply source, long lead time and poorly performing supplier ● Lack of power over the partner suppliers ● Was forced to sacrifice some intellectual property ownership in order to its maintain relationship with key suppliers

From the three cases studied in this research, we show that supply chain design should be considered proactively and should be connected to product design and growth strategy. A reaction-based supply chain design would lead SMEs to a longer product design process and less implementable growth strategy.

Implementation issues

All three companies studied in this research suffered setbacks coming from the supply chain. The setbacks made the case companies take a longer time to achieve their growth strategy.

Table 5.8 Implementation issues for the three case studies

Case No	Product design
A	<ul style="list-style-type: none"> ● Non-conformance of components and unreliable delivery times of suppliers caused obstacles to the company's growth ● High level of customisation resulted in inefficiencies in the manufacture and assembly of each unit ● Closer relationships with suppliers and involving them more in the product design process will open opportunities for a new range of product to be developed
B	<ul style="list-style-type: none"> ● Outsourced "design for manufacture" ● Poor investigation of the competence of its supplier proved a costly mistakes leading to major delays in product development ● After the first production model was completed an alternative supplier was used ● The company had to take over the role of managing the chain, with responsibility for monitoring and dealing with quality issues arising
C	<ul style="list-style-type: none"> ● Final cost up to three times more than expected ● Long delays in the product launch (2 year) ● Losing IP to component designing partner (PCB) ● Risk to the implementation of growth strategy is real and high

From the three cases studied in this research, we show that the majority of implementation issues were caused by the supply chain perspective. Implementation issues not only affected the new product development, but also made SMEs a long time to achieve their growth targets.

CHAPTER SIX

THE MINI-SURVEY AND SEMI-STRUCTURED INTERVIEW

6.1 INTRODUCTION

This chapter provides results from the mini-survey and the semi-structured interviews. These were conducted in order to extract first hand data from practitioners. The design of the survey questionnaire, selection of SME companies to be surveyed, and the tools and techniques used in the data analysis are described. There are two main aims of the mini-survey. First, it is designed to investigate the views of practitioners. When they consider growth strategy what role does the supply chain play. Second, it provides the means by which suitable companies for the semi-structured interview can be selected. Based on the responses of the surveyed companies, five companies were selected for semi-structured interview in order to achieve a more detailed understanding. The five interviews put the results of the survey into context and provided the background behind survey answers. They provided a “richer” understanding of what practitioners thought about the supply chain and what they did at an operational level. The structured

interviews also enabled the researcher to expose any discrepancies or misunderstandings that could emerge.

6.2 THE DESIGN OF MINI-SURVEY

The research results from the in-depth case studies provided the key elements on which to construct the research. But the results needed further support of broader evidence due to the limitations in the case studies. The research needed to make clear that the “disconnected” thinking evident in these three case studies is a general misconception among all SME’s.

The researcher is able to use this survey to validate findings reported in the literature. If the survey results are found to be in disagreement with the literature, the researcher is required to carry out further survey and investigation work. If the results are in line with the existing literature, the researcher can use this survey to find suitable companies to undergo the semi-structured interviews. This is the main function of the mini-survey.

A postal questionnaire was sent to 120 manufacturing SMEs in the Northwest of England. It had the following aims:

- Looking for the discontinuity in thinking between growth strategy and supply chain influence at a broader level;

- Investigating the attitude of practitioners to the key findings of the research:

6.2.1 Design of the questionnaire

In order to obtain the information required, the questionnaire was arranged into three sections:

In the first section the company's profile was investigated. It contained questions about the company's organisational characteristics such as sector, market size, number of products launched in the last year and the number of supplier.

Section 2 concerned strategy and growth. There were two questions in this section. The first one concerned the growth trajectory of the company over the previous three years and was based on product and market growth. The second question asked respondents to identify the main obstacles in the supply chain that affected implementation of growth strategy. The options available as of answers were based on the conclusions drawn from the case study and from relevant literatures.

Finally, section 3 concerned suppliers/supply chain issues.

There were seven questions in this section covering involvement of suppliers, supply chain design strategy, the benefits arising through the cooperation with suppliers, and the impact on growth strategy from proactively considering the supply chain.

A copy of the questionnaire is included in Appendix B

6.2.2 Conducting the questionnaire survey

Since it was not a quantitative survey, the survey sample companies were limited to 120 in total. A majority of the companies were extracted from the Agility Centre database held at the University of Liverpool. The remainder were the result of internet searching.

There were 20 responses received, of which 19 were valid. Considering its qualitative nature, this sample size was considered as satisfactory sample for the purpose of this research.

6.2.3 Data analysis tools and methods

Considering that there were 10 questions on the questionnaire and only 19 responses.

Possible, Microsoft Word and Excel could be used to analyze the data.

6.3 The findings of the mini-survey

In this section, the findings of the mini-survey are presented.

Company profile:

Table 6.1 Company profile

Company No.	Sectors	No of products launched in the previous year
1	Cleaning facility for printing	4
2	Speciality lamp capping cements for the lighting industry	2
3	Mechanical and electrical engineering	Bespoke
4	Window and door manufacturing and installation	Bespoke
5	Innovative skip lighting	0
6	Earthmoving machinery	0
7	Industrial temperature measurement and control	2
8	Packing machinery	1
9	Industrial pumps equipment	5
10	Sheet metal work	1
11	Industrial pump equipment	0
12	Advanced composite design and manufacture	5
13	Industrial weighing control systems	1
14	Mechanical engineering	Bespoke
15	Steel fabrication	Bespoke
16	Conveying and handling equipment	Bespoke
17	Instrumentation equipment	2
18	Mechanical engineering	2
19	Machine manufacturing	1

The companies that responded were all manufacturing SMEs. 80% companies had launched at least one new product in the previous year. Each company had more than 10 suppliers to manage.

Strategy and Growth

Question Number 1:

As a percentage of your planned target growth, where did the sources of growth come from?

For this question, 55% of the companies indicated that their growth was due to market expansion or product development. Due to the economic downturn 30% of the companies did not grow at all and 15% companies indicated that it had declined over the past three years.

Question number 2 was:

Rank from the list below those main supply chain obstacles that affected the implementation of your growth strategy? (highest=1)

Capability of existing suppliers	<input type="checkbox"/>	Reliability of new suppliers	<input type="checkbox"/>
Availability of new suppliers	<input type="checkbox"/>	Trust with new suppliers	<input type="checkbox"/>
Other (please specify)	<input type="checkbox"/>	_____	

In terms of the supply chain obstacles that affected the implementation of growth strategy, all the four options (capability of existing suppliers, reliability of new suppliers, availability of new suppliers, trust with new suppliers) were mentioned with different levels of emphasis. Practitioners also added other factors such as the capability to manage the supply chain.

Capability of existing suppliers was ranked as the number 1 reason with 50% of respondents selecting it

Reliability of new suppliers was ranked at the number 2 with 40% of respondents selecting it..

Availability of new suppliers was ranked the least important obstacles to the implementation of the growth strategy. Only 30% of respondents selected this choice.

Based on these results, it is clear that those practitioners do not think about the supply chain proactively as they only reacted to existing supplier performance instead of thinking of supply chain issues strategically. The availability of new suppliers was considered the least important. Consequently this attitude meant that they often did not react quickly enough to falling supplier performance. Frequently their response came too late.

Section three supplier/supply chain issues

Question 3 is addressed the involvement of the supplier in the product design process by asking:

How often and to what extent have you involved your key suppliers in:

	How often				Extent of involvement			
	Never	Rare	Often	Always	None	Limited	Major	Total
Product design process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business and strategy planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In terms of key supplier involvement in the production design process 45% of respondents chose the answer “often” or “always”. As for the extent of involvement, 70% of response chose “limited”.

For the questions regarding supplier involvement in marketing planning and business and strategy planning, 90% of respondents chose the answer “never”.

The answers to this question indicate that involvement of suppliers in product design has to some extent been accepted by SMEs. But involving suppliers in the broader horizon of business planning was not considered necessary by most of them.

Question 4 is:

To what extent does the capability of suppliers is a consideration when you are planning new product features?

None Minor Medium Major Crucial

The answers indicated that practitioners in SMEs had an inclination to think of supply chain issues proactively for product development as 70% of respondents answered medium, major or crucial.

Question 5 was:

What is the percentage of suppliers, which have been changed (discarded or replaced), and please rank the reasons for changing the suppliers (Highest=1)

None <5% 5%--20% 20%--50% >50%

Rank the reasons:

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Capability/capacity of current suppliers |
| <input type="checkbox"/> | Technology available to current suppliers does not meet new requirement |
| <input type="checkbox"/> | Level of trust of current suppliers does not sustain a high level of collaboration |
| <input type="checkbox"/> | Current suppliers could not meet the future strategic needs |
| <input type="checkbox"/> | New partnership suppliers are needed in order to grow |
| <input type="checkbox"/> | (other) _____ |

Around 45% of respondents chose <5% and another 45% of respondents chose 5%-20%.

The answer indicates that SMEs retain stable supply chains.

In terms of the reasons for changing supplier, “capability/capacity of current supplier” was ranked first at 35%. It was surprising that 25% of respondents chose the option

“current suppliers could not meet the future strategic needs”. This option indicates that practitioners in SMEs had begun to think the supply chain strategically.

Question 6 was:

What benefits to your market position have you gained as a result of working with suppliers?

Please rank them if more than one answer. (1=Highest)

- | | |
|--------------------------|---|
| <input type="checkbox"/> | Opening up new marketplace |
| <input type="checkbox"/> | Rapid responding to market opportunities |
| <input type="checkbox"/> | Sharing market risks |
| <input type="checkbox"/> | Stronger position to compete with competitors |

Around 50% of respondents chose the answer: “rapidly responding to market opportunities” and 35% of respondents chose the answer “stronger position to compete with competitors”.

From the answers given, rapid response to market opportunities and being able to compete with competitors were ranked as key benefits. The results indicate that the supply chain can allow SMEs to quickly respond to market changes and enhance the competitive advantage.

Question 7 was:

How did working with your supplier impact on your internal capabilities to meet customer needs?

Please rank them if more than one answer. (1=highest)

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Introducing new technology/knowledge |
| <input type="checkbox"/> | Improving design and innovation capabilities |
| <input type="checkbox"/> | Opening up a new product range |
| <input type="checkbox"/> | Complementing company’s manufacturing capabilities |

Around 45% of respondents chose the answer: “complementing company’s manufacturing capability” and 30% of respondents chose the answer: “opening up a new product range”

The answer showed that complementing the company’s manufacturing capability and being able to open up new product ranges were ranked as key benefits gained from the supply chain. The results indicate that the SMEs had the perception that they could leverage the capabilities of suppliers to enhance their own capabilities.

Question 8 was:

If you had known the current supply chain situation in advance, would have selected a different growth strategy in past three years? *(please refer to question 1)*

- | | | | |
|---------|---|--|--------------------------|
| | Yes | | No |
| Product | <input type="checkbox"/> <u>(Specify)</u> _____ | | <input type="checkbox"/> |
| Market | <input type="checkbox"/> <u>(specify)</u> _____ | | <input type="checkbox"/> |

This provided a surprising result when compared with the results of previous research.

In this survey, only two respondents answered “Yes. It showed that practitioners did not

realize that the supply chain could contribute to growth strategy in advance. However, from other questions in this survey, most of the respondent company's had met with supply chain problems. These had impeded the implementation of growth strategy. It shows the disconnection between what SMEs think about the supply chain and what they face operating it.

Question 9 was:

What benefits would you expect if, at an early stage, your growth strategy was to consider the impact of the supply chain?

	None	Minor	Medium	Major	Crucial
Cost/Investment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smooth implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market visibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Higher market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better margins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In this question, there were 8 benefits to choose. The results from this survey are presented below:

Cost/investment: 28% of respondents chose medium whilst 44% chose major.

Speed: 50% of respondents chose medium whilst 40% of response chose major.

Smooth implementation: 50% of respondents chose medium whilst 40% chose major.

Flexibility: 28% of respondents chose medium whilst 28% chose major

Market visibility: 40% of respondents chose minor whilst 40% chose medium

Better product: 40% of respondents chose medium whilst 45% chose major

Higher market share: 35% of respondents chose minor whilst 35% chose major

Better margins: 40% of respondents chose medium whilst 28% chose crucial.

From this question, it is apparent that practitioners can benefit all aspects if the supply chain is considered in advance of strategy formulation. “Smooth implementation” and “speed” of the growth strategy were ranked as the two most important. These results positively supported the key point of the research that proactively thinking of the supply chain facilitates a growth strategy. That can be implemented smoothly and swiftly.

Conclusions from the mini-survey

Although there were only nine questions in the questionnaire (excluding the company profile), the results from the survey reveal that:

1. There was a disconnection between thinking about the supply chain and actually operating it.

2. Most SMEs were reacting to changes occurring during the implementation of growth strategy instead of proactively thinking about it during the formulation process in order to achieve a smooth implementation.
3. SMEs could do better if they thought about supply chain issues more strategically and proactively since they were fully aware of their benefit.

6.4 Semi-structured interviews

In order to understand the reasons behind the answers given in the survey questionnaire and to gain a broader view, 5 companies were selected for semi-structured interview from the 19 respondents. The respondents' answers to the mini-survey formed the basis for the interview. These included both the respondents' knowledge of supply chain, and their willingness to take part in the research. The interviews with each company lasted between half an hour and one hour. The key aims of the interviews were to confirm the responses from the case studies and the questionnaire/mini-survey.

Introduction of case company

By way of an introduction, table 6.2 provides a brief description of each of the 5 companies taking part in the semi-structured interviews.

Table 6.2 Brief detail of the companies chosen for semi-structured interviews

Company No.	Product/service	Key issues
1	Cleaning facility for the printing industry	Outsourcing manufacture to Taiwan without thinking about it strategically
2	Speciality lamp capping cements for lighting industry	No involvement of suppliers in product design
3	Mechanical and electrical engineering	Opened up a new product line by maintaining a good relationship with one of its suppliers
4	Window and door manufacturing and installation	Adoption of a product differentiation policy
5	Innovative skip lighting	Even one person workshop firm needs to consider the supply chain proactively

The companies chosen vary in industrial sectors and scale. All of the companies attended a workshop concerning supply chain management held at the University of Liverpool three years ago and posse substantial knowledge of supply chain management.

The key findings of the interviews

The key driver behind the interviews was to understand the reasons underlying the answers given in the mini-survey. The interviews were, in essence, a review of the questionnaire and asked why particular answers had been chosen. It also gave the researcher the chance to ask the interviewee about the key research question, which was “what is the role of the supply chain in the growth strategy”.

Strategy and Growth

Not all companies interviewed had a satisfactory growth trajectory. Two of the companies (companies 4 and 5) had suffered declines in their market share. Both companies thought that the poor economic environment was responsible. Although the two companies were very keen to maintain their market share by introducing new or improved products, they could not change the market. Company 4 mentioned that the situation had pushed it to consider introducing new products based on suggestions from its suppliers. The company had for a long time only provided one product to its customers. Acting on the suggestion of its raw material supplier, the company attempted to segment the market by providing a range of products. The company admitted that the change was forced on it by the market. Although the new strategy did not save the company from declining growth, the company thought it was a rewarding strategy since it enhanced the capability of it to cope in the market. From this example it shows that growth strategy not only increases turnover, but also the knowledge and capabilities of the company.

As for the supply chain, and in terms of how it affected implementation of growth strategy, the capability of existing suppliers was ranked as the main obstacle. According to the interviews, the real reason was the lack of proactive thinking regarding suppliers.

Company 2 provided the researcher with their experience regarding the capability of existing suppliers. The company planned to upgrade one of its products. They took it for granted that their existing supplier could provide the component specified. They thought that even if the current supplier could not provide the component, they would still be able to find alternative suppliers easily. In reality it was found that the component provided by the existing supplier was not reliable. The company delayed the launch of the new product for six months in order to seek and build up relationships with new suppliers. In this case, it seemed that the incapability of its existing supplier was the obstacle affecting implementation of the growth strategy. However, once the interviewee understood the benefits from an approach that considers supply chain issues proactively as advocated in this research, it was realized that the real reason behind the limited existing supplier's capability was a lack of proactive thinking about the supply chain. Meanwhile, they agreed that proactively thinking about the supply chain could lead to a better growth strategy.

Supplier/supply chain issues

Question 3 on the questionnaire investigated what aspects each SME involved its suppliers in and to what was the extent. The results indicated that most SMEs involved their supplier in the product design process but only to a limited extent. It was very rare

for them to consider involving their supplier in marketing planning and business and strategy planning. The interviews indicated that there were two reasons for this. The first concerned suppliers' trust. The interviewed companies were afraid that supplier would take advantage of information regarding marketing planning and business strategy planning. Even when they allowed involvement in product design, SMEs limited it as they could not fully trust their suppliers. Another obstacle was that they had no clue how to involve suppliers in market planning and business strategy planning. From this question, it appears that the foundation of supplier involvement is a matter of trust.

As regards the question on the extent of the capability of the suppliers was a consideration when the company are planning new product features, the SMEs thought it was major or crucial. The researcher asked the managing director of company 1 how they achieved this in practice since they thought it was crucial to consider the supply chain in product design. The managing director told a story about a lesson they had learnt from past experience. The company designed a new product aimed at the overseas market. During the product design process, one of the key components was outsourced to a supplier to develop. They did not consider the R&D capability of the supplier and took it for granted that the supplier would invest in the necessary R&D.

Since the R&D capability of the supplier was limited, the company had to wait for the component for an extra three months and even then they had to provide their own resources to help the supplier complete the design of the component. The managing director told the researcher that they would not have chosen the original component if they had known that the supplier was unable to develop it on time. After the design was determined, it would have been very costly to change back.

As regards the reasons for changing the suppliers, the “capability/capability of current suppliers” was ranked as the main reason. When the researcher asked the question “Does the company proactively think about the supply chain and change its supplier according to future strategy?”, only one company answered in the affirmative. Another four companies said it was too risky strategically to change key suppliers. If we link this question with a previous question about obstacles to implementation of strategy, it indicates that SMEs will inevitably meet supply chain problems and obstacles to the implementation of growth strategy if they only consider changes to the supply chain reactively after problems emerge. If they could proactively think about the supply chain and build up a supply chain strategy in advance of the growth strategy, they could reap its benefits through smoothly implementation. When the researcher asked the managing director of one of the interviewed companies what he thought about the idea of

considering the supply chain in advance instead of reactively, the answer was that he had never thought about the supply chain in such a way and agreed that it would be an effective way of thinking since the all supply chain problems would emerge.

Questions 6 and 7 investigated the benefits on market position and internal capability that can be achieved if SMEs involve suppliers in advance. The author will not repeat the result of the survey here, but presents interesting points from the interviews instead.

For the four benefits listed as options to question 6, all the companies asked the researcher to explain what was meant by option 3 “sharing market risk”. After providing examples such as JIT used in Japanese car companies, where supplier great market risk, all the companies interviewed thought it was a little bit far for them to go. They thought they could not build up such strong relationships. The suppliers were very reluctant to share any market risk. As for the benefits for the internal capability in question 7, the interviewed companies all agreed that they should try their best to level up the supplier capability to benefit their own. All of them were unsure about how to systematically achieve it strategically instead of by opportunity. They were aware of the relationships and saw trust as the foundation to realise its benefit. When the researcher asked if they ever thought they could plan for the benefit in advance and pursue a different growth strategy, the response was that they could not just base policy on a

single initiator from the supply chain and that all the benefits must be considered connecting with the market and actual situation.

The last two questions investigated the same topic (the impact of the supply chain on growth strategy) from different angles (proactively without props and reactively with props). For question 8, the answers were a little disappointing. Most of the interviewees confirmed the view they would not select a different growth strategy even if they knew the supply chain in advance. When the researcher asked the interviewee why, they responded by saying that the growth strategy should be based on the market requirement and capability of the company. They added that even if there were problems in the supply chain, they could adjust them later. However, as for the last question, when the benefits of proactively thinking about supply chain were listed as props and asked the companies to select and rank them, they ranked all the options quite high. During the interviews, the researcher asked the questions “since you were aware that the supply chain could impact the growth strategy in so many aspects (question 9), why you did not consider different growth strategies if you had knew the supply chain in advance (question 8)”. One managing director said it was very hard for him to project supply chain problems until they emerged. What he did was to quickly respond to supply chain problems and overcome them. Another managing director mentioned he knew the

benefits; but he had no clue how to positively think about and take advantage of the benefit to growth.

Conclusion of the interview

The interviews discovered the reason for the disconnection between thinking about supply chains strategically and their everyday operation. In this questionnaire, there were two kinds of questions used to ascertain the position of the supply chain in growth strategy. One kind was to ask practitioners to think of the supply chain proactively and how it could contribute to their growth strategy. Another question was to ask practitioners to think of the supply chain reactively and it could affect implementation of growth strategy. When the practitioners answered the first kind of question regarding proactively thinking about supply chains, it became obvious that practitioners did not think that supply chain issues could contribute to strategy formulation. However, when they answered the second kind of question regarding reactively thinking about the supply chain, it became clear that the supply chain was the key to implementation of the growth strategy. The interviews gave the researcher a good chance to understand what made practitioners think differently and what reasons there were behind such thinking.

There were two main findings from the semi-structured interviews. First, practitioners in SMEs did not think strategically about growth and the supply chain. They considered

the supply chain issues only at an operational level and reactively operated the supply chain according to market change. The reason for this was that the SMEs could not afford the human resources needed to deal with supply chain issues. In passing, it can be noted that these are usually part of the duties of the managing director. The drawback was that SMEs had to spend more time in coping with the supply chain in order to achieve the targets of growth strategy. The second finding of the interviews was that SMEs were very aware of the importance of supply chains at an operational level and acknowledged that they could achieve a smoother execution of growth strategy if they could handle them well. However, there was a gap in knowledge between knowing about the benefits of the supply chain and knowing how to use them proactively in strategy formulation. From the results from the interviews, SMEs practitioners appreciated the general idea of this research and expected a simple and straightforward method to help them think of supply chain strategically. The examples in the interviews not only provided the researcher with ideas on how to involve the supply chain to benefit from an implementable growth strategy, but also allowed the researcher to appreciate the importance of the research for the practitioners.

CHAPTER SEVEN

DISCUSSION OF THE CASE STUDY RESULTS AND DEVELOPING A FRAMEWORK FOR ASSESSMENT OF THE IMPACT OF THE SUPPLY CHAIN IN THE GROWTH STRATEGY OF SMES

7.1 Introduction

In this chapter the research results are presented from which an assessment framework is then developed. The framework that was briefly introduced in a general form in chapter four is developed further.

The structure of this chapter is as follows. Firstly an overview of the research is presented. In the following section we then discuss the results from empirical studies.

The key section in this chapter is to develop the structure of a tool that allows the supply chain to be integrated into growth strategy formulation. The key building blocks that are viewed from three perspectives - market, dynamic capability, and supply chain - will be elaborated in detail. Two tables to accommodate the building blocks will be developed to provide a road map that explains how the framework can be used to make decisions with respect to product features and growth strategy. Based on these tables, a practical approach emerges that can guide practitioners to proactively think of the supply chain

and construct an implementable growth strategy. The approach will guide the practitioner through prompts of “what to think” and “how to think”. A list of questions based on each perspective will act as a reference point for practitioners. Finally, the author will use one case to review the approach and show how it works.

7.2 An overview of the research

In chapter four, a review of the literature relating to the latest philosophies and theories of supply chain and strategy management led to some general ideas. The literature provided a conceptual framework that shows how the supply chain perspective can be integrated into growth strategy formulation. Following the literature review, three in-depth case studies were carried out to gain further information. What do SMEs think about when considering the relationship between the supply chain and growth strategy? A mini-survey was conducted in order to understand the thinking of SMEs in a broader fashion following the findings of the case studies. Five semi-structured interviews were conducted in order to further understand the reasons behind the survey answers. The results from the three in-depth case studies provided the data and hence the information required for implementing the ideas and development of the final practical framework. The final practical framework will help the practitioner achieve an implementable growth strategy.

7.3 Discussion of results from the empirical studies

The discussion will summarise and highlight important and relevant issues investigated.

The results from the case study, mini-survey, and semi-structured interviews will provide the ground for the practical framework developed later.

In-depth case study

As a popular research method in operations management, a case study provides the researcher a larger set of data required to assess, extend and widen the borders of understanding of research questions. They help solve the problems of “how” and “why”.

The in-depth case studies investigated the new product development process. Factors including the market, company’s dynamic capability and supply chain were investigated by comparing the original growth strategy with the later partially realized one. The case study asked the company to re-consider its growth strategy by proactively adding a supply chain perspective. The findings were that a different growth strategy could be achieved by thinking about the supply chain issues in advance. Based on current business circumstances, the new strategies could gain advantages in implementation both in terms of speed and smoothness.

The results from the three cases provided strong evidence to support the building of the framework structure. The results include:

1. Strategic priorities derived from a supply chain perspective are as important as traditional market requirement (external) and company dynamic capability (internal)
2. Proactively building partnerships with suppliers and involving them earlier in product design are crucial in achieving fast growth
3. Relationship building with partners in the supply chain can influence formulation of a growth strategy and ease its implementation

The in-depth case studies grasped factual ideas on the position of the supply chain in the formulation of growth strategy from a practical point of view and identified the main factors defining the model and relationships required to construct the final practical framework. Key themes were studied across the case study companies. Views, experiences and actions of the case companies were studied as the results are used in the construction of the practical framework.

Mini-survey and semi-structured interview

The mini-survey followed the findings of the case study and was designed to obtain further evidence. The mini-survey indicated that there was a disconnection in most SMEs between thinking about the supply chain and managing it. The SMEs were aware of the importance of the supply chain and knew the benefit from making use of it.

However, they did not, in practice, think about supply chain strategically and proactively. This made them incapable of taking advantage of supply chain contributions to the future growth strategy.

The semi-structured interviews then conducted to investigate the logic behind the answers given. The interviews showed that the disconnection occurred due to a simple fact: practitioners possessed limited knowledge and tools of how to take advantage of the supply chain in terms of market growth. They did not realise how the supply chain could contribute to the formulation of growth strategy. The examples and stories told by practitioners also helped the researcher to understand how the supply chain influenced growth strategy.

7.4 Development of the practical approach

The practical approach developed is based on a conceptual model formulating a growth strategy by triangulation of market, dynamic capability, and supply chain factors, which were introduced in chapter four (see Fig 4.2). The original conceptual framework is based on the literature review and from studying previous cases. There are only general descriptions of the procedures in the original conceptual framework. In the final developed framework, there are added stages based on the findings of the empirical work. Especially in the middle part of the framework, by introducing the attractiveness to different stakeholders from customer, company and suppliers, it provides a straightforward

concept for practitioners to understand. These attractiveness creates a platform to carry on the triangulation of the three perspectives proposed in original conceptual framework. The conceptual framework accommodates the basic building blocks from the three perspectives and provides a general path how to go through the three perspectives. However, the conceptual framework needs to be enriched in order to make it usable by adding practical and detailed questions that are understandable by practitioners. Based on data from the case studies, a series of questions from each perspective were composed. In order to differentiate the contribution of suppliers, the attractiveness in supply chain perspective is divided into “attractiveness *to* supplier” and “attractiveness *of* supplier”. In the conceptual framework, the strategic influence factors derived from each perspective ultimately determine growth strategy. In the final practical framework, a list of questions is composed to tackle each of the strategic influence factors. The detailed questions make it easier for practitioners to understand and make decisions. Two tables are created to accommodate the questions the twin viewpoints of product feature and strategic directions. The two tables will address the problems of operational level and strategic level of the growth respectively. From them, practitioners not only achieves a set of product features best fit the current situation based on market, dynamic capability, and supply chain; but also gain a vision of how a product with new features can create growth for the company.

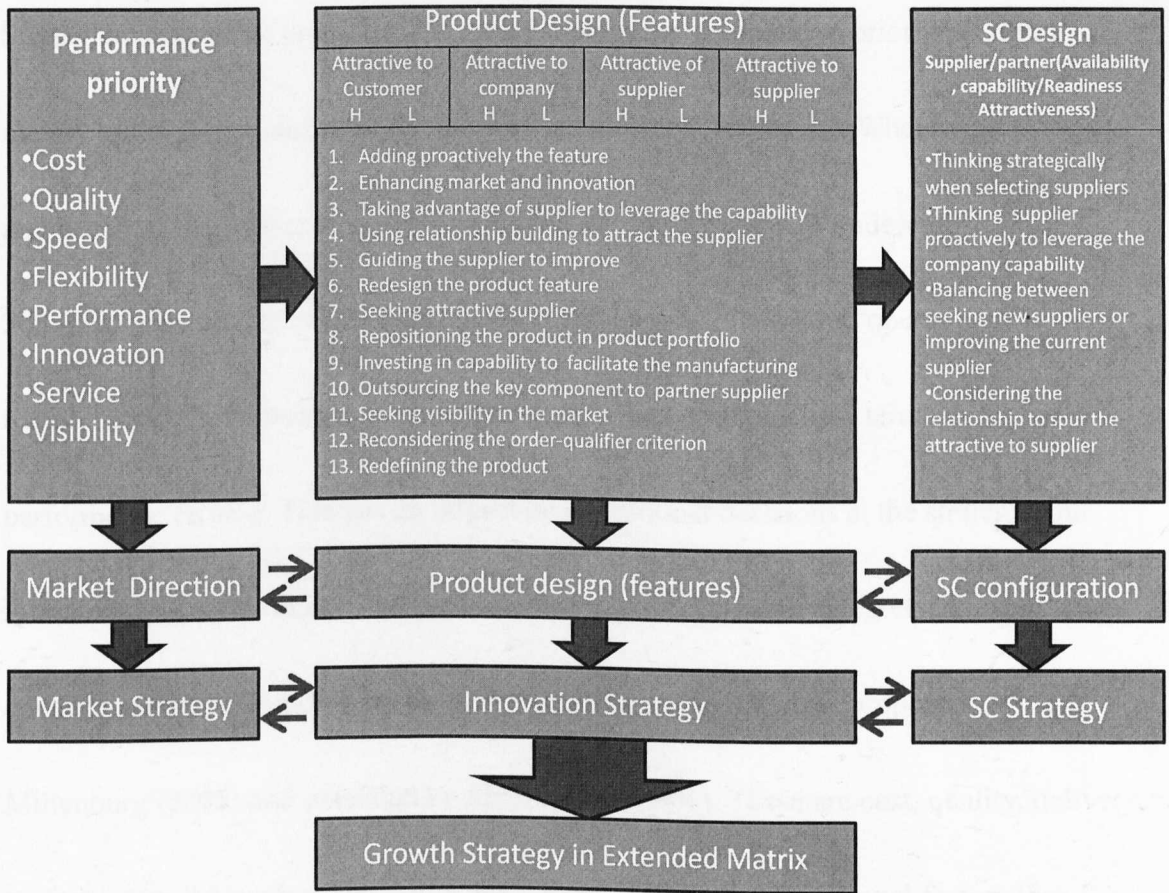
The questions composed within each perspective resulted from a combination of the literature survey and the data gained from the in-depth case studies, mini-survey, and semi-structured interviews. The product feature selection is the key platform to interact supply chain proactively with other dimensions of market and dynamic capability. The

earlier involvement of suppliers in product development is the literature foundation to create the framework. But this framework is not just focusing on the product features. How feature selection influences future growth will be intensively discussed in order to achieve an implementable growth strategy. The cooperation, collaboration, and partnership with suppliers will be key interacting points. These key points will interact with other stakeholders from market and dynamic capability. The literature and empirical findings all support that relationship building with supply chain members would be the main strategic influence from supply chain perspective. The principle underlying the selection is that the questions should be simple and straightforward for practitioners as well as more general for different SMEs.

7.5 Structure of the methodology used to involve the supply chain in growth strategy formulation

The preliminary conceptual framework was proposed in chapter 4. The result of empirical studies provided additional and more detailed information, which in turn resulted in further development and change of the conceptual framework. A modified version of the framework is shown in figure 7.2

Figure 7.1 A framework to formulate a growth strategy by proactively thinking about supply chain



Traditional strategic thinking is a top-down process with strategy at the top. In this research, the researcher put the strategy at the bottom of the framework in order to emphasize the importance of proactive thinking about supply chain. The framework composed aims to provide a simple and straightforward approach for SMEs to formulate implementable growth strategy. The philosophy behind the framework is to think of the supply chain in advance and extract its contributions and in so doing achieve an implementable growth strategy. The framework with strategy in the bottom is more suitable for SMEs.

7.5.1 Performance priorities

Strategic/competitive priorities: the term “strategic or competitive priorities” refers mainly to the firms’ choice of competitive capabilities (Hayes and Wheelwright, 1984), and becomes the reference point for aligning the supply chain (Vonderembse *et al.*, 2006). In this approach customers’ requirements are translated into operational requirements and presented as competitive priorities or in practical terms as performance criteria. This has an impact on operational decisions at the strategic and infrastructural level. In here the list of performance criteria are categorised under seven operational factors building on six manufacturing strategy factors proposed by Miltenburg (2005) and extended by Sharifi *et al* (2006). These are cost, quality, delivery, performance, innovation, flexibility and service. Other non-operational factors that could influence customer decisions are also considered at this stage. These include brand visibility and market share visibility. These factors whilst not operational in nature can be the winning criteria in a market where other forms of differentiation cannot provide a clear advantage.

Strategic priorities come from an audit of market and business environment factors. Market factors cover aspects relating to market size, levels of competition as well as market/industry structure. Business environment factors cover aspects that include

legislative, economic, social and environmental factors that impact on a company's ability to achieve its intended strategy.

From the case studies it was found that it was not only the market perspective but also the supply the supply chain perspective that dictates what the strategic priorities. The contribution of the supply chain perspective is critical. It can create a brand new market requirement, or enable the company to reach a market, which the company could not satisfy before. One example comes from the case study company B. When the market growth strategy could not be implemented as expected, the company came up with a new idea through cooperation with supplier. The design team in the company originally thought it would be a complex and time-consuming process to redirect production from its domestic customers to business and enterprise customers. During the manufacturing process, the company made use of, and developed, a collaborative partnership with the manufacturer that saw effective communication and involvement in each other's business. The technical team from the manufacturer helped the design team quickly solve the design problem and realise the product design needed for business and enterprise customers. With the new product available, the company planned to agilely change market direction by changing its performance priorities.

The findings from this research show that companies, and especially SMEs, can abstract strategic priorities from a supply chain perspective to formulate growth strategy. This not only widens the choice of growth strategies available, but also makes the chosen growth strategy more implementable. But what the strategic enablers from the supply chain perspective are, and how to decide on which growth strategy to pursue remain the two key questions to be addressed. In the following sections, the proposed model will describe how we can use the strategic growth enablers to formulate implementable growth strategy.

The visible and invisible categorization of product features

If a products feature is defined as visible to the customer, it means that any change of design makes a difference in the use of the product by the customer.

If a products feature is defined as invisible to the customer, it means that the customer is unable to recognise that features of the product have changed.

We will also add a further distinction. Product features will be classified as order-qualifier, order-winner, or order-delighter. (Hill, 1993)

For order qualifier product features no compromise space exists. The company has to deliver all the order-qualifiers in order to gain access to the market. The order-winner determines how attractive the product is and how many orders it is likely to gain. The

compromise among order-winner features will define its market share. The order-delighter adds a “wow” factor to the product and gives the customer an unexpected surprise, which could further develop the market.

7.5.2 Product feature selection by interaction of attractive from four perspectives including attractive to market, attractive to company, attractive to supplier, and attractive of supplier.

Various scenarios are investigated to show different combination of attractiveness. The building blocks will be the key factors that have to interact with each other in order to achieve a clear growth strategy vision and route.

Attractiveness to customers:

Attractiveness to customer is defined as the level of attention the company can expect from the customer given the specification and structure of the product in terms of its features. This relates to the market position and direction that the company has mapped out for the product whether in new or existing markets.

The attractiveness to customers can be classified into two kinds: **exclusive** attractiveness and **comparative** attractiveness.

Exclusive attractiveness is the attractiveness that is possessed exclusively by the company and is framed by brand, cutting-edging innovation, or unique product design.

This kind of attractiveness is hard to acquire and takes long time for competitors to achieve.

Comparative attractiveness is attractiveness possessed by the company and measures performance of the company in comparison with its competitors. This kind of attractiveness is a “me-too” feature and is easy for competitors to catch up with.

It is very important to distinguish the attractiveness into these two categories. Firstly, it helps the company to be aware of where the original source of attractiveness is coming from and whether it can be sustained. Secondly, it provides a clear picture of the product in the market through creditable reference to competitors. *“With it, the company can avoid head-to-head fierce competition in the battlefield of the “Red Ocean” and have the chance to find its own peaceful and profitable “Blue Ocean”. Blue ocean strategy challenges companies to break out of the red ocean of bloody competition by creating uncontested market space that makes competition irrelevant”* (Kim & Mauborgne, 2005).

If attractiveness to customers is an exclusive feature, the company should pay more attention to retaining it. The decision will be more strategically important for the company to consider.

If the attractiveness to customers is determined by its comparative features, the company should keep a close watch on competitors' actions and continually make adjustments to maintain its comparative advantage.

From awareness of these two kinds of attractiveness to customers, the company can make better decisions that possibly involve other perspectives of attractiveness.

After distinguishing different kinds of attractiveness to the customer, we can consider how attractiveness to customers interacts with attractiveness to the company and attractiveness against competitors.

Figure 7.2 The chart of attractiveness to customer, attractiveness to company, and attractiveness against competitors

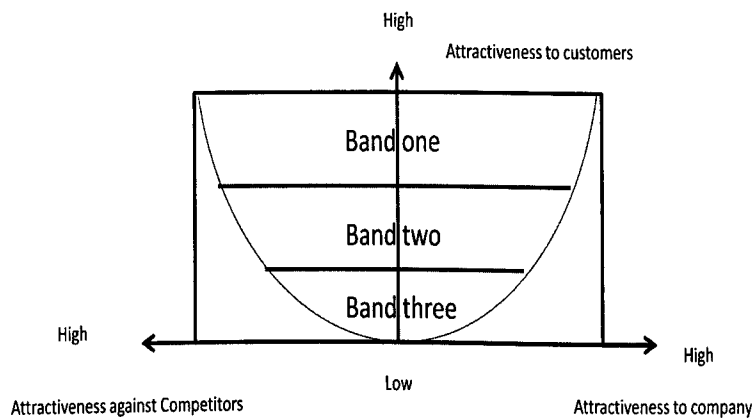


Figure 7.3 shows how the attractiveness to customer, to company, and against competitors, are related

In band one there is a high attractiveness to customers. In this band, the attractiveness to all stakeholders is high. It is an ideal product feature to develop since there is not only positive attractiveness to the customer (market guarantee), but also positive support from the capability of company to deliver the product.

If the product feature is an order-qualifier, then the feature must be retained even if the attractiveness to the company and attractiveness against competitors is medium or low.

The reason is simple that the product can not enter and stay in the market if it does not have the order-qualifier feature demanded by customers.

If the product feature is order-winner or order-delighter, there is space for the company to compromise. If the product feature is of high attractiveness to the company and less

attractiveness against competitors, it means the company should act cautiously as competition will be very intensive. The company should try to stretch the attractive to both directions (to company and against competitor). This not only delivers the product, but prevents competitors from catching up.

In the second band, there is medium attractiveness to customers. In this band, the attractive to the company and against competitors should be higher enough to stretch attractiveness to the customer. If features attractiveness to customers is medium, there will need to be further thought on how important of the features are to the company. If the features is order-qualified. Even the attractiveness to customer is medium, the company should keep the features in design. Also the company should find the proper way to deliver the product feature.

If the attractiveness to the company and against competitors is also medium, the company should re-consider its features. The feature under this circumstance is not highly attractive to the customer, and the capability of the company to deliver this feature is not strong either. So these features should be redesigned to enhance the attractiveness and allow the company to deliver and provide enough advantage to prevent competitors from catching up.

In the third band attractiveness to customer is low.

In this case, the company should consider redesign of the product to make it attractive to customer or to company.

For some product features, it is hard to decide whether the attractiveness is due to its novelty to market. In such cases the addition of features will be a strategic decision for the company to make. If the company wants to follow a more innovative strategy, it may be worth to add novelty features to tap into a new market or to give existing customers a surprise.

Attractiveness to company:

Attractiveness to the company is defined as the position of the product in the company's strategic portfolio of product design, development and introduction to market (innovation). It also takes into account the level of resources required to achieve a competitive level of product attractiveness to the consumer.

There are two aspects that need to be considered when looking at attractiveness to company. One is from the strategic point of view about the position of the product in company's product portfolio. Another is to consider how the dynamic capability and resources of the company can accommodate the product. The two aspects also affect each other. It means that the company will allocate more resources and invest more in a product with a higher strategic position. Consequently, an attractive product that

matches the company's dynamic capability will push the company to reconsider its strategic position.

Even the company's dynamic capabilities are limited to develop the product; the company should consider supplier as an important source to enhance the capabilities if the attractiveness to supplier is high. The company should proactively guide the supplier to contribute more to the development of product. By building up higher levels of cooperation with suppliers, the company is able to use them in solving problems.

These are problems that generally could not be tackled by the company alone. The company may have also outsourced key components design and manufacture to avoid heavy investment. Through partnership with suppliers, the company can quickly gain access to a technology or product. It allows it to develop a broader mix of product and services and to achieve the nimbleness required to adapt to rapidly changing market conditions. The key to successfully achieving such benefits is to maintain strong partnerships with suppliers. The high level of trust and common strategic vision will facilitate the cooperation needed to reap such benefits. Such cooperation also means that the company should think of the supply chain strategically and proactively.

If the relationship is not strong enough to support the levels of cooperation required, it will be dangerous for the company. In the case studies, one of the case companies

suffered a lot due to an unstable relationship with its key supplier. In this case, a component was designed by the supplier according to the requirements of the case company. The case company had no intellectual property right over it. As the supplier held the IP it took advantage of its dominant position. The supplier charged a high price for this component, even after the purchasing order increased substantially. The lead time for this component was also quite long. But due to the bespoke nature of this component, the company had to accept this poor state of affairs. From this example, we can see that it is very important to choose the correct partner; and relationship building is very important in sustaining high levels of cooperation.

If attractiveness to the company is high and the dynamic capability of the company is sufficient, then the company should proactively add the new features to enhance its market and keep its innovative edge. Meanwhile the company should be flexible and provide enough incentive for suppliers to build up high levels of cooperation or consider new markets to fully utilize the potential of their dynamic capability.

Attractiveness to supplier:

Attractiveness to supplier can be defined as how interested a supply chain player is in joining the particular venture the supply chain is being designed for. The interest in such case can be of any business proposition type including joint development, brand

attachment, or bringing visibility and opening new opportunities in terms of business models.

If the product feature is of high attractiveness to suppliers, the company should consider carefully how they can use it as an incentive to make the supplier contribute more to the product. Firstly the company should consider building a stronger supply chain in its attempt to support company to achieve market advantage. A strong supply chain needs a strong and high-level of strategic partnership to underpin the cooperation needed.

From a market strategy point of view, strategic partnerships can promote shared benefits among the parties and ongoing participation in one or more key strategic areas such as technology, products, and markets. From the company's point of view, organizations can work more effectively when there are a small number of important suppliers who are willing to share responsibility for the success of the products. From the supply chain point of view, suppliers participating early in the product-design process can provide more cost-effective design choices, help select the best components and technologies, and help in design assessment.

One of the examples from the case study analysis shows how suppliers can contribute to a product's features if there is enough attractiveness to the supplier. In case study two, there were problems in launching the product. However the supplier was very interested

in this project and expected a high-level of cooperation with the company. The supplier thought that it could help the company to redesign the product to allow it to target a new market aimed at commercial users such as pubs, Cafés and so on. Originally, the company had a plan to develop its commercial market after success in the domestic market. Since there were problems in the domestic market, it was an ideal opportunity if it could swiftly move into the commercial market. With active involvement of the supplier in the design of a new-generation product aimed at the commercial market, the company adjusted its strategy and put resources into new product development. This adjustment in strategy helped the company solve very pressing problems such as securing the funding from broad to do new product development even though the product launching aimed at the domestic market did not go well. Also, and through talking with the design team, they were more confident of success for the new design as a result of the involvement of the supplier.

If product features have low attractiveness to suppliers, the company should stimulate the supplier to become involved in the product development and remain in the supply chain. The company should consider redesign of invisible feature to attract suppliers.

Another possibility is that suppliers have their own problems in coping with

specification requirements. If this is the case, the company should seek new and able suppliers to replace problematic or incapable current suppliers.

Attractiveness of suppliers

Attractiveness of supplier is defined as how attractive the supplier or supply chain is to the product design and development in terms of supply chain capabilities, complementary abilities including technological as well as business model, readiness, and their ability to possibility of enhancing the product beyond the original plans. A supplier could also be attractive due to their brand visibility or market position.

If the attractiveness of suppliers is high, the company will do all it can to maintain the stability of the supply chain and enhance partnerships with suppliers through relationship building. The company should favour the requirements of its suppliers.

Meanwhile, the company could proactively add new features based on the attractiveness of the supply chain (technology, or scale) to enhance attractiveness to customers. The strong attractiveness of the supply chain perspective could not only contribute to improving the operational level of the dynamic capability, but also influence the market and key strategic area such as technology, product, and market. Corsten and Felde (2005) suggest that suppliers may contribute to firm innovation by performing R&D of their own and thus absorb some of the R&D costs the buying firm would normally incur.

Moreover, suppliers often have valuable knowledge of production that can influence another firm's performance. Finally, suppliers can suggest ideas for better products and features that enable the buying firm to enhance its products. All these contributions from a supply chain perspective could find the practical evidence from cases studies carried on this research.

The truly strategic nature of supply chain management quickly becomes apparent for participating companies since a successful supply chain is a source of competitive advantage.

The high attractiveness of suppliers could be considered more strategically; and product features could be added or changed based on the attractiveness of suppliers. One example from the case study shows evidence of the benefits available to a company from thinking strategically about the attractiveness of suppliers. In the second case study, company B was developing a brand-new product and the company needed to build up a new supply chain to manufacture it. The company decided to choose potential suppliers through a bidding process. However, one of the key factors in choosing its partner was based on product design capability (the chosen supplier had a sister company focusing on the design of components for its customer). The case company had experienced and learned from problems it had with its design in designing

the prototype. It had not only taken a longer time to design but some of the design features were compromised. As the result the company, in future, would pay more attention to its manufacturing partners and their design capabilities.

If the attractiveness of suppliers is low, the company should seek attractive suppliers.

The company could also consider alternative components that fulfil the same function of the feature if no attractive supplier is available. Also, and by using other incentive mechanisms, the company can guide the supplier to enhance its desire level if the product is highly attractive to suppliers. The company should consider carefully the balance between setting up a new supply chain and improving the current one. A proper supply chain is so important for the firm to deliver the final product. A supply chain with problems not only damages the short-term operational ability of the company, but also limits the long-term strategy of the company. The performance of key suppliers directly influences a manufacturing company's performance.

One of the case study examples shows that companies can induce suppliers to improve and build up stronger supply chains. The case company suffered from the poor performance of its supplier. There were two choices available. One was to replace the supplier; the other to improve the current supplier's performance. Although, the firm was an SME, there were very stable orders from regular customer. This point is very

attractive to their supplier. The biggest problem for the supplier was that it could not provide output at the required speed. Production could only begin after the company dispatched the order. This meant that the lead time was very long. In order to give an incentive to the supplier to keep the required level of stock, the firm decided to place orders on a quarterly rather than monthly basis. Since there was already a contract that guaranteed quantity, the supplier began to stock the component.

It is very dangerous for firms to choose suppliers only on basis of price as it will make it very difficult to achieve a high level of cooperation with them. Firms should pay more attention to building up relationships. With an increase in trust, suppliers are more likely to contribute to the firm when it is necessary. Communication is a very important method in building up this trust. One of the case studies showed that the firm always invited the supplier to attend seminars where topics ranged from market prediction to manufacturing process were discussed. With a deep understanding between supplier and firm, the actual implementation process can be swift and efficient as the supplier will have a clear picture about future developments.

It is a dynamic system where all four stake-holders interact with each other. However, they are not all of equal importance. Market attractiveness is the driving force and premier priority. A company's dynamic capability is the foundation needed to produce

the product and compete in the market. Attractiveness to the supplier is the enabler that ensures the strategy implementation is smoothly delivered. The attractiveness of suppliers is an add-on factor to enhance all other three perspectives.

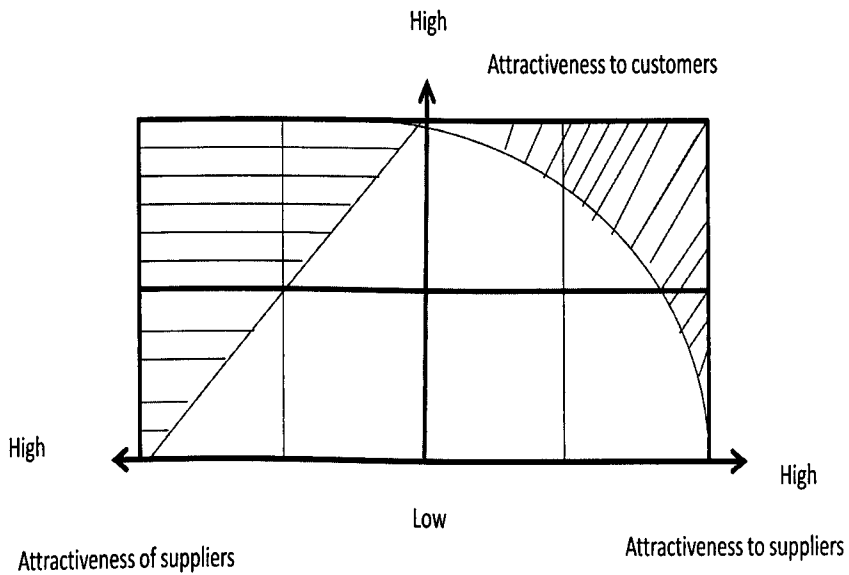
The interaction between attractiveness to the customer and attractiveness to/of supplier

If attractiveness to the customers is low, then attractiveness of suppliers should be kept high, as this will compensate for the shortfall. The company should cooperate with suppliers to enhance product features by accessing their capability.

If attractiveness to the supplier is high, the supplier has an incentive to become involved. But attractiveness to the customer should be kept high. In general speaking, the contribution of attractiveness of suppliers should always be greater than the attractiveness to suppliers.

The ideal combination of product feature between attractiveness to customers and attractiveness to/of suppliers is shown by the shadow area shown in figure 7. 4

Figure 7.3 The interaction between attractiveness to customers and attractiveness to/of suppliers



The company should keep attractiveness to customer and attractiveness to/of supplier as high as possible before they choose product features. The contributions from attractiveness to/of supplier can if needed compensate for low attractiveness to customers. However, the influence is different between attractiveness of suppliers and attractiveness to suppliers. The attractiveness of supplier can provide a bigger influence than attractiveness to suppliers.

The interaction between the attractiveness to company and attractiveness of/to suppliers

The company can seek to gain advantage from the supply chain that enhances its capabilities. If attractiveness to the company is low due to limitations in capability, then

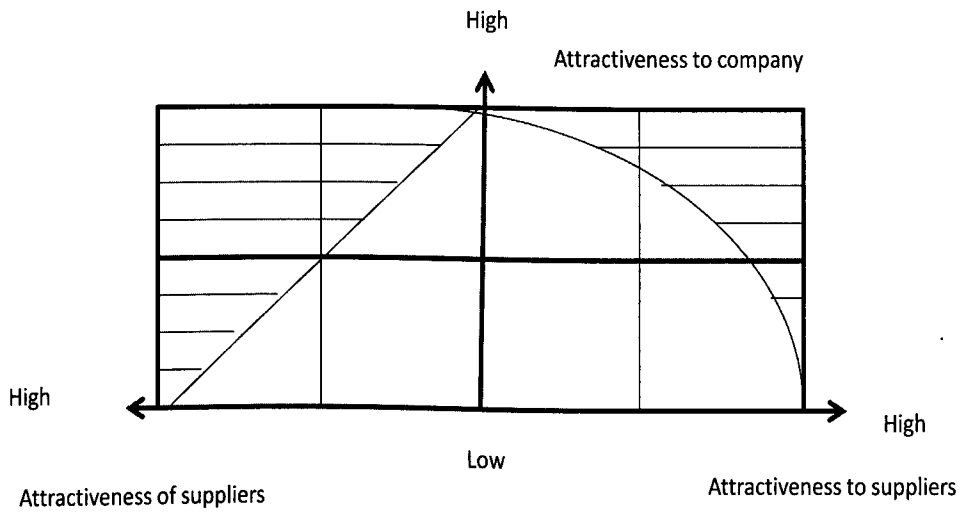
the company can cooperate with its existing suppliers to design and provide key components or outsource them to new suppliers. A necessary pre-condition is that the attractiveness of suppliers is high enough to facilitate the requirement and that the relationship with suppliers is strong enough to support high-level cooperation. The high attractiveness to the supplier can also mitigate any shortfall in company capability. But it is not as strong as the attractiveness of supplier since this indicates that the company recognises that the supplier is able to provide all that is needed.

The company should proactively think about the contributions from the supply chain when making strategic growth decisions. Such perceptions not only broaden the strategic choices available, but also make the final strategic choice more implementable.

If the company does not think of the supply chain in advance and before finalising its growth strategy, then it may face many different operational difficulties. This will make implementation of strategy difficult or mean that it takes a longer time to achieve.

The ideal combination of product feature between attractiveness to the company and attractiveness to/of supplier is the shaded area shown in figure 7.5

Figure 7.4 The interaction between attractiveness to company and attractiveness to/of supplier



Four stages in evaluating the interaction of attractiveness to the four stakeholders:

Stage one:

The procedure begins from the interaction between attractiveness to the customer and attractiveness to the company/ against competitors. In this stage, product features are determined. What to keep and what to discard are analysed.

The key questions that need to be answered are:

Is this feature an order-winner, order-qualifier, or order-delighter?

Is the feature visible or invisible to the customer?

Is the attractiveness to the customer exclusive or comparable?

Is the attractiveness to the company high enough to deliver the feature?

Is the attractiveness to the company when compared against its competitor is high enough to maintain the competitive advantage?

Stage two:

The interaction of attractiveness to customer and attractiveness to/ of suppliers

The key questions that need to be answered are:

- Is attractiveness to the supplier high enough to induce the supplier into delivering this product feature?
- Is there any potential to increase attractiveness to the supplier? If the answer is yes, can it be defined?
- Is the attractiveness of the supplier high enough? Can the supplier better deliver the product feature than the company itself?
- Is there any potential for the supplier to increase its attractiveness? If the answer is yes, can it be defined?

Stage three:

The interaction of attractiveness to company and attractiveness to/ of suppliers

The key questions that need to be answered are:

Is attractiveness to the company high enough to deliver the required product feature?

Is attractiveness to the supplier high enough so that it becomes involved in delivering this product feature?

Is attractiveness of the supplier high enough to contribute to the company's dynamic capability to better deliver this product feature?

What kind of contribution can the supplier pass on to the company? What benefits would these provide to the company?

Stage four:

Compare all the factors and make the final decision.

Based on the answers from the previous stages, the final decision is made. During these stages, various options are available for the company to choose from. At each stage, the company needs to make a decision based on its own specific circumstances. The company should also record the reasons underlying each decision, as they will impact on implementation.

During the interaction process, the key comes in determining the balance of what the market requires and what the company can efficiently deliver. As regards the capability of the company to deliver the product, it should make a further balance between how to

configure company capabilities and how to utilize the contribution from supply chain to enhance the capabilities.

Through undertaking such a procedure, the company can choose the best combination of product features on the one side and choose the market, configure company capability, and build up supply chain on the other side. The growth strategy could be clearly depicted with the implementation measures and targets. With the supporting implementation measure ready, the formulated growth strategy will be a more implementable one. That means with the involvement of supply chain perspective into the formulation of growth strategy it not only makes the strategy more realistic, but also facilitates all the implementation steps. This point is the key contribution of the research to the theory.

The sub-division of supply chain perspective into attractiveness to/of supplier will help the practitioner consider the supply chain perspective from two different viewpoints.

The two viewpoints make the decision maker aware of not only the benefit apparent from the supply chain, but also positively guiding or pushing the supply chain to contribute.

Based on the previous discussion, two tables are created that accommodate all the important questions. They provide a simple tool that practitioners can understand and

use. The first table demonstrates the decision making process required to determine product features. The second table demonstrates the decision making process required to determine growth strategy.

Table 7.1 The decision making process used to determine product features

Attractiveness to Customer	Attractiveness To Company	Attractiveness Of Supplier	Attractiveness To Supplier
<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the customer? 2. Is this feature an order-qualifier? 3. Is this feature an order-winner? 4. Is this feature visible to the customer? 5. Is the order-qualifier set by the customer or industry sector? 6. Will the feature allow the company to enter a new market? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the company? 2. Is the attractiveness exclusive or comparative? <p>If it is comparative, what is the advantage to the company when compared with its competitors?</p> <ol style="list-style-type: none"> 3. What is the advantage of company to manufacture the product such as cost-leading; technology-leading; market advantage; quick response to market requirement? 4. Can the outsourcing of this feature help the company focus on core competency? 5. Does the company need heavy investment in order to deliver the required feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness of the supplier? 2. Is the current relationship with the supplier strong enough to support the cooperation needed in order to reap the benefits of its attractiveness? 3. What kind of advantage could be gained by the company from the supplier? These include Technology, R&D contribution, borrow the knowledge, flexibility in capacity and delivery, earlier product design involvement. 4. How can the company cooperate with its supplier in order to leverage dynamic capability? 5. Can the product feature be included in the component provided by the supplier? 6. Can the company proactively enhance the feature with the strong support from the supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Are there more attractive suppliers available? 2. Does the current supplier have the potential to change and become more attractive? If the answer is yes, what the potential does it have in terms of: <ul style="list-style-type: none"> • High capacity • Design team • Technology advantage • Brand 3. Are there sufficient incentives to make the supplier change? 4. What is the current relationship with the supplier? 5. Can the company make the component in house instead of having to outsource? 6. Balancing the cost and time between seeking new suppliers and changing 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. How can the company harness the incentive coming from the attractiveness to its supplier? 3. Is there any chance for the company to consolidate the supply chain with the incentive from attractiveness to supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. What kind of incentive can be provided in order to induce the suppliers to become involved? 3. Can the company make the component in house instead of having to purchase it? <p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. How can the company harness the incentives from the attractiveness? 3. Is there any chance for the company to consolidate the supply chain with the incentive from attractiveness to supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. What kind of incentive can be provided in order to make suppliers become involved? 3. Can the company make the component in house instead of having to outsource?

<p>LOW</p> <ol style="list-style-type: none"> 1. Is this feature an order-qualifier? 2. Is this feature visible to the customer? 3. Is the order-qualifier set by the customer or by the industry sector? 4. Is the low attractiveness due to the novelty of the product? 	<p>LOW</p> <ol style="list-style-type: none"> 1. What prevents the company from manufacturing it? These include Technology, know-how, capacity, cost-efficiency, new investment? <ul style="list-style-type: none"> • Can the company invest in the capability to overcome these hurdles? • Can the company outsource the component in order to overcome these hurdles? 2. If the feature is invisible to the customer, can the company redesign the feature so that it makes the feature more attractive to the company? 3. If the feature is order-qualifier, can this feature be reconsidered under the condition of different feature combination or changed market condition? 4. What is the negative impact on the company of it drops this feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness of the supplier? 2. Is the current relationship with supplier strong enough to support the cooperation needed in order to reap the benefits of the attractiveness? 3. How can the company cooperate with supplier in order to leverage the dynamic capability? 4. Can the product feature be included in the component provided by supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Are attractive suppliers available? 2. Does the current supplier have the potential to change and become more attractive? If the answer is yes, what the potential does it have in terms of? <ul style="list-style-type: none"> • High capacity • Design team • Technology advantage • Brand 3. Are there enough incentives to make the supplier to change? 4. Balancing the cost and time between seeking new suppliers and changing current suppliers 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. How can the company harness the incentive coming from the attractiveness to its suppliers? 3. Is there any chance for the company to consolidate the supply chain with the incentive from attractiveness to supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. What kind of incentive can be provided in order to induce supplier to become involved?
<p>LOW</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. How can the company harness the incentive coming from the attractiveness to its suppliers? 3. Is there any chance for the company to consolidate the supply chain with the incentive from attractiveness to supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. What kind of incentive can be provided in order to induce supplier to become involved? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness of the supplier? R&D contribution; product design involvement; flexible in capability; unique component; cost-leading. 2. Are there enough incentives to supplier that would lead them to contribute to this feature? 3. Can the product feature be included in the component provided by the suppliers? 4. Can the involvement of suppliers increase the visibility of the product in the 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. Is the current relationship with supplier strong enough to support the cooperation needed in order to reap the benefits of the attractiveness? 3. How can the company cooperate with supplier in order to leverage the dynamic capability? 4. Can the product feature be included in the component provided by supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Are attractive suppliers available? 2. Does the current supplier have the potential to change and become more attractive? If the answer is yes, what the potential does it have in terms of? <ul style="list-style-type: none"> • High capacity • Design team • Technology advantage • Brand 3. Are there enough incentives to make the supplier to change? 4. Balancing the cost and time between seeking new suppliers and changing current suppliers 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? 2. How can the company harness the incentive coming from the attractiveness to its suppliers? 3. Is there any chance for the company to consolidate the supply chain with the incentive from attractiveness to supplier? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. What kind of incentive can be provided in order to induce supplier to become involved?

	<p>attractiveness to the customer by using marketing to enhance the visibility of the feature?</p>	<p>marketplace?</p> <p>LOW</p> <ol style="list-style-type: none"> 1. Are any attractive suppliers available? 2. How can suppliers induced to contribute more to the feature? 	<p>3. If the feature is an order-qualifier, is there any supplier attracted to this product feature?</p> <p>HIGH</p> <ol style="list-style-type: none"> 1. Can the supplier become involved in providing the component that satisfies the feature requirement? 2. If the feature is an order-qualifier, does the supplier have the intention to contribute more to this feature? <p>LOW</p> <ol style="list-style-type: none"> 1. If this feature is attractive to the company, is there any incentive the company can provide to attract suppliers? 2. Is there any supplier attracted to this product feature? 3. If the feature is an order-qualifier, is there any supplier attracted to this product feature?
	<p>LOW</p> <ol style="list-style-type: none"> 1. If this feature is order-qualifier, can the company outsource the feature to its supplier to provide the component? 2. Can the company reconsider this feature as an order-qualifier? 3. What is the downside if the company drops the feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness of the supplier? These include R&D contribution, product design involvement, flexible in capability, unique component, cost-leading. 2. Are there enough supplier incentives that would lead them to contribute to this feature? 3. Can the product feature be included in the component provided by the supplier? 4. Can the involvement of suppliers increase the visibility of the product in the marketplace? <p>LOW</p> <ol style="list-style-type: none"> 1. Are any attractive suppliers available? 2. How can suppliers induced to contribute more to the feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. Can the supplier become involved in providing the component to satisfy the feature requirement? 2. If the feature is an order-qualifier, does the supplier have the intention to contribute more to this feature? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. If the feature is an order-qualifier, is there any supplier attracted to this product feature?
	<p>HIGH</p> <ol style="list-style-type: none"> 1. Can the supplier become involved in providing the component to satisfy the feature requirement? 2. If the feature is an order-qualifier, does the supplier have the intention to contribute more to this feature? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. If the feature is an order-qualifier, is there any supplier attracted to this product feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. Can the supplier become involved in providing the component to satisfy the feature requirement? 2. If the feature is an order-qualifier, does the supplier have the intention to contribute more to this feature? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. If the feature is an order-qualifier, is there any supplier attracted to this product feature? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. Can the supplier become involved in providing the component to satisfy the feature requirement? 2. If the feature is an order-qualifier, does the supplier have the intention to contribute more to this feature? <p>LOW</p> <ol style="list-style-type: none"> 1. Is there any supplier attracted to this product feature? 2. If the feature is an order-qualifier, is there any supplier attracted to this product feature?

Table 7. 2 The decision making process required to determine growth strategy

Strategic direction	Attractiveness To Company	Attractiveness Of Supplier	Attractiveness To Supplier
<p>HIGH</p> <ol style="list-style-type: none"> 1. Is the R&D capability strong enough to develop the product? 2. Is the product development process or development team good enough to develop the product? 3. What is the level of innovation of the product? 4. What is the marketing capability of the company needed to promote the product in market? 5. What is the frequency of the product upgrade? 6. At what point in the life cycle for this innovative product are we? 7. What is the strategic position of the product in the company product portfolio? 8. What is the level of competitions for this product? <p>LOW</p> <ol style="list-style-type: none"> 1. What are the barriers that prevent the company from developing this product? 2. Is technology the key to this new product? 3. Is product design the key to this new product? 4. Is the learning curve the key to this new product? 5. Is the main component obtained from the supplier the key to this new product? 6. Is heavy investment the key to this new product? 7. Is the manufacturing process the key to this new product? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the advantage of the supplier 2. How can the supplier contribute to this product? These include Earlier involvement in product design, contributing R&D to develop the product, providing the key components to enhance product features, improving the manufacturing process through bespoke component design, increasing the market visibility by providing reputable component 3. Is the relationship with the supplier strong enough to support a high level of cooperation for this product? <p>LOW</p> <ol style="list-style-type: none"> 1. Does the low attractiveness of suppliers create bottlenecks that affect development of the product? 2. Does the supplier have the potential to improve? 3. Is there an attractive supplier available? 4. What is the best way to develop this product from the point of view of cost and time, seeking a new attractive supplier or changing current suppliers to make them more attractive? 5. What are the traits of suppliers with low attractiveness? R&D, technology, product design, unreliable relationships, flexibility in quantity and delivery 	<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the attractiveness to the supplier? These include High purchasing quantity, chance to update the component for supplier, enrich the product portfolio of supplier, set up partnership cooperation, enter a new market. 2. How can the company harness attractiveness to the supplier to benefit the new product? These include Bargain power; make the supplier more involved in the product design; transfer the R&D cost and risk to supplier; Set up a partnership cooperation; access to the design and technology capability of supplier. 3. Can the company use the high attractiveness to the supplier to provide an incentive to suppliers to build up stronger working relationships? <p>LOW</p> <ol style="list-style-type: none"> 1. What is the reason for low attractiveness to the supplier? These include: Investment in technology to catch up the new requirement, uncertain market future, unimportant customer to supplier, previous unsuccessful cooperation in new product? 2. Is there any supplier available who is interested in making this product available? 3. Is the company confident enough to set up a new supply chain to support the new product? 4. Is there any incentive available to the company that enhances attractiveness to suppliers? 5. Is the key success factor for this product connected to the supplier? 	<p>Product innovation</p>

<p>HIGH</p> <ol style="list-style-type: none"> 1. What is the market advantage to the company? 2. Is it aiming to expand market share in the current market, or to develop a brand-new market? 3. How can the company contribute the advantage in market to the new product? 4. What is the advantage to the company in comparison with its competitors? <p>LOW</p> <ol style="list-style-type: none"> 1. How can the company enhance its marketing capability to promote the product? 2. What is the competitors' situation in the market? 3. What is the low attractiveness to company? These include flexibility in quantity and delivery or high operation cost? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. Is high attractiveness of the supplier related to flexibility in quantity supplied and delivery? 2. Can the supplier satisfy the flexibility in market requirement? 3. Can the supplier satisfy the future potential product specification change? <p>LOW</p> <ol style="list-style-type: none"> 1. Is the low attractiveness of the supplier related to flexibility in quantity supplied and delivery? 2. What is the contingency plan to compensate for the shortfall in suppliers if the market fluctuates? 3. Can the company quickly find more attractive supplier to secure the requirement of flexibility? 	<p>HIGH</p> <ol style="list-style-type: none"> 1. Can the company take advantage of the high attractiveness to the supplier to make the supply more flexible in terms of quantity supplied and delivery? 2. Is the supplier willing to provide an improved component in order to satisfy the future market requirement? 3. Is attractiveness to the supplier high enough to make the supplier improve flexibility? <p>LOW</p> <ol style="list-style-type: none"> 1. Does the low attractiveness to the supplier make it hard for the company to involve the supplier in product design? 2. What is the potential risk caused by low attractiveness to suppliers? 3. Can the relationship building enhance attractiveness to the supplier?
<h1>Market</h1>		

7.5.3 Making the supply chain future proof

With analysis of the attractiveness to the four stake-holders complete and product features determined, the supply chain specific to this product can be designed and configured.

In this section, issues of how to construct a future-proof supply chain; how to leverage the cooperative partnership, and how the supply chain impacts the product will be addressed. The tasks of designing and configuration the supply chain at an operational level will not be considered here.

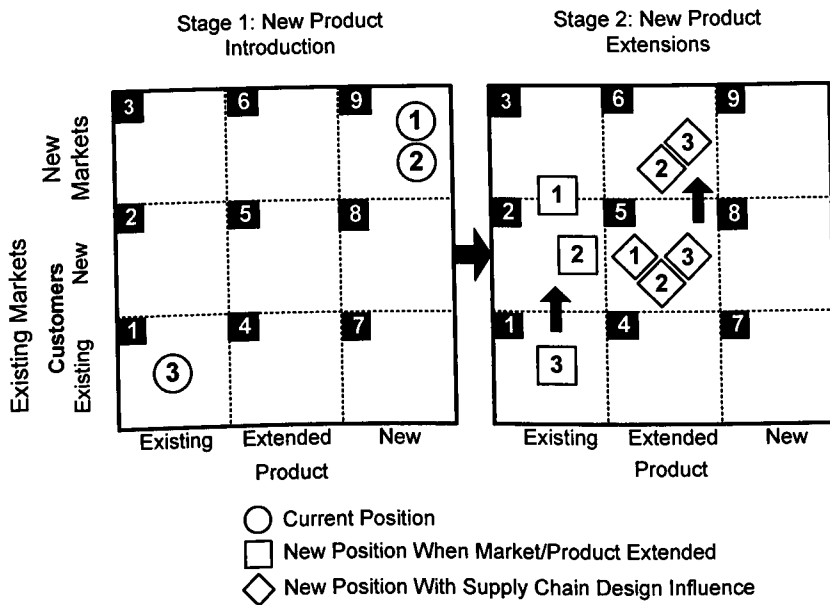
The supply chain design strategy should be related to the growth strategy. It considers not only the current requirement, but also the further requirements. Through interactions among the four different stakeholders over attractiveness, problems in the current supply chain and over future supply chain requirements will emerge. Practitioners should consider the results from the interactions as the basis on which to design and configure a supply chain which is future-proof.

Future proofing a supply chain is concerned with aligning the strategic direction of a company to the current and future capability of the supply chain. If the strategy is one of market penetration then selecting a supplier that can meet the increase in demand caused by future expansion is critical. Obviously quality will also play a role but most

quality issues would have been ironed out at an earlier stage. On the other hand, a strategy based on continual innovation and the launch of new products dictates the need for a supplier that can add to product knowledge and technically capable of delivering this at reasonable cost. A strategy based on extending existing product features and range is one that requires the supplier to have a degree of flexibility and innovation in the way the product is designed (e.g. modularization) to address the varied needs of customers. For SME's these are questions seldom asked when embarking on a new product and selecting a supplier. The drive is usually to get the product to the market as quickly as possible at the right price.

Based on the extended Ansoff Matrix discussed previously there are number of directions a company can take when selecting its growth strategy. Figure 7.6 shows the position of each of the case studies on the Ansoff Matrix and the growth direction planned. The figure shows the initial state where company's 1 & 2 are in the process of developing a new product while company 3 is looking to extend its market presence. In the figure also shows the potential that engaging the supplier can bring for extended the product range. The following section will focus on one of the case studies.

Figure 7.5: Strategic view of the company case studies



7.6 The practical approach in practice: case company B

In this section, the researcher will review one of the case studies to show how the practical approach could work in practice.

The second case looked at in the case study chapter will be selected for this purpose. As explained earlier, the second case company was a new start-up company focusing on an innovative energy-saving product. The company had no manufacturing capabilities beyond a limited technical laboratory for component and product testing. The product was a low maintenance energy saving device for use in domestic residences that consisted of a number of standard components, printed circuit boards and other more specifically designed subassemblies and plastic casing.

The company suffered a delay in its product launch and had to take on the extra responsibility of purchasing and logistics when its manufacturing partner was found wanting because supply chain issues were not properly considered when the product features and the growth strategy were formulated.

The selection of product features and cooperative partner

The product features can be defined as:

1. Energy-saving (End customers save money on energy bills)
2. Easy installation thus reducing costs for the service provider
3. Low maintenance and a good support network for repair and replacement
4. Small size saves space. It allows it to be easily accommodated.
5. An investment payback period that is comparable to other energy saving devices
6. Reliability as energy utility companies are part-sponsoring installation.

Although similar products have been developed for large commercial firms the market that this product is aimed at is the domestic market. It is a relatively new market and there is limited competition in it. Consequently, the company has a degree of flexibility in entering the market and dealing with competition. There are three types of customers: the home or consumer; companies providing electrical installation services, and energy utilities. The visible features for end customers are the size of the product, the time to

pay back the cost of the product by reducing the energy bills. For electricians the main features are ease of installation and servicing. For energy companies, reliability (in terms of operation and performance) is crucial as customer retention figures play a key role in their long term survival.

The attractiveness to the company is high since the company had no competitors and quick access to customer through its partnership with a utility company.

The attractiveness of suppliers is high as all product manufacture and assembly is outsourced. The company maintained good relationships with all its suppliers during the product design process. However, the initial partner responsible for product design was not attractive due to a disagreeable cooperation experience. The company attributed this experience to an indifferent supplier culture and under-resourcing of the project.

Based on the observation of the researcher, insufficient and ineffectively communication between the two companies were the key reasons for this poor level of cooperation. Since the company could not continue with the initial design supplier, the company had to suffer delays in its new product launch in order to seek a new partner.

Attractiveness to suppliers is high for this product. The product is not a complex high technology product, and was easy for an electrical manufacturing company to produce

and assemble. Considering the potential of 25.2 million final customers, the attractiveness to suppliers was very high.

The problems faced by the company in the product design process:

- The disagreeable experience with its design agent
- The compromise over with the product size (double the original size)
- The compromise in quality of some product components –especially the robustness of the casing during transit

If the company had thought of the design agent strategically at the very beginning, it would have been more cautious in choosing a suitable partner. They could also have given sufficient incentives to maintain a good relationship with the design agent. The benefits from cooperation with the initial design agent are obvious. The company could save a considerable amount of time spent in seeking a new partner. The initial design agent could have contributed to the improvement of the product design better than a new partner.

The company learnt their lesson quickly and improved considerably when they came to choose their next partner. In choosing their second partner they asked for more strategically and paid much more attention to the design capabilities of the partner. The new partner finally chosen was not the one about to manufacture the product at the

lowest cost. The new partner was selected on the basis that it the strongest design team among all the potential partners.

The selection of the growth strategy direction

The case company is creating a new market with its innovative product. There are some points regarding the supply chain that were missed or ignored by the company.

The first stage of the growth strategy

The attractiveness of/to supplier

The selection of the right supplier was key to the growth strategy for the company (i.e. attractiveness of the supplier). By attracting energy firms to support the product, the company had put itself in a position of having to meet a large demand for the product. This required both production resources and an ability to logistically manage the ordering of the components and distributions of the product. As a result the logistics was as important as design part. The company did not have these capabilities. The key criteria for the company in selecting its supplier were the supplier's ability to support the anticipated volume of demand and to act as distributor for the product. This entailed possibly carrying the costs of components and finished stock and managing all the transactions with component suppliers and utility companies.

The company chose a design agent to co-develop the product. But the company did not think of the design agent strategically. The design agent was only considered as a possible cooperative partner. Due to the fact that the case company did not treat the design agent as its strategic partner, there was insufficient incentive for the design company to allocate sufficient resources to develop the product. The disagreeable levels of cooperation between the case company and design agent not only led to a longer design process, but also delayed the new product launch. In essence, the case company had not considered the link between product design process and future manufacturing process. If the case company had thought through the supply chain issues in advance and put sufficient attention into relationship building with its initial cooperative partner, it could have achieved a better design and faster product launch.

According to the proposed framework, the case company did not ask in advance key questions about the supplier. These were the cause of the setbacks.

The questions what should have been asked were:

- How could the company cooperate with its supplier in order to leverage its dynamic capability?

The case company did not think about the design agent strategically and did not ask the question on how to leverage the capability of design agent.

- Does the current supplier have the potential to change and become more attractive? If the answer is yes, what is the potential: high capability, design team, technological advantage, branding

The case company did not think of the potential of the design agent in advance. So they could not adapt any positive measure to build up the relationship to take advantages of the design agent.

- What kind of incentives could be provided in order to attract the supplier to be involved?

The case company did not think of any incentives to attract the design agent in advance. They could not quickly change the disagreeable relationship with their design agent when setbacks occurred.

The second stage of growth strategy

The company learnt its lesson and from that point began to think about supply chain issues more strategically when choosing its supply chain partner. The final partner was considered not only in terms of the manufacturing capability, but also design capability.

The company asked the key questions proposed in the framework. These include:

- What is the advantage of the supplier? Is it R&D, product design, long-term cooperation, flexibility in quantity and delivery or something else?
- How could the supplier contribute to this product? Answers include earlier supplier involvement in product design; R&D to help develop the product; provision of key components needed to enhance product features; improvement to the manufacturing process by providing bespoke component design, and by increasing the market visibility through providing of reputable components

Since the case company had asked the question in advance, the final partner was a company that had a sister-company focusing on product design. As a result the company benefited from the decision very quickly. With the help of its chosen partner, the case company began to design the second-generation product rapidly and achieve unexpected benefit from it. The details of this were described in chapter five.

Logistics

As the case company did not think of supply chain issues in advance, they suffered long delays in launching the product. In order to expedite the manufacturing process, the case company had to bear the responsibility over logistics for the first order. The company had to spend time negotiating with components providers and arrange the transportation and stocking of the components. Although the case company relied on the capability of

its parent company (purchasing team/warehouse) to finally complete the job, it led to further delays, extra cost, and all the team exhausted from the purchasing details. The components have to be stocked in the warehouse of the parent company and then delivered to the final manufacturing partner. The final cost of purchasing was, as a result, more than originally expected. All of the team members were busy with the confirmation of the specification of each component and dealing with unexpected problems at both a technical and operational level. All of these could have been avoided if the case company had considered the supply chain proactively.

Summary

In this section, one of the case studies was further reviewed to see how questions proposed in the two tables can help practitioners to think proactively about the supply chain. By demonstrating the problems faced by the case company, it shows the importance of proactive thinking. The review also showed that SMEs can benefit significantly if they think about supply chain problems strategically.

CHAPER EIGHT

CONCLUSION AND FUTURE WORK

8.1 INTRODUCTION

This chapter presents the overall conclusions of the research conducted and reported in this thesis. An overall summary of findings is presented firstly. Then some of the limitations of the research are discussed. Finally a series of recommendations for future research work will be presented.

8.2 OVERALL FINDINGS OF THE RESEARCH FINDINGS

The aim of the research was to develop a framework that enables SMEs to develop robust growth strategies that exploit the capabilities of their supply chain. The work has focused on strategic issues showing how an SME that is developing new products can proactively consider the role of the supply chain in determining product features while still maintaining an edge in the market. The research in this thesis presents a conceptual framework built on an extensive literature review and in-depth case studies and interviews. The work also presents a simple but practical approach to how an SME can align product featured with internal and supply chain capabilities.

Various findings are attained during the research, which have been presented in previous chapters. To provide the reader with a more organised view of the research findings, all the findings are broken down into a number of categories. The categorized findings include the basic understanding from the literature survey, the elements considered in developing the conceptual model, and various steps taken in developing the methodology.

- The changing nature of competition from company to supply chain creates a new way of thinking about growth strategy. It involves proactive thought about supply chain issues.

Conclusion: That proactively thinking of involving the supply chain in growth strategy formulation leads to swift and smooth implementation

- SMEs do not think strategically about either growth or the supply chain.

Conclusion: SMEs need a simple, straightforward method to guide them to think about the supply chain more strategically. It needs to show them how this can contribute to formulation of an implementable growth strategy.

- Earlier involvement of supplier in product design process is becoming increasingly necessary for rapid product development and introduction

Conclusion: With earlier appreciation of the role of the supply chain in product development a range of new product strategies will become available to SMEs

- Relationships with suppliers and customers determine a company's success

Conclusion: Relationship building with suppliers is the key requirement needed to sustain high levels of cooperation.

- Communication is the basis for building up the relationship

Conclusion: For SMEs effective communication at all levels is the key measure requirement needed in building up relationships with its suppliers.

- For a majority of SMEs practitioners there is a disconnection between the perception of, and operation of the supply chain.

Conclusion: The disconnection between perception and operation the supply chain limited the ways in which practitioners would take advantage from proactively thinking about the supply chain

- Attractiveness *of* suppliers and attractiveness to suppliers are different

Conclusion: Distinguishing between the attractiveness *of* the supplier and attractiveness *to* the supplier can help SMEs practitioners proactively consider the benefits from the suppliers' point of view and strategically take advantage of them.

- Guides to help SMEs to think about growth strategy by involving supply chain proactively are few in number.

Conclusion: Practitioners in SMEs world welcome a simple, straightforward approach that helps them formulate implementable growth strategies through proactive involvement of the supply chain.

8.3 Limitation of the research

This research has certain limitations that need to be taken into account. There are two levels of limitation that apply to this research. First are the limitations of the research methods used. Second are the limitations of the final framework.

Limitations of the research methods employed

A case study approach has been used in this study. One substantive criticism of qualitative research concerns the seeming lack of “objectivity” of the researcher. As a novice researcher, there exist inevitable mistakes due to the lack of experience. The case study approach has also been criticized on the grounds that it is often difficult to

summarize and develop general propositions and theories on the basis of specific case studies. In this research, three in-depth case studies were conducted. The case companies could not represent the myriad of manufacturing SMEs. The conclusions drawn from this research may not apply to certain types of SMEs. The case studies provide an in-depth study of the nature of these problems and the impacts they have. Furthermore the three case studies are representative of SMEs involved in developing complex products.

A mini-survey was also used in this research. Due to its scale and the low response rate, the results from mini-survey it could be questioned. The follow-up semi-structured interview was then used to complement the mini-survey.

In terms of the semi-structure interviews, the data obtained is always prone to distortion due to the attribution of interviewee objectivity. This is a classic problem and supports the use of the in-depth studies where the researcher is able to identify the factors more objectively.

Limitation of the final framework

The research is a descriptive framework for SMEs practitioners. It allows them to proactively think about supply chain involvement in growth strategy. It needs

practitioners to understand the role of the supply chain. This research has focused on a qualitative approach that aligns strategy with supplier capabilities and strategies. The researcher felt that there was no need to address the quantitative approach. An operational view of the supply chain can be dealt with using existing tools such as the SCOR model.

The usability of the framework need to be further developed in order to become a practical tool for SMEs to employ. Some simple and straightforward tools should be integrated into the framework. The framework should be further refined for different types of SMEs since the supply chain varies.

8.4 Learning experience of the researcher

It is a long journey for every PhD researcher and needs dedication, diligence, and persistence. Personally, it has been even longer and harder than is usual as throughout the research I have been fighting an intense battle against depression. I am appreciative for all the help and patience that supervisors and colleagues in the management school have given me. Their encouragement and tolerance allowed me to reach the final goal.

The PhD research is a training process that generates the next generation of academics who will ensure that the finesse scholarly research methods are maintained and not

allowed to die. During this journey, I have learned the basic skills to undertake independent research, especially of a qualitative nature. I am familiar with the research methods of case study, survey and semi-structured interview. I think the biggest challenge for me in my research is to know how to ask the right questions. From one side of the fence, the expected confirmation of the answer to a question indicates to the researcher that their suspicions were indeed correct. From the other side of the fence, questions should be easy for practitioners to understand and answer. So well designed set of questions issued in the form of a survey questionnaire or used as the basis for a semi-structured interview is one of the keys to successful research. Another challenge is how to consolidate the practical findings with existing literature to discover something new. It is from this knowledge that new theory originates. In this research I provide a framework that connects proactive thinking of and about the supply chain to growth strategy formulation and implementation. The literature review shows that the strategic view of the supply chain is becoming increasingly important for growth strategy implementation. Through analysis of the practical data, the evidence supports the efficacy of the conceptual framework. The final framework is developed as a combination from extracting relevant literature and adding practical data.

8.5 Issues for further research

There are many issues in which the ideas developed in this research might be extended.

Firstly, a broader range of SMEs could be investigated to find the characteristics of the various types of SMEs. With more input, the framework could be generalised to cover different kinds of SMEs.

Secondly, further tools should be integrated into the framework to make it use more practical. The current two tables concerning product feature and growth direction listed the questions practitioners need to consider before they make any decision. With more tools involved, practitioners can flexibly choose the appropriate decision making tool to make the final decision.

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Appendix A

The questionnaire for in-depth
case study

Part 1: COMPANY PROFILE

Company name	_____		
Parent company	_____		(if applicable)
Address	_____	Tel	_____
	_____	Fax	_____
City/Town	_____	URL	www. _____
County	_____	Post Code	_____
Contact name	_____	Tel	_____
Position	_____	Email	_____

Please indicate the main business functions carried out in your company and the number of employees involved in each of the activities (tick more than one if applicable)

<input type="checkbox"/>	Marketing	[]	<input type="checkbox"/>	Sales	[]
<input type="checkbox"/>	Procurement	[]	<input type="checkbox"/>	Distribution	[]
<input type="checkbox"/>	Product Development	[]	<input type="checkbox"/>	Manufacturing	[]
<input type="checkbox"/>	Customer Services	[]	<input type="checkbox"/>	HRM	[]
Others	_____	[]			

		Approximate average of last three years	Current	Future three year figure or trend (2009-2011)
Annual turnover £M				
Market size £M				
Number of competitors				
Customers	Number of customers			
	New customers in existing market			
	New customers in new markets			
Number of main suppliers	Market place			
	Contractual			
	Partnership			
Number of products				
Number of new product introductions	Extended product			
	New product			

Part two: Product selection procedure and product feature classification

Key principles for product selection

1. Turnover contribution to company
2. Growth potential
3. The complexity of product:
 - Product design and product process
 - Number of components, suppliers,
 - Technology operations
 - Marketing

	Name	% Contribution to Turnover	Potential for Growth High, Medium, Low	Complexity (e.g. Design, Operations, No of Parts, Marketing etc) High Medium Low
A				
B				
C				
D				

What are the main features for this product?

Feature 1: _____

Feature 2: _____

Feature 3: _____

Question: Specify features, then identify the relevant characteristics. Comment that how and when these features were considered in the product design process

Feature 1

	Product Features	Feature 1-		Comments
	Feature Characteristics			
Drivers	Cost	W	Q	
	Delivery	W	Q	
	Quality	W	Q	
	Performance	W	Q	
	Innovation	W	Q	
	Flexibility	W	Q	
	Service	W	Q	
	Market	W	Q	
Supply Chain	Outsourcing (Y/N)			
	Supplier (within market place)			
	Supplier Specialist			
	Supplier Involvement			

W: Order Winner

Q: Order Qualifier

Feature 2

	Product Features	Feature 1-		Comments
	Feature Characteristics			
Drivers	Cost	W	Q	
	Delivery	W	Q	
	Quality	W	Q	
	Performance	W	Q	
	Innovation	W	Q	
	Flexibility	W	Q	
	Service	W	Q	
	Market	W	Q	
Supply Chain	Outsourcing (Y/N)			
	Supplier (within market place)			
	Supplier Specialist			
	Supplier Involvement			

Feature 3

	Product Features	Feature 1-		Comments
	Feature Characteristics			
Drivers	Cost	W	Q	
	Delivery	W	Q	
	Quality	W	Q	
	Performance	W	Q	
	Innovation	W	Q	
	Flexibility	W	Q	
	Service	W	Q	
	Market	W	Q	
Supply Chain	Outsourcing (Y/N)			
	Supplier (within market place)			
	Supplier Specialist			
	Supplier Involvement			

Part Three: Questions concerning strategy/market, company capability and supply chain

(Please note. All questions in the following sections relate to the product chosen in Part two)

Questions 1 to 9 concerning company strategy/market**1. Which of the following best describes the market for this product?**

- Growing Mature Declining Turbulent

2. What are the main factors that have made this product so successful? Please tick each box that is applicable and also rank these where possible

Y/N	Rank		Company capability
<input type="checkbox"/>	<input type="checkbox"/>	Product/process Innovation	
<input type="checkbox"/>	<input type="checkbox"/>	Product/process quality	
<input type="checkbox"/>	<input type="checkbox"/>	Resource advantage (Information, materials, location, human etc)	
<input type="checkbox"/>	<input type="checkbox"/>	Management of the internal organization (operational planning, systems & procedure etc)	
<input type="checkbox"/>	<input type="checkbox"/>	Finance (management of, sources of, favourability of exchange rate etc)	
<input type="checkbox"/>	<input type="checkbox"/>	Human Resource Management (recruitment, training, reward, appraisal, team work, culture)	
<input type="checkbox"/>	<input type="checkbox"/>	Other (please specify) _____	
Y/N	Rank		Market
<input type="checkbox"/>	<input type="checkbox"/>	Market advantage (niche, competitive position, exporting)	
<input type="checkbox"/>	<input type="checkbox"/>	Statutory regulation	
<input type="checkbox"/>	<input type="checkbox"/>	Other (please specify) _____	
Y/N	Rank		Supply Chain
<input type="checkbox"/>	<input type="checkbox"/>	Management of external organization (suppliers, customers, shareholders, partnerships)	
<input type="checkbox"/>	<input type="checkbox"/>	Transport networks (distribution/logistics etc)	
<input type="checkbox"/>	<input type="checkbox"/>	Other (please specify) _____	

3. Over the next 3-5 years are there any barriers that are likely to affect the growth of this product?

- | | |
|---|---|
| <input type="checkbox"/> Availability of finance | <input type="checkbox"/> Cost of Labour |
| <input type="checkbox"/> Availability of labour | <input type="checkbox"/> Employment Regulations |
| <input type="checkbox"/> Managerial/leadership capability | <input type="checkbox"/> Availability of suitable skill/ qualifications |
| <input type="checkbox"/> Environmental Regulations | <input type="checkbox"/> Transport networks |
| <input type="checkbox"/> Ability to introduce organizational change | <input type="checkbox"/> Intensity of competition |
| <input type="checkbox"/> Information & Communication Technology (ICT) | <input type="checkbox"/> Suppliers/supply chain issues |
| <input type="checkbox"/> Other (please specify): _____ | |

4. In relation to this product specific, what are the drivers behind product development?

- We tend to be a leader in product development and first to market with product
- The product emerged reactionary to competitors' and we were forced to response
- The product emerged as a direct reactionary result of a customers' requirement

5. How would you describe the nature and intensity of the competition you face for this product?

- Nature of competition: Local Regional National International
- Intensity of competition: Low Medium High

6. How would you judge the market attractiveness for this product?

- The size of the market Low Medium High
- The profitability of customers Low Medium High
- The competitive nature of the marketplace Low Medium High
- Other (s)
- Overall judgement of the market attractiveness Low Medium High

7. How would you perceive the relationship with your suppliers for this product?

- High strategic – our suppliers can often provide a basis for change and improvement
- Medium strategic – our suppliers can cooperate with us to support the change and improvement
- Low strategic – our suppliers only provide the material specified by us.

8. Do you perceive the supply chain could provide a vehicle for growth of this product?

- YES NO

If the answer is yes, could you give a brief explanation?

9. What growth strategies are you currently pursuing for this product and how might these change in the future?

- We are currently working to bring in new customers for this product (market development)
 We are currently pursuing development of the product for our existing customers (product development)

How is this likely to change in the future?

Questions from 10 to 23 concerning Company's capability
10. How would you describe the technology used to produce this product?

- Conventional Advanced Specialised

11. What percentage of different source of the new technology in this product based on contribution to the product value?

- [%] R&D in house
 [%] Acquirement from market
 [%] Cooperation with supplier or customer

12. What are your company's main types of production?

- One off Small batch Large batch
 Continuous or mass Process mix (if so name it: _____)

13. How would you describe the required process for this product?

- Same machinery as previous products
 Required new machinery generally available
 Required new machinery specifically created for the product
 Required outsourcing part or all manufacturing

14. How would you describe the material required for this product?

- Same material as previous products
 Required new material readily available for supply
 Required new material specifically created for this product

15. How would you describe the staffs' skill needed to manufacture this product?

- Same skill as previous products
 General skill training improvement required
 Specific skill training for this product required

16. Has there been any new design change to this product?

- Yes No

If the answer is yes, please answer the question 17 & 18, or else go to question 19.

17. In the original design process of this product, how do you describe the design capability?

- All designed in house
 Some specialised parts designed by supplier according to company's requirement
 Some specialised parts designed by the cooperation between company and suppliers
 Some new features were based on the supplier's new product (not specified by company)

18. How would you describe your new product design process based on your latest design of this product?

- Well-managed in a structured process Training needed for members of design team
 A structured process needed

19. With respect to production, which of following best describes the real situation?

- All made in house Outsourcing some parts Outsourcing all parts

If the answer is outsourcing some parts, could the percentage of outsourcing be given: [%]

20. Which of following capabilities created barriers for the success of this product?

- Marketing research management Product design management
 Production operation Human resource management
 Supply chain management Others: _____

21. Which of following capabilities have facilitated the success of this product?

- Product design Production process Management R&D
 Supply chain management Others: _____

22. In the latest product design for this product, did the company's capability match the original proposed product features?

- Yes No

If the answer is no,

a. please describe what kind of product features were dropped and based on what principles:

b. please describe what kinds of new capabilities were needed and how were these capabilities attained:

23. a. Have you considered any form of relationship building with other members in supply chain during the latest product design and production process for this product?

- Yes No

b. If the answer for 22a is yes, did you feel any enhancement of company's capability due to such kind of relationship building ?

- Yes No

If the answer for 22b is yes, please indicate what kinds of capability were enhanced:

- Product Design Production process R&D
 Product promotion Business model

Others: _____

24. For this product, did you benefit from other main partners' capabilities in your supply chain during the latest product design and production process?

- Yes No

If the answer is yes, which partners you aligned with and brief the benefit if possible

- Suppliers Customers Distribution channels Logistics providers

Others: _____

What benefits were achieved?

Questions 24 to 28 concerning suppliers/supply chain

25. What is the general strategy of the company for choosing a supplier and the type of relationships with them?

25. Please fill the number of different type supplier type table.

Relationships-Type of relationships with main suppliers for this product				
Indicate the number of suppliers of each group (vertical) in different relationships (horizontal) with the company				
	Marketplace	Long Contract or Strong Relationship	Partners	Ownership
General				
Specialist				

26. Please fill the supplier relationship Table.

Supplier Relationships [With Main Suppliers] for this product						
Contract Length	a	Individual Orders			Other Comments	
	b	less 1 Year,		c 1 - 3 Years		
	d	more than 4 Years or Product Life				
Trust		Low 0	1	2	High 3	Other Comments
Dependence		Low 0	1	2	High 3	Other Comments
Commitment		Low 0	1	2	High 3	Other Comments
Communication		Low 0	1	2	High 3	Other Comments
Information Share		Low 0	1	2	High 3	Other Comments
Cost Transparency		Low 0	1	2	High 3	Other Comments

27. Have there been any positive benefits resulting from working with suppliers on this product or range to:

- Introducing a new technology/knowledge to the company
- Opening up a new marketplace
- Opening up a new product range for the company
- Improvement to achieve the design of the product for better [cost/quality/delivery/flexibility/performance/innovation]
- Others _____

Please briefly describe:

28. If you were to select suppliers for this product [to design/change or to promote to new markets], which of the following will be relevant as your selection criteria? Also please rank them.

Relevant	Rank	
<input type="checkbox"/>	<input type="checkbox"/>	Cost (cheap)
<input type="checkbox"/>	<input type="checkbox"/>	Quality
<input type="checkbox"/>	<input type="checkbox"/>	Delivery
<input type="checkbox"/>	<input type="checkbox"/>	Flexibility
<input type="checkbox"/>	<input type="checkbox"/>	Willing to share risk
<input type="checkbox"/>	<input type="checkbox"/>	Easy to work with or to cooperate (partnership)
<input type="checkbox"/>	<input type="checkbox"/>	Trustworthy (from their history)
<input type="checkbox"/>	<input type="checkbox"/>	Cost Transparency
<input type="checkbox"/>	<input type="checkbox"/>	Technical support
<input type="checkbox"/>	<input type="checkbox"/>	Technology Transfer (for design or production)
<input type="checkbox"/>	<input type="checkbox"/>	Complementary company's capability
<input type="checkbox"/>	<input type="checkbox"/>	Consultation for better approach to design or product
<input type="checkbox"/>	<input type="checkbox"/>	Earlier involvement in product design

29. Are there any process integration with your main supplier?

- a) No
 - b) Yes
- If the answer is Yes, how do you perceive the impact of such behaviour

If the answer is No, could any followings explain the reason?

- a) Lack of perception of process integration
- b) No incentive to carry on the process integration
- c) The relationship is not strong enough to carry on the process integration
- d) Do not know how to carry on the process integration#

Growth strategy:

30. When you rethink the implementation of growth strategy of last time, what are the obstacles making the implementation of some objects unachieved or taking longer time to achieve?

- a) Supply chain issues b) Market issues c) Internal capability d) Others

If supply chain is the one of the obstacles, could you describe in details

31. If you have known the current supply chain situation in advance, will you make a different growth strategy?

- a) Yes b) No

If the answer is Yes, what is the difference for the growth strategy?

- a) Different expected speed b) Different product range
b) Different approach to achieve the growth d) Different growth objectives

32. Do you think the strong relationship between members within supply chain could facilitate?

- a) The implementation of growth strategy
b) Enhance and even shape the growth strategy
c) A different approach to internal capability development
d) Open up a new market

33. What are the key factors to build up the strong relationship with members in supply chain?

- a) Open and effective communication
b) Trust
c) Commitment
d) Process integration

34. How do you perceive the contribution of supply chain to the growth strategy? Any example?

35. How do you think the relationship among market requirement, the internal capability, and the supply chain issues?

36. Supply chain issue could influence which part of following item of market negatively according to your experience?

- a) The market opportunities could not be caught because of lack of suitable suppliers or taking longer time to find the suitable suppliers
b) The product profit could not be increased because of the uncompetitive material price from our suppliers.
c) The market share could not be expanded because of the limited capability and cooperation of our suppliers.
d) The competitive advantage could not be enhanced because of the limitation from supply chain.

Appendix B

The questionnaire for Mini-survey

Thank you for participating in this short survey. In these turbulent business environments, the role of the supply is becoming more critical to a company's success. Practitioners need to consider the supply chain in advance of any strategic decision in order to achieve the desired growth targets. The aim of this survey is to investigate the position of the supply chain in formulation and implementation of the growth strategy in today's business. The survey is particularly aimed at SME's. You could send the completed survey by fax (0151-7953640) or by post (The Agility & Supply Chain Management Centre, The University of Liverpool Management School, The University of Liverpool, PO Box 147, Liverpool L69 7ZH)

Company profile:

Company Name: _____

Sector: _____

Market size: _____

No. of product launched in last year: _____

No. of suppliers: _____

No. of key suppliers: _____

Strategy & Growth

1. As a percentage of your planned target growth, where did the sources of growth come from?

Product	Existing product		Extended* products		New Products		Total
Over last three-year	[]%	+	[]%	+	[]%	=	100%
Current	[]%	+	[]%	+	[]%	=	100%

Market	Existing Customers		New customer in existing market		New market		Total:
Over last three-year	[]%	+	[]%	+	[]%	=	100%
Current	[]%	+	[]%	+	[]%	=	100%

* new extensions or variation on existing products

2. Rank from the list below those main supply chain obstacles that affected the implementation of your growth strategy? (highest=1)

Capability of existing suppliers		Reliability of new suppliers	
Availability of new suppliers		Trust with new suppliers	
Other (please specify)		_____	

Suppliers/supply chain issues

3. How often and to what extent have you involved your key suppliers in:

	How often				Extent of involvement			
	Never	Rare	Often	Always	None	Limited	Major	Total
Product design process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business and strategy planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. To what extent does the capability of suppliers is a consideration when you are planning new product features?
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| None | Minor | Medium | Major | Crucial |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. What is the percentage of suppliers, which have been changed (discarded or replaced), and please rank the reasons for changing the suppliers (Highest=1)
- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| None | <5% | 5%--20% | 20%--50% | >50% |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Rank the reasons:

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Capability/capacity of current suppliers |
| <input type="checkbox"/> | Technology available to current suppliers does not meet new requirement |
| <input type="checkbox"/> | Level of trust of current suppliers does not sustain a high level of collaboration |
| <input type="checkbox"/> | Current suppliers could not meet the future strategic needs |
| <input type="checkbox"/> | New partnership suppliers are needed in order to grow |
| <input type="checkbox"/> | (other) _____ |

6. What benefits to your market position have you gained as a result of working with suppliers? Please rank them if more than one answer. (1=Highest)

- | | |
|--------------------------|---|
| <input type="checkbox"/> | Opening up new marketplace |
| <input type="checkbox"/> | Rapid responding to market opportunities |
| <input type="checkbox"/> | Sharing market risks |
| <input type="checkbox"/> | Stronger position to compete with competitors |

7. How did working with your supplier impact on your internal capabilities to meet customer needs? Please rank them if more than one answer. (1=highest)

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Introducing new technology/knowledge |
| <input type="checkbox"/> | Improving design and innovation capabilities |
| <input type="checkbox"/> | Opening up a new product range |
| <input type="checkbox"/> | Complementing company's manufacturing capabilities |

8. If you had known the current supply chain situation in advance, would have selected a different growth strategy in past three years? (please refer to question 1)

- | | | | |
|---------|--|--|--------------------------|
| | Yes | | No |
| Product | <input type="checkbox"/> (Specify) _____ | | <input type="checkbox"/> |
| Market | <input type="checkbox"/> (specify) _____ | | <input type="checkbox"/> |

9. What benefits would you expect if, at an early stage, your growth strategy was to consider the impact of the supply chain?

- | | | | | | |
|-----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | None | Minor | Medium | Major | Crucial |
| Cost/Investment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Speed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Smooth implementation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Flexibility | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Market visibility | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Better product | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Higher market share | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Better margins | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |