# METHODS AND ORGANIZATION OF NEW PRODUCT DEVELOPMENT: AN INVESTIGATION IN THE UK TEXTILE AND CLOTHING SUPPLY CHAIN

Vol. I of II

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Ph.D. Thesis

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2004

**Methods And Organization of New Product Development: An Investigation In The UK Textile And Clothing Supply Chain (Volume One of Two)**

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ACKNOWLEDGEMENTS

I would like to thank the members of the organisations involved in this study, and Professor Rachel Cooper for her supervision and encouragement.

In addition I am grateful for the help given by the members of the Industry Forum in the original supply chain interventions including Ken Watson, Jo Heeley and Caroline Davey.

I am indebted to the University of Central Lancashire Department of Art & Fashion for allowing me the time to continue my studies.

Finally I would like to thank my wife Janet Redfern for her continued support and understanding.

## ABSTRACT

There have been relatively few studies into new product development (NPD) in the apparel supply chain which is known for a high level of seasonal product development. Moreover the literature so far has been criticised as not being generalizable with a call for more sector specific studies.

The literature also suggests that faster NPD is an aspiration of successive NPD models. The aim of this research has been to study the UK Textile and Clothing Supply Chain sector to discover if it achieves fast NPD through using the recommendations of the literature. The current literature suggests that flexibility is required for success, but that senior management still maintain close control of each project as it progresses through the NPD process.

The study used the opportunity to study four supply chains where the researcher was facilitating on improvement projects supported by the Department of Trade and Industry. Sixty eight site visits took place over a two-year period, with two hundred and eighty nine interviews. Mappings were constructed for the NPD processes being used by three leading UK retailer clothing supply chains that collectively had nine hundred and fifty six stores in the UK.

Analysis of the mappings and intervention project data suggests that the sector does not use the flexible NPD management and senior management control methods of the literature to achieve speed. Instead there are systems and structures that are by comparison very rigid with timings for key activities and far less senior management involvement.

The study shows that sector specific studies can help develop understanding of NPD processes and the research has additionally identified clear methods to achieve fast product development in a supply chain. These include setting boundaries that reduce uncertainty, empowering junior staff and having fixed dates for completion of key NPD activities.

# Chapter One – Introduction to the research

## 1. Introduction

This chapter sets out the background to this research about New Product Development (NPD). It also defines the research problem and explains the thesis structure. The chapter is organised as follows. Some history of the research literature about New Product Development is first described. The chapter then establishes the main focus of the existing NPD literature regarding NPD models, success influences and organizational factors. This introductory chapter goes on to illustrate weaknesses in some of the existing literature's methods, and difficulties that business managers appear to have in practice with the lessons of the NPD literature. The focus of this research is subsequently made clear and the chapter then concludes with a justification for the research, an outline of the method used and a map of the thesis structure.

### 1.1 Background to the research

> **"...but what, exactly, does an innovative enterprise look like? Yes we can see its products, but its working are all too obscure".**
> **(The Editors: Harvard Business Review, August 2002)**

The editors of the Harvard Business Review sum up one of the problems that remain after 30 years of almost continual research into New Product Development (NPD) practices in organizations. We do not yet know what goes on in detail in the process of product development inside firms. Not that the subject of NPD has been neglected. Researchers have carried out many surveys in the past three decades, trying to discover what it is that managers can do, in their organizations, to improve the chances of a new product being more successful.

One of the earliest studies into management behaviour and NPD success or failure was the Scientific Predictor from Patterns with Heuristic Origins (SAPPHO) Project (Rothwell et al, 1974). This study compared management behaviour in firms where new products were either commercial successes or failures. The firms, in the UK, were competing in the chemical and scientific instruments industries. The study showed that the successful products were likely to come from a firm that was more in touch with the needs of the product users. The successful products met these needs more closely and the managers involved in the successful development projects were more likely to have more power and status than in the firms where products had failed.

Since this early study, the research into the so-called NPD 'success factors' has been somewhat dominated by Robert Cooper. One of his first studies (Cooper, 1975) was about the reasons for new product failure in 66 Canadian industrial products firms with an analysis based on 114 failed products. In this study, managers rated sales below expectations as the most common reason for failure. Significantly Cooper also identified twelve stages in the NPD process in this study. Firms in the study executed some of these stages in the NPD process less well than others, particularly the more market oriented stages of market research, test marketing and product market launch. Furthermore, not all firms carried out all twelve stages. The overall conclusion of the research was that there needed to be greater market orientation if failure was to be avoided.

Cooper has continued his research into success factors, largely with industrial firms, in his subsequent NewProd studies (Cooper, 1979, 1985a, 1992, 1994a; Cooper & Kleinschmidt, 1986, 1987, 1993). The methods used in Cooper's NewProd studies have tended to repeat the use of surveys based on constructs that link management behaviour and organization to NPD success. For example, in one NewProd study, (Cooper, 1992) asks respondents to rate the following statement on a Likert scale from 0 (strongly disagree) to 10 (strongly agree): *"Our company's marketing skills and people are more than adequate for this project"*. In the NewProd studies, new product project outcomes in terms of commercial success or failure were then compared with the NewProd survey answers to provide a statistical correlation between success and behaviour factors such as marketing skills in the case of the example above.

Cooper has also developed (Cooper, 1991, 1993, 1995, 2002) his trademark Stage-Gate NPD Model. In this model the twelve process steps discovered earlier are split into development steps - Stages, and decisions steps - Gates. On the one hand, carrying out a new product financial analysis, for example is a Stage activity. On the other hand selecting a new product project, that has reached an agreed return on investment, is a Gate activity. The stage gate model is described in more detail in chapter two.

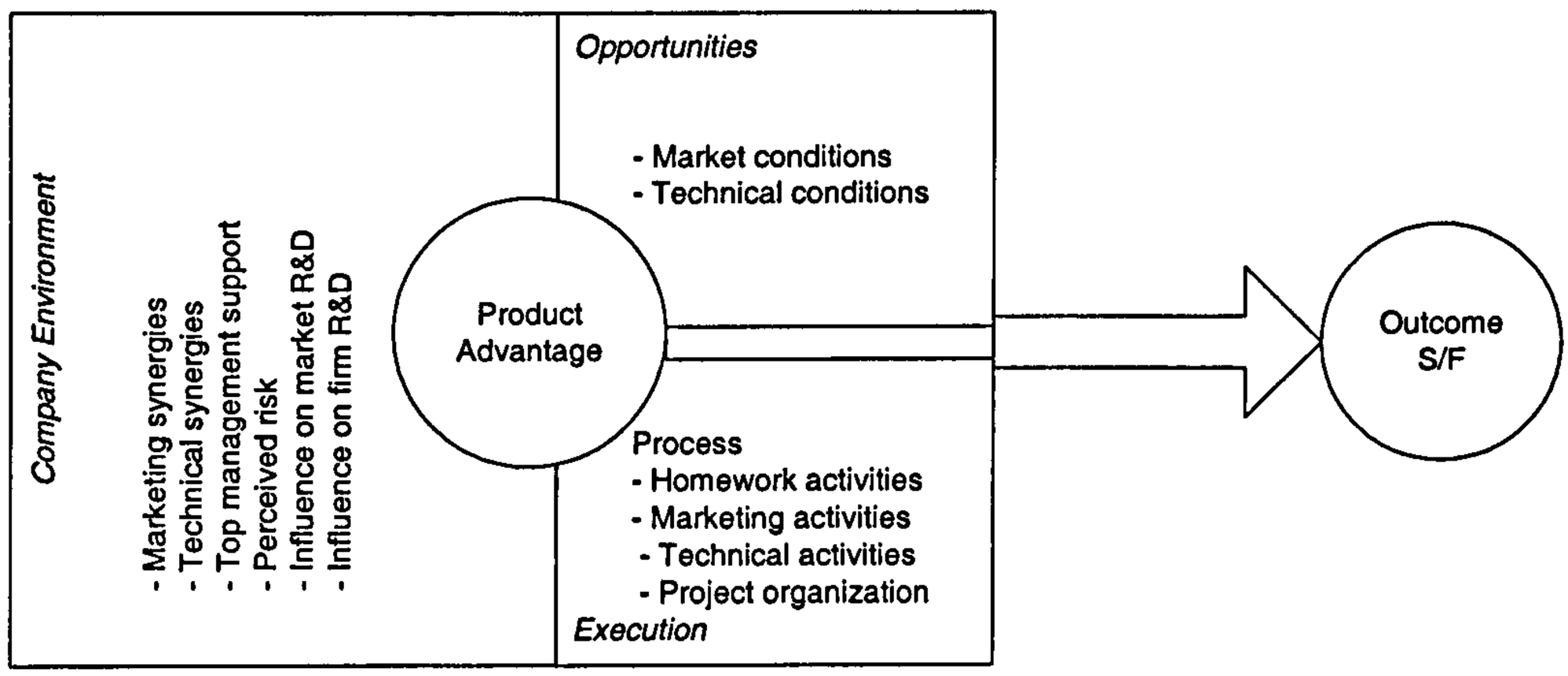



Figure 1.1: Conceptual Model of NPD success or failure. Source: Cooper & Kleinschmidt, 2000.
The authors have developed this conceptual model after twenty-five years of continuous research into New Product Development Success Factors.

Cooper continues to work in the NPD field with Elko Kleinschmidt and a more recent Australian study shows how they have developed a conceptual model of NPD (Cooper & Kleinschmidt, 2000). This NPD conceptual model links organizational behaviour with success (Figure 1.1). The model shows how various firm-level factors, for example top management support, can impinge on new product programmes. The year 2000 model also refers to the importance of the execution of the NPD process activities in much the same way that the early 1975 Cooper study did.

Cooper's studies have typically investigated the NPD of industrial products in sectors including chemicals, electronics and heavy equipment. The Cooper investigations have also taken place in various countries including Canada, USA, Germany, UK and Australia. In spite of the passage of time since the earliest Cooper research report, the later studies have found similar results to Cooper's original 1975 Canadian report.

Incidentally the very innovative firms in Japan have also been studied and found to have similar results in terms of success factors (Song & Parry, 1996).

The Cooper Stage-Gate™ model introduced the concept of decision points or gates. The model also proposes (Cooper & Kleinschmidt, 1988) that senior managers use these gates to regulate the portfolio of new products so that the scarce resources that the firm can devote to NPD are used efficiently. This new product portfolio should also be part of a planned mix of new products (Wind & Mahajan, 1981).

We have already seen that some NPD process stages are less well carried out than others. However it is also suggested (Cooper, 1998) that some stages in the stage gate process are more critical than others with the early pre-development activities being singled out as having a significant effect on the success rate of new products.

The stage gate model is not however the only NPD model that has been developed in the past 30 years. Conceptual models of NPD have progressed in the post war period (Rothwell, 1994) and the theory base has now reached the 5th Generation. This progression is discussed in more detail in chapter two. These model generations are usually the result of some identified weakness in an earlier model (Rothwell, 1994). The Stage Gate model itself has been developed and Cooper has proposed a new 'fuzzy' version (Cooper, 1993) that avoids some of the rigidities and slowness of the original concept.

Whilst NPD models have been developed, there has also been other research into the 'success factors'. It has been estimated (Ernst, 2002), for example, that there are between 1 and 2 journal papers published each week on this subject in refereed international journals.

However not all the research into NPD has been about success factors or about NPD conceptual models and NPD process stages. Other research has looked at NPD strategy. Merle Crawford, for instance (1980) suggests that, before NPD begins, firms need a new products strategy that outlines the business goals in terms of target markets, sales levels and profit objectives. Griffin (1997) has taken up the strategy theme, arguing that the best firms have a strategy step in their NPD process.

Another area of research interest pertinent to NPD is that of idea generation. Cooper originally left this step out of his NPD process but recently included it (Cooper, 2001, p154). Johne (1994) argues that customers are the best source of new ideas for products. However customers may only be able to visualise in terms of the products that they already know (Johne & Snelson, 1988) and therefore this may restrict innovation.

Since new product success factors are a focus of much research effort it is perhaps surprising that there is no agreed measure of success (Griffin & Page, 1996; Cooper & Kleinschmidt, 1987, 2000; Craig & Hart, 1992). There are up to 46 success measures used by researchers (Griffin & Page, 1996). Interestingly there is also no agreed measure of what constitutes newness (Craig & Hart, 1992) in products. Newness may, it is suggested (Drucker, 1996, p38), be in services or the production technology used to produce products. It seems anyway that much new product activity does not result in very innovative products since 'new to the world' products are rare (Hanna et al, 1995).

Research into NPD has also examined organizational structures in firms relative to NPD success and failure. Most managers are deeply involved in NPD (Millson & Wilemon, 2002) and they can influence success. Researchers have also investigated organizational aspects of NPD including senior management roles, communications between functional departments, the structure of NPD teams and the use of project leaders (Pinto & Pinto, 1990; Page, 1993; Griffin & Hauser, 1996; Griffin & Page, 1996; Gupta & Wilemon, 1998; Larson & Gobeli, 1988).

In spite of the development of several NPD conceptual models, and after three decades of NPD research findings, firms do not use the models or research results (Mahajan & Wind, 1992). Managers seem unaware of the need for well-executed NPD stages since most subsequent studies repeat the early findings where stages are poorly executed (Ernst, 2002). New product failure rates remain high (Cooper, 2001, p11) and this is seen as a waste of resources.

The reasons for managers failing to learn the lessons of 30 years of NPD research are suggested as a lack of dissemination of research outcomes in popular forms of communication (Ernst, 2002) and a lack of industry specific conceptual models (Tidd,

2001). NPD research methods have also been criticised with the robustness of the construct and questionnaires approach being questioned (Ernst, 2002) and the sampling of views from only a few development managers being considered (Ernst & Teichert, 1998) suspect due to possible bias. Success measures have also been described (Tidd, 2001) as not sufficiently long term.

The literature on NPD, whilst being repetitive, having less than robust methodology and not being applied in practice, contains useful themes and reference points which can assist in any new NPD research into new product development methods and organization in the UK Textile and Clothing Supply Chain.

The literature regarding NPD has been briefly described here in this introductory chapter in order to give some background to the research. A more detailed explanation about the NPD literature will be presented in chapter two.

## 1.2 Research Problem

The UK Textile and Clothing Supply Chain (UKTCSC) is an important sector for the UK economy, employing 277,000 people. The sector is involved in setting new fashion trends with new product ranges being developed every six months (Drapers Record, 2004). This sector has received little research attention regarding NPD methods and organization since much of the published research covers other sectors. It therefore seems a good idea to investigate methods and organization of NPD in the UK Textile and Clothing Supply Chain,

There are several relationships in a clothing supply chain since various raw materials are processed including fibres, yarns and fabrics before garments can be manufactured for subsequent distribution and sale to consumers.

The UK clothing supply chain also involves retailers and there are various forms of innovation developing relationships between suppliers and retailers (Bruce & Moger, 1999) including large scale co-partnerships, ad-hoc relationships and niche sector networks.

NPD is a complex and confusing topic (Craig & Hart, 1992) for individual firms to be involved in. So we might expect product development involving multiple firms like the clothing supply chain to be even more difficult or at the very least to be different to development in single firms. **This research is based on this general hypothesis that the UK Textile and Clothing Supply Chain firms behave differently to the lessons of the literature in managing NPD. The aim of the research is to investigate the NPD Methods and Organization in the UK Textile and Clothing Supply Chain in order to discover if the sector exhibits specific characteristics regarding NPD or if the lessons of the literature appear to be generalizable to this sector.**

The existing literature has some clear themes, as discussed in chapter two, but these are generally based on investigations of NPD in individual firms rather than studies along supply chains. However, the themes provide a useful benchmark for the supply chain research.

NPD in supply chains may be different to that in a single firm. One possible cause of differences may be the general focus of these supply chains. Supply chains, it is suggested, are often based on a 'lean' paradigm (Cox, 1999). The lean idea is one where firms try to manage with fewer resources, in particular using suppliers rather than owning resources. Lean firms try to reduce waste of all forms but also focus on speed and responsiveness. One of the leading examples of the lean model was Toyota (Womack, 1990, p118).

The literature on NPD has developed into a set of suggestions regarding how single firms and their managers can organise NPD to improve success rates and break down the barriers that exist between functional departments. Are these lessons of NPD research relevant to supply chains and the UK Textile and Clothing Supply Chain in particular? We might expect that NPD in supply chains is more complex than for single firms, be subject to some relationship factors and need good levels of communication. To test these propositions and then answer the question about how NPD is organised in the UKTCSC it was decided to investigate the detailed new product development practices of a sample of firms in the UK Textile and Clothing Supply Chain. Details of the sample are given in chapter three.

The opportunity arose for the researcher to gather and examine relevant data from regular access to the sample of firms over a period of eighteen months, starting in 2001, whilst working on a Department of Trade and Industry funded project aimed at improving the sector's supply chain performance.

The research in the UKCTSC attempted to find detailed answers to the following questions:

- How is NPD organized?
- How is NPD managed between the clothing retailer and manufacturers?
- Are the NPD processes considered efficient?
- What are the stages in the NPD processes?
- What is senior management involvement?
- How is success measured?
- How new are the products and services concerned?
- Are the latest generations of NPD model in use?

The research not only answered the list of questions above, but also explored the differences between single firm best practice NPD (as espoused in the existing literature) and the practices in a possibly 'lean' type of UK Textile and Clothing Supply Chain.

The research conducted an investigation against a general proposition that firms in the UKTCS have a specific approach to NPD as a consequence of the needs of the clothing sector and for the reason that they belong to a 'lean' supply chain. The issues of leanness and supply chain NPD are discussed in more detail in chapter two. For example, it was proposed in this research, that the sample cases in the UK Textile and Clothing Supply Chain would, since they seek fast response, use the newer versions of classic NPD models. These propositions are developed in chapter two and tested in chapter four.

The research concludes with a proposed new NPD model for supply chains.

## 1.3 Justification for the research

There are three main reasons that justify the research:

First, studies into NPD in supply chains have been limited (Bruce & Moger, 1999) and the body of literature also complex and confusing (Craig & Hart, 1992) and therefore sector specific studies may be worthwhile and help (Tidd, 2001) to explain and develop conceptual models. This sector study may then lead to help for managers and researchers who want to understand fast, collaborative, supply chain NPD.

Tidd explains the current problem:

> **"Several decades of research on the management of technology and innovation have created many insights into the innovation process, but to date have failed to provide a conceptual framework to guide innovation research or management practice". (Tidd, 2001)**

Tidd goes on to suggest that the best practice will depend on the industry and the environment and he concludes that the solution is more sector specific studies.

Secondly, the clothing sector manages NPD of new products and ranges in short timescales with a close launch deadline in some cases. Little is know about this type of NPD even though development speed is recognised as an important driver of the latest NPD methods (Rothwell, 1994). This study therefore makes a contribution to understanding and knowledge about fast NPD by explaining, for example, how the fixed launch date is achieved for a fashion-driven clothing range.

The third justification for the current research was that previous NPD research has not revealed why firms still make the same NPD process mistakes. We have already suggested that the construct and questionnaire survey type of research has simply led to a repetition of results (Ernst, 2002) and so not enough detailed knowledge has been published of the 'workings' of the NPD process within firms. For example we needed to discover why managers still ignore supposed NPD best practice and leave out some NPD steps. Another survey asking if the steps are carried out would not lead to an

understanding of behaviour. For this reason a case study approach into NPD practices was chosen as providing contextual richness and detailed explanations of practice.

## 1.4 Methodology

The research used a case study approach to examine NPD methods and organization in the UK Textile and Clothing Supply Chain. Seven firms involved in four typical supply chains in this sector were studied in detail. The access to these firms has been organised as part of a government initiative to improve the performance of the UKTCSC. The overall programme, the Industry Forum (I.F.), was a three year initiative worth £3.8 million (www.industryforum.net), funded equally by the government and participating UK high street clothing retailers and their supply chain partners. The sample of firms yielded data (regarding new product development) from projects designed to improve supply chain performance. One I.F. partner retailer, for instance, instigated projects to improve the speed of its new products development and also to enhance the product quality from a garment supplier. The researcher was employed as a consultant by the Industry Forum and acted as a facilitator for the retailer's projects over a twelve month period. Part of the project investigation into development speed required a mapping of the existing NPD process. The data collected for the process map has been used to investigate the research questions for the UKTCSC.

Not all of the twelve industry-led supply chain projects worked on by the researcher during eighteen months with the I.F. were relevant to NPD or had enough data to contribute in a meaningful way to the research. Nevertheless, four detailed supply chain case studies were of significance with regard to the research questions and form the basis of this thesis.

## 1.5 Outline of the thesis

The thesis has seven chapters that are linked as shown in Figure1.2.

Chapter One introduces the research topics and gives the background.

Chapter Two contains the main literature review, covering the themes of the existing research about NPD. The second chapter also discusses the importance and structure of the UK Textile and Clothing Supply Chain and explains how supply chains reflect a 'lean' focus in their innovation. The lean focus is then combined with the literature NPD themes in the development of eight propositions that underpin the current research.

Chapter Three explains the theoretical methodology choices and the reasons for the actual method used. One case study (KnitwearCo) data collection method is described in detail as an example of the general data collection approach. The issues of validity and reliability of the study's research methodology are discussed.

Chapter Four sets out the research analysis for each of the four supply chain case studies. Each of the NPD themes is investigated in detail for each case study through the mechanism of testing the eight research propositions developed in chapter two.

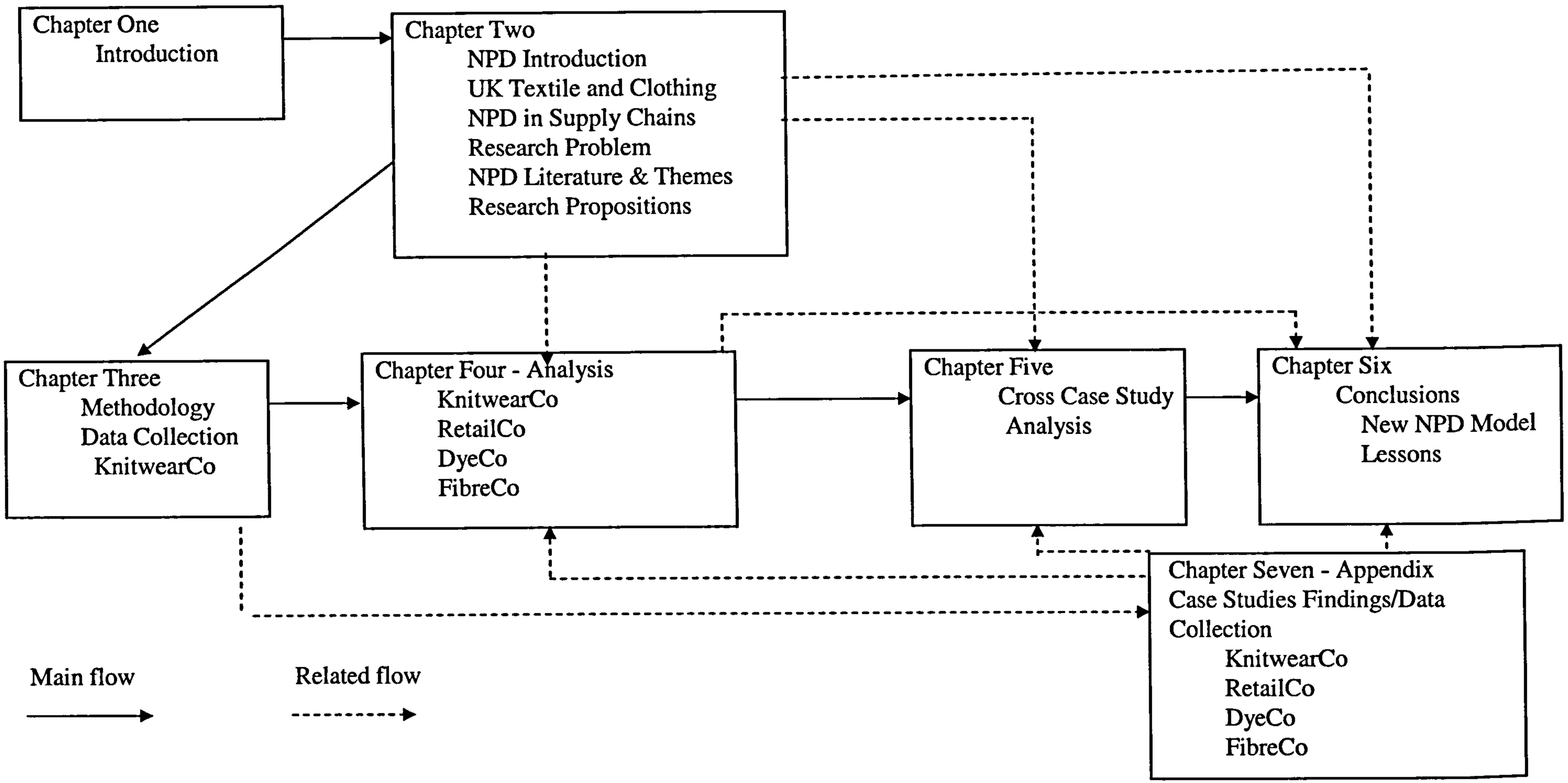
Chapter Five is a cross case summary and analysis for the four supply chains in the study.

Chapter Six presents the conclusions of the research and proposes a new conceptual model for retail clothing NPD.

Chapter Seven is an appendix where the original data findings from the sample of four detailed UKTCSC case studies are presented. Also included here are the detailed data collection methods for the remaining three case studies: RetailCo, DyeCo and FibreCo.

The thesis is organised as follows:

Figure 1.2



# Chapter Two - Literature Review

## 2.0 Introduction

Chapter one presented a brief introduction to the research. This chapter discusses the literature and previous theories about NPD.

First themes of existing conceptual models for NPD activities in firms are introduced and then these themes are used to structure the main body of the literature review. The chapter continues with a background summary of the trends in the UK Textile and Clothing sector before briefly examining literature on aspects of supply chain product development. The main body of the chapter then contains detailed examinations of the major themes of NPD literature. For each theme a research proposition is developed, linked to a supply chain 'lean' focus, that will help to answer the research problem. The chapter concludes with a summary of the research propositions.

Leading researchers, (Cooper and Kleinschmidt 2000; Griffin 1997; Cooper 1994a; Wheelwright and Clark 1992, p2, Cooper 2001, p3; Craig and Hart 1992; Griffin 1997; Rothwell 1994) consider that there are four main external drivers of NPD in firms:

- Technological advances
- Global competition
- Changing markets and consumer needs
- Shorter product life cycles

"If the world was stable" (Griffin, 1997, p430) "there would be no need to change business operations and methods, nor to understand what has changed and what works well."

New Product Development success or failure can have a significant impact on the performance of the firm and this can be reflected in the way that the financial market views the firm. Cooper (2001, p8) links data from a *Fortune* survey on the *long-term investment* value of firms in the chemical industry to show that the 'degree of

innovativeness of the firm is the single strongest predictor of investment value'. Cooper estimates that 40% of company sales were from 'New' products, which he defines as those on the market for less than five years. Managers have long agreed that New Product Development is important. Craig and Hart (1992) cite a UK study by Bain consultants quoting that 74% of companies regarded innovation as 'very important' to company survival and the remaining 26% thought it was 'quite important'. New Product Development matters for most firms since without a steady stream of new products the existing range will naturally reach a period of decline in sales through the mechanism of the product 'life cycle'. Iansiti (1997) cites the semiconductor industry where firms have put more and more transistors into successive generations of memory chips (DRAMs). Those who failed to keep up had to exit the market.

How managers respond to these four external forces driving firms to develop new products has been the subject of a great deal of research and publication.

## 2.1 Conceptual Models of NPD

> **"...but what, exactly, does an innovative enterprise look like? Yes we can see its products, but its workings are all too obscure."**
> **(The Editors, Harvard Business Review, August 2002)**

The body of literature on New Product Development (NPD) is a complex and confusing one (Craig & Hart, 1992). For the past 30 years there has been conceptual and empirical research (Ernst, 2002) to identify the critical success factors in NPD. Conceptually there have been a number of different models of innovation and NPD proposed; from First Generation 'technology push', then to a 'market pull' and so on to a Fifth Generation faster, cheaper 'lean innovation' model (Rothwell, 1994). Empirically there have been studies to determine those NPD processes and activities within the control of firms that can have an impact on the success of new product developments (Cooper, 1975, 1979, 1985b, 1988, 1994; Cooper & Kleinschmidt, 1987, 1995, 2000; Montoya-Weiss & Calantone, 1994; Song & Parry, 1996;). Tools and methods used by firms in NPD have also been examined (Mahajan & Wind, 1992; Balbontin et al, 2000; Nijssen & Lieshout, 1995). Various organisational and decision making issues have been raised, including NPD strategy (Crawford, 1980; Cooper &

Kleinschmidt, 1995), how to organize NPD (Griffin, 1997, Millson & Wilemon, 2002), how to measure NPD success (Griffin & Page, 1996) and the type of innovation that a firm aims for - either similar products (defensive) or more risky new innovations (offensive) - for new markets (Cooper, 1985a; Kleinschmidt & Cooper, 1991; Cooper & Kleinschmidt, 1995, 2000).

Failure of new product projects remains high both within the NPD process and after launch (Cooper, 1995). New Product success rates can be improved (Cooper, 1996) but this requires firms to adopt the lessons of the research and implement a high quality NPD process. Cooper (1996) also suggests that a clear and well-communicated NPD strategy is also needed along with adequate resources of people and funds.

There are a number of issues that have been studied in NPD research. Craig & Hart (1992) have summarised these as themes shown in Figure 2.1 below:

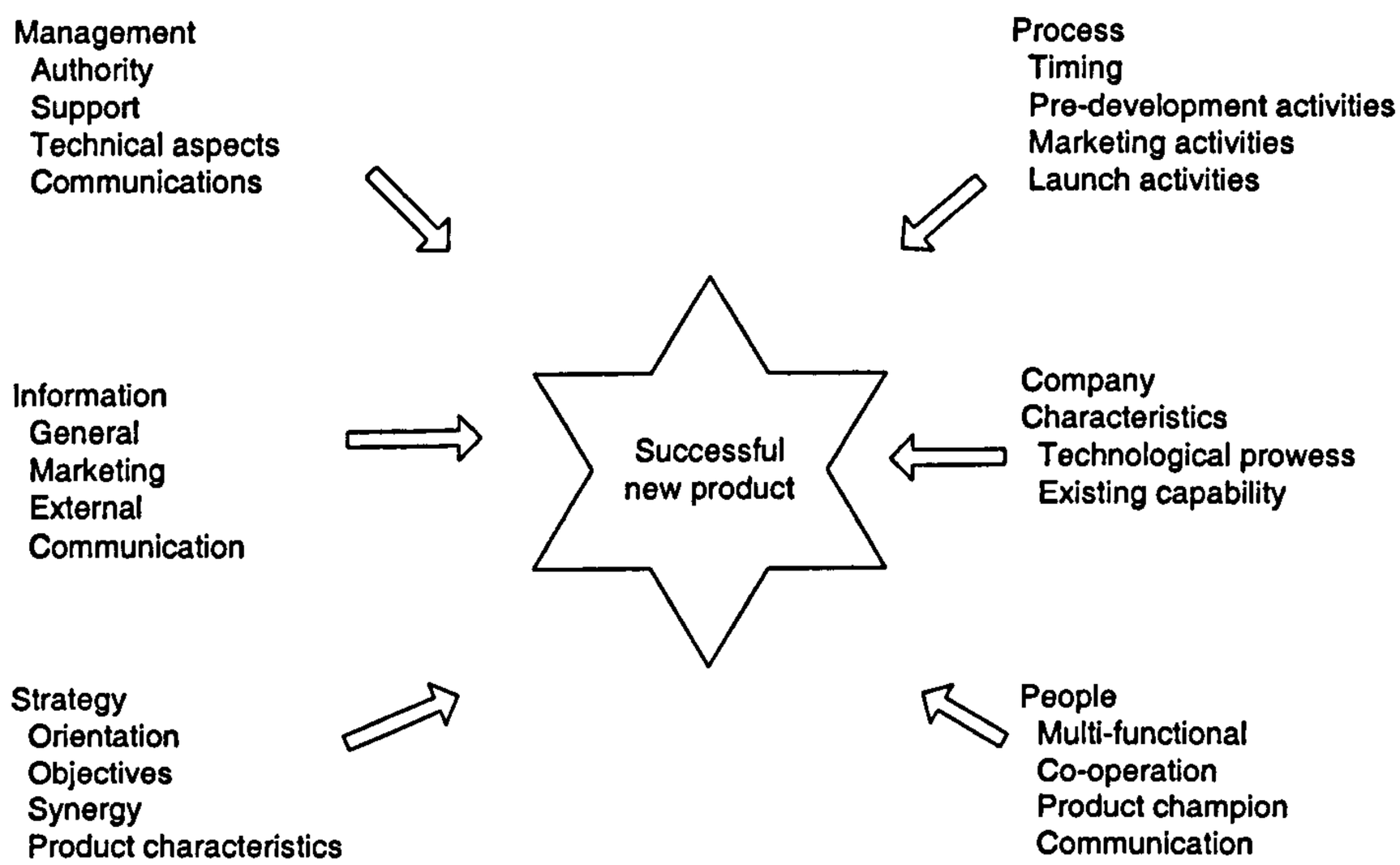



Figure 2.1: NPD Themes. Source: Craig & Hart, 1992

In the diagram it is suggested that a successful new product can be created by the right combination of NPD process activities, an NPD strategy run by the correct organization of project staff and a senior management that are committed and involved. In addition Craig & Hart claim that the company characteristics should match the market needs with the whole NPD process and organization aided by good use of information and communications.

Cooper & Kleinschmidt (2000) have also developed a conceptual model that shows a similar list of various factors that impact on the generation of new products - that have advantages and are then successful. This is shown in Figure 2.2 below:

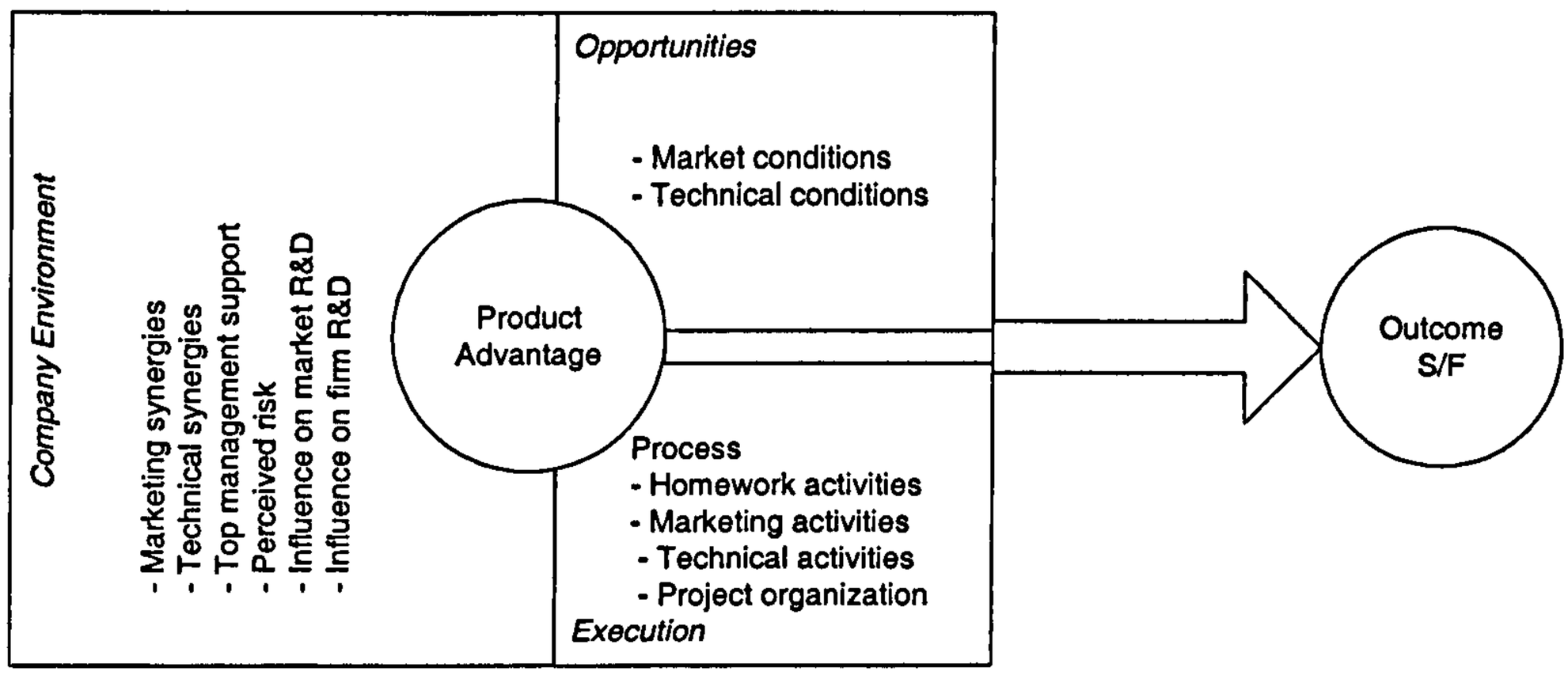



Figure 2.2: NPD Factors. Source: Cooper & Kleinschmidt, 2000

There are no universally agreed conceptual models of the issues surrounding NPD. There are also gaps in the existing research and whilst there has been a great deal of research into success factors, the methods used have been criticised as weak with their use of dozens of constructs and questionnaires aimed at only a few, possibly biased, managers within firms (Ernst, 2002). Whilst the literature is complex and confusing it nevertheless provided a benchmark against which the findings of the investigation of NPD in the UK Textile and Clothing Supply Chain could be compared in order to establish if the sector demonstrated any significant differences in methods and organization from the literature.

In order to make this comparison eight supply chain oriented propositions were developed using the literature themes and a supply chain focus.

The main methods and organization identified in the literature concern:

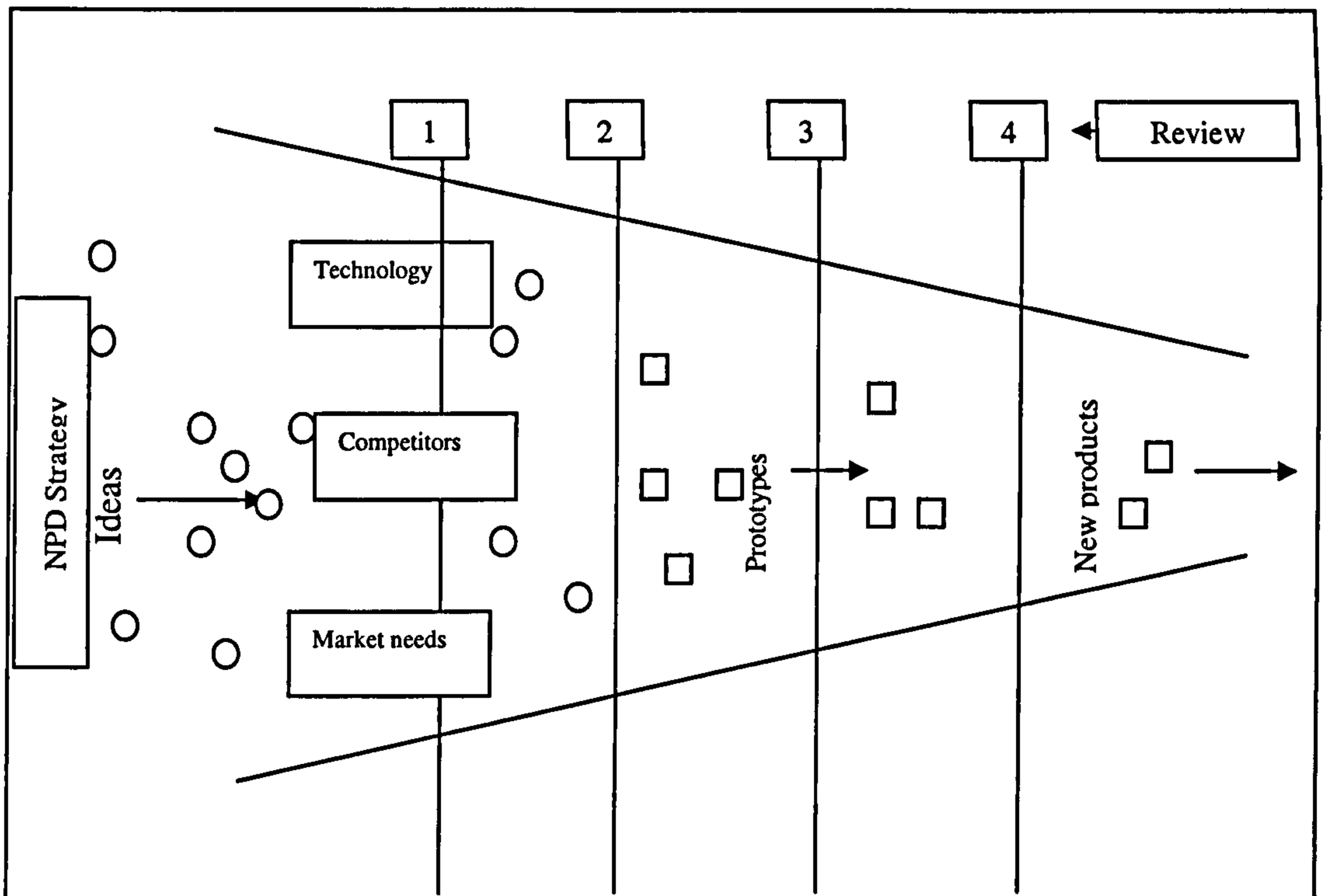
1. The innovation funnel
2. The process stages and activities
3. The NPD strategy and orientation
4. The organization of resources devoted to NPD
5. Tools and methods

These are outlined briefly below and discussed in more detail in the literature review.

- Many ideas and concepts enter an NPD funnel (Iansiti, 1997; Wheelwright & Clark, 1992, p112).
- The funnel has various stages and review gates (Cooper, 1996) where decisions are made that focus the limited resources of the firm on to the products that offer the best opportunities and fit with the NPD strategy of the firm.
- The NPD process has an aim of producing new products that fit in with the strategic direction of the firm. The strategy (Crawford, 1980) includes the market stance that the firm takes; the targets and measures used and risk taking or level of innovation.
- The resources devoted to NPD concern the organization structures, involvement of senior management and project team structure (Page, 1993).
- Firms use a limited number of tools and methods to assist in the NPD process from idea generation (Mahajan and Wind, 1992), to portfolio management (Cooper & Kleinschmidt, 1988).

In addition the literature discusses the degree of newness of new products and how NPD success is measured. Figure 2.3 below shows how the various NPD themes are linked in the view of the researcher with ideas entering the NPD process that has a set of main stages and NPD activities. The firm's NPD process takes place within an overall NPD strategy and organizational structure. The firm may opt for a high or low level of newness and may measure NPD success in various ways and use organizational structure and communication tools to aid the NPD process.

The research has therefore investigated the five areas listed above and also the three areas of the degree of product newness, success measures and use of NPD communication tools. The research has developed eight propositions to test each area.




| Aim | A superior product | | | | |
|---|---|---|---|---|---|
| **Stage** | **Ideation** | **Business Case Development** | **Product development** | **Testing & validation** | **Launch** |
| **Process** | *Idea gathering* | *Preliminary market & technical assessment. Build business case* | *Product development* | *In-house and customer tests. Test marketing and pilot production. Pre-launch business analysis* | *Production ramp up and marketing activities* |
| **Strategy** | *NPD Strategy, Success measures, Degree of newness, Market orientation* | | | | |
| **Resources** | *Idea sources, Organizational structures, Senior management, Project Teams* | | | | |
| **Tools & Methods** | *Techniques to improve NPD: Idea generation, portfolio selection* | | | | |

Figure 2.3: NPD Literature Review Related Issues

The literature review below begins with consideration of the trends in the UK Clothing Supply Chain at the time of the research in 2001, and then considers the question of NPD in supply chains before discussing the development of the test propositions.

## 2.2 The UK Textile and Clothing Supply Chain

### *Introduction*

The UK Textile and Clothing Supply Chain (UKTCSC) is an important manufacturing industry supporting the clothing retail sector. Textiles include fibres, yarns, fabrics, carpets, interiors, household textiles plus the allied dyeing and finishing processing of materials and garments. Clothing includes outerwear, underwear, knitwear and hosiery. Clothing retailers, at the time of the study, were under pressure from price deflation and were sourcing more clothes from offshore manufacturing. The textile and clothing supply sector in the UK was in decline (DTI, 2000). Plans to help the UK manufacturing sector included the Industry Forum Supply Chain project designed to improve collaboration, performance and spread best practice.

### *The UK Clothing Market*

An informative summary of the Clothing Industry Market was given in Keynote 2003. This stated that the Clothing market in the UK was worth £32.6 Billion at current retail selling prices (Keynote, 2003). It went on to describe further details. For instance the market had grown by between 4 and 5% per year for the past 5 years and this trend was expected to continue (Figure 2.4).

| £ 000's | 1998 | 1999 | 2000 | 2001 | 2002 | % Change 1998-2002 |
|---|---|---|---|---|---|---|
| Clothing | 27,810 | 28,960 | 29,500 | 31,350 | 32,600 | 17.2 |

Figure 2.4: Clothing Retail Sales Trend

Whilst clothing sales had grown in the period 1998 to 2002 by 17.2% there was a continuing decline in the expenditure on clothing as a proportion of household expenditure and the share of expenditure was now only 6% having been 10% in the 1960's. Gender plays a large part in clothing purchases with two thirds of clothing bought by women and girls.

There had been *deflation* of 15.5% in the price of clothes and footwear over the past 5 years to 2002 as shown in the table in Figure 2.5 below:

| £ 000's | 1998 | 1999 | 2000 | 2001 | 2002 | % Change 1998-2002 |
|---|---|---|---|---|---|---|
| Current prices | 32,375 | 33,530 | 34,150 | 36,350 | 37,750 | 16.6 |
| Constant 1998 Prices | 32,375 | 34,600 | 36,800 | 41,400 | 44,675 | 38.0 |
| Prices index (1998=100) | 100.0 | 96.9 | 92.8 | 87.8 | 84.5 | -15.5 |

Figure 2.5: UK Clothing and Footwear Retail Price Deflation. Source: Keynote, 2003.

Hence clothing retailers had been forced to compete on lower prices and this had led to a continuation of the trend towards the import of cheaper manufactured clothes. Import penetration was very high, estimated at 90%. There had been an acceleration of this import trend with a move by Marks & Spencer to source more of their clothes from offshore manufacturers.

## *The UK clothing manufacturers*

There had been a rapid decline in size of the clothing manufacturing sector and this continued with new closures announced in 2002/3, including SR Gent PLC closing two factories; Alexon Group PLC closing a clothing factory at Pontypridd; Desmond & Sons Ltd of Northern Ireland announcing the closure of three clothing factories at a cost of over 300 jobs; Barbour (Europe) Ltd, famous for its outdoor coats, concentrating production in one, rather than two, sites in the North East; Albert Martin reducing employment at its clothing factory in Sutton-in-Ashfield; Velmore Fashions (Ellesmere Port), British Buttons (York), Grasshopper Babywear (Wolverhampton) Flude & Company, James Bennett and Aspira Leg &Bodywear all cutting jobs and Coats Viyella selling its main assets, the Jaeger and Viyella brands, in order to concentrate on its global threads business.

Clothing manufacture covers various garment categories, including underwear and outerwear. Firms were generally not specialised and had a small number of employees, turnover and profit (Figure 2.6).

| | Men's Outerwear | Women's Outerwear | Other Outerwear | Underwear |
|---|---|---|---|---|
| Number of companies | 54 | 140 | 335 | 50 |
| Turnover (£000) | 3378 | 2752 | 706 | 1185 |
| Pre-tax profit | 60 | 42 | 12 | 8 |
| Pre-tax margin | 0.2 | 1.9 | 2.4 | - |
| Turnover per employee | 63007 | 171478 | 76116 | - |
| Average remuneration | 15304 | 19946 | 15304 | - |

Figure 2.6: UK Clothing companies' size. Source: Keyote,2003

The table in Figure 2.6 shows those firms registered for VAT with a turnover in excess of £56,000. Many firms did not concentrate on men's or women's and are in the Other Outerwear category. These firms were small with a turnover averaging £706,000 and a profit of only £12,000 per year. There was a concentration of larger womenswear firms. When employment per site is used as a measure (Figure 2.7) the fragmented structure of clothing manufacture was evident with 69% of firms having less than 10 employees and only 10 of the firms having more than 500 employees on one site. This fragmentation may account for the limited research studies, so far, about clothing NPD.

| Employee Sizeband | | | | | | |
|---|---|---|---|---|---|---|
| | Under 10 | 10-49 | 50-199 | 200-499 | 500+ | Total |
| Clothing | 4,100 | 1,480 | 315 | 70 | 10 | 5,975 |

Figure 2.7: UK Clothing Employment by firm size. Source: Keynote, 2003

The Textile and Clothing Supply Chain that supports the retailers includes the following sectors and employment (Figure 2.8).

| Sector | Employment Estimates (1998-2000) |
|---|---|
| **Clothing & Knitwear** | |
| Clothing manufacture | 117,000 |
| Knitwear & Hosiery | 45,300 |
| **Textiles** | |
| Wool | 15,500 |
| Linen | 4,000 |
| Technical | 25,600 |
| Knitted Fabrics | 4,000 |
| Carpets | 17,600 |
| Interior Textiles | 20,000 |
| **Dyeing & Finishing** | 19,900 |

Figure 2.8: Sectors and Employment. Source: A National Strategy for the Textile & Clothing Industry, 2000, DTI.

In spite of the high import penetration the Textile and Clothing sector remained important to the UK economy. The Department of Trade and Industry published a report in 2000 outlining the importance of the sector citing that it was the 9th largest sector in the UK with a turnover of £17.7 billion in 1998 and exports of over £5.1 billion. The report stated that the sector employed 277,000 people across the country, as at January 2000. The gross added value of the industry was around £6.75 billion. Within the sector there were some significant sub sectors such as Clothing and Knitwear which contributed £3.5 billion of added value, had sales of £8.1 billion, involves over 7,370 firms and employed 177,000 people. The average employment by each firm was therefore only 24 people and the average level of annual sales by each clothing firm was just over £1 million. Clothing production had fallen by 40% in the four years to 1999 as the large High Street retailers had changed their purchasing policies and exports had also fallen. The Knitwear and Hosiery part of the industry employed 45,300 people and had sales of £1.5 billion whereas the Clothing sector had sales of £6.6 billion and employed 117,000. Dyeing and Finishing had sales of £882 million, employed 19,900 people and offered the opportunity to ensure that colour decisions could be taken at the last possible moment and changes in fashion and taste could be responded to quickly by the supply chain.

So the clothing supply sector whilst important was in decline and this led the government to set up a working party to investigate the problems and propose solutions in the Department of Trade and Industry National Strategy Document published in 2000. This was followed by the setting up of the Industry Forum.

Since the Strategy Document publication in 2000 the textile and clothing sector has continued to see a decline in employment numbers. By June 2004 the employment level in Textiles and Clothing had fallen by 42% to 162,000 according to the Office for National Statistics Labour Market Trends Report for November 2004.

## *Industry Forum Initiative*

The Strategy Document (DTI, 2000) made several recommendations:

Firstly to build on the existing strengths:

1) Manufacturer/retailer co-operation to establish stronger and more efficient supply chains;

2) More effective use by the industry of the UK's design talent;

3) How better to exploit the technical expertise and resources available in our universities and colleges;

4) The effective promotion of the industry's reputation for quality and excellence in specific product areas.

Secondly to tackle some industry weaknesses:

5) Enhancing innovation by collaboration;

6) Improving and formalising training and career development;

7) Strengthening marketing skills;

8) Improving the image of the industry to make it more attractive to new recruits.

Finally there were steps that others could help with:

10) The need for Government to ensure a level playing field;

11) The importance of easier access to the right kind of public sector support;

12) The need for universities and colleges to offer appropriate training opportunities

The Strategy Document report went on to specify that good supply chain management and relations was the key to responding to retailers needs to have the right goods at the right price at the right time and in the right place. In particular the report further recommended that:

> **'The Apparel and Textile Challenge (AT&C[1]) should seek to disseminate best practice case studies in supply chain management to companies in the textile industry. The work of the AT&C should be extended and expanded to include relations throughout the supply chain including yarn and fabric suppliers, designers, dyers and finishers, clothing manufacturers, distributors and retailers. This work should be supported by the DTI under the 'Industry Forum' initiative. High level support, including a financial contribution, from firms in all parts of the supply chain should be given to the work of the AT&C, with participants ensuring that this commitment is communicated throughout their organisations.'**

A National Strategy for the Textile & Clothing Industry, 2000, DTI.

The supply chain was thus being encouraged to work together throughout its length and to make a commitment at all levels. The use of best practice case studies was to be encouraged and universities also involved. As a direct consequence bids were requested for organisations to work on this brief to create an 'Industry Forum', modelled on some of the previous forum type activities in the automotive and ceramic sectors.

The UK Textile and Clothing Supply Chain Industry Forum (I.F.) initiative was set up in 2001 and aimed to improve the performance of UK based firms through the use of a team of external consultants and university academics who would work with project teams within a number of firms to solve problems that were selected by the firms

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[1] The AT&C was founded in 1995 to develop more effective apparel and textile UK supply chain partnerships.

themselves. The time scale of each project would be relatively short, of the order of 12 to 16 weeks, due to the funding mechanism of the Department of Trade and Industry. Individual firms could nevertheless become involved in a series of projects provided they were prepared to contribute to the project both in terms of finance and staff who could devote time to the work. One important aspect of each project was that the findings would be disseminated as best practice Case Studies to other members of the Industry Forum partnership. The Industry Forum involved two universities, Cranfield and Salford, each with a team of three that comprised a senior researcher, a research fellow and a research assistant. The Salford research fellow (the researcher) was encouraged to develop close links with particular firms and to work individually on specific projects and use his own projects as a basis for individual research study. This study into NPD is one of the outcomes. The research assistant at Salford, on the other hand, was interested in how firms measure overall performance and the senior researcher took maternity leave. The Cranfield researchers worked on their own projects helping firms but the staff left in the middle of the Industry Forum work and did not carry out research studies.

There was also an administration office based in London where the Industry Forum Director Ken Watson was based with his secretarial staff at 5, Portland Place, just off Oxford Circus. The Director was instrumental in canvassing support from the major UK retailers and making initial contact with the senior managers of firms in the supply chain. The retailers supported the Industry Forum with direct funding and were also helpful in directing the Industry Forum team towards their suppliers who had particular problems that might benefit from some independent help. The DTI provided £1.9 million of funding for three years with firms themselves providing a further £1.9 million of staff resources working on projects. This initiative provided for the first time a strong basis from which to address NPD related issues in the Clothing Supply Chain.

The research for this thesis is based on the data collected from a series of these Industry Forum supply chain case studies with the objective of understanding the New Product Development methods and organization of the UK Textile and Clothing Supply Chain.

## 2.3 New Product Development in Supply Chains

**"It was often said that Marks & Spencer was Britain's biggest manufacturer without owning any factories and that suppliers were retailers without shops. For decades this symbiotic relationship provided low prices and flexibility for M&S and security for the supplier."**
**The Rise and Fall of Marks & Spencer, Bevan, 2002**

As we have seen (section 2.2) the UK Textile and Clothing Supply Chain is under pressure from cheap clothing imports. The government strategy document has suggested that one way to counter this continuing import threat is from better performance from the UKTCSC. But what does better performance require. Is a more responsive supply chain wanted or one that can minimise stocks and hence risk? Or are both responsive and low stocks possible at the same time? The strategy document also suggested that the UKTCSC work together to enhance innovation. The next section examines some of the theoretical options for supply chains including 'lean' management, Quick Response, 'agile' management and supply chain innovation models.

### 2.3.1 Supply Chains and Lean Thinking

Supply chains stem from the concept, first introduced by Toyota in Japan, of not owning all the manufacturing for making automobiles but buying in components and controlling suppliers (Cox, 1999). Supply chains have since been the basis of aspects of the 'lean management' paradigm that has the following features according to Cox:

- Constant improvement in value for customers
- Just in time methods
- Waste reduction
- Stakeholders
- Collaboration
- Demand driven
- Preferred suppliers

Some of these aspects concern operational issues of delivery and logistics. The ideas of just in time and being demand driven, for example, imply a focus of fast response in

delivery. Yet the ideas of having preferred suppliers, stakeholders and collaboration suggest that a supply chain may act beyond the level of logistics to one of sharing of resources. This sharing may include innovation (Rothwell, 1994) or the co-operative relationships and sharing of demand information suggested by Forza & Vinelli (1996). Leanness whilst aiming to respond quickly nevertheless does not necessarily lead to low inventories in supplying firms (Bruce et al, 2004).

The information technology revolution offers faster exchange of information and therefore supply chain management has become more important as a competitive weapon (Cox, 1999). However as with the Toyota approach, supply chains are defined by the degree to which a firm wants to concentrate on its core competencies or have ownership or influence on the raw materials and components that it needs.

The objectives of a lean supply chain may lead to goals for those involved and supply chain management has three objectives according to Boubakri, 2002:

1. Get the right product to the right place at the least cost.
2. Keep inventory as low as possible and still offer superior customer service.
3. Reduce cycle times.

Boubakri considers that many studies on supply chain management have focussed on transport and limited themselves to the operational systems that move goods from factory gate to customer.

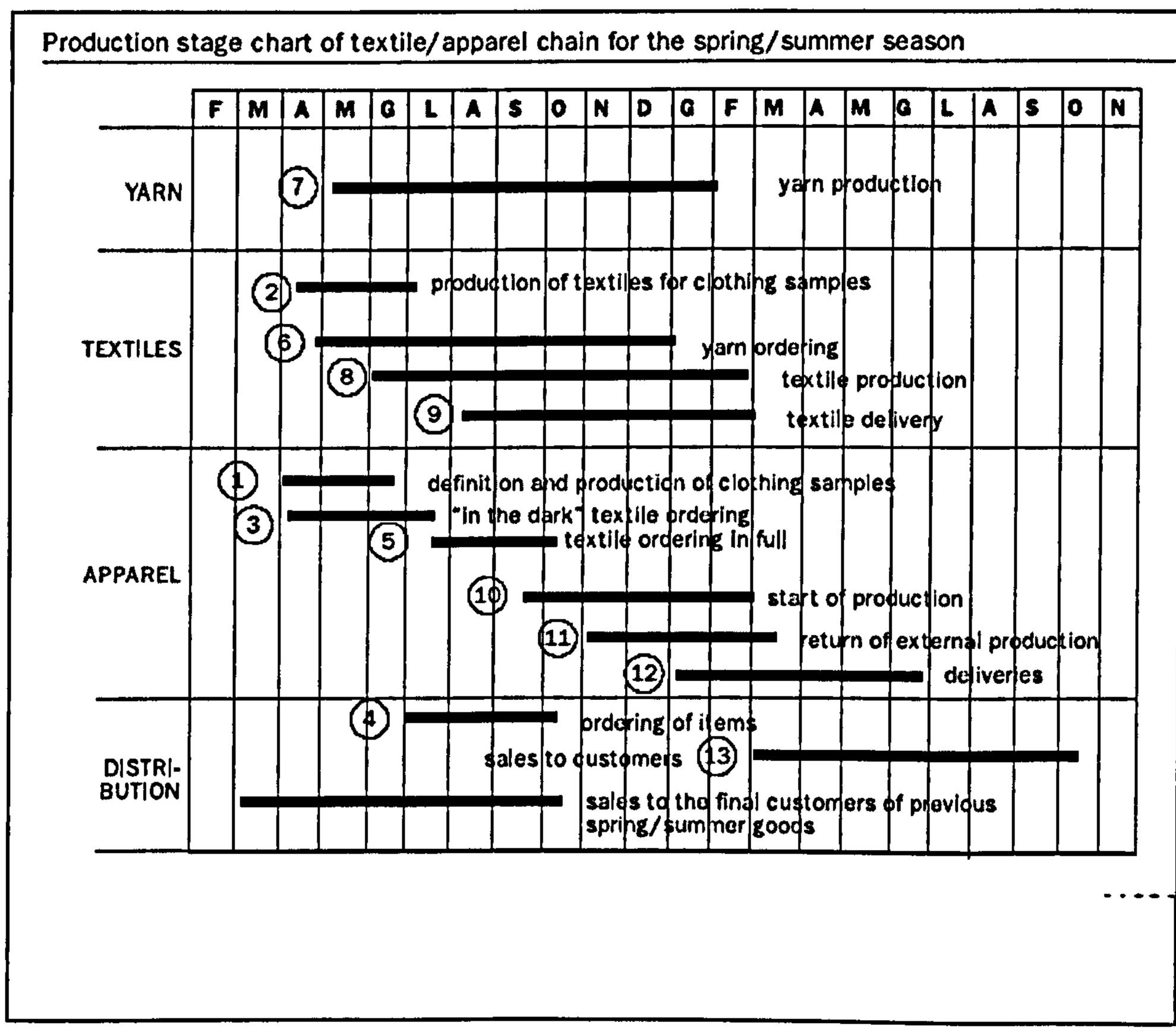
In a similar way the operational aspects of the Clothing Supply Chain have also led to the concept of Quick Response in the USA as a means to counter low cost imports.

## 2.3.2 Quick Response

As we have seen supply chains are designed to bring advantages (to the retailer) of cost reduction and speed of response. However the clothing sector has high levels of demand uncertainty (Abernathy et al, 2000) and the difficulty for a clothing supply chain operationally is then how to resolve the conflicting demands for speed of response with the apparently long lead times of parts of the supply chain (Forza & Vinelli, 1996).

Quick Response uses information feedback and fast production cycles from local manufacturers to meet changing consumer demand. Unfortunately the textile and clothing supply chain whilst aiming to replace products in retail stores every six months and, at the same time respond to market needs, has some quite long lead times shown in the chart in Figure 2.9 below (Forza & Vinelli, 1996). It takes almost 21 months to move from yarn to clothes into stores.

Figure 2.9. Lead Times in Clothing Supply. Source: Forza & Vinelli, 1996



Forza & Vinelli recommend that there needs to be better relationships between retail distributors and the suppliers with more exchange of information for the process of quick response to be achieved. Changing supply methods can also speed up response. Fabric can take 10 months to be sourced and yarn nine months. Garments require fifteen months to move from design to deliveries. New methods of using later dyeing of fabric or yarn rather than fibre may be a faster process since delivery times are quicker (Figure 2.10).

> "Fabric delivery time can be dropped from the typical 120 days of fibre dyeing to 30 days using piece dyeing and to 60 days using yarn dyeing".

Figure 2.10. Lead Times in Clothing Materials. Adapted from Forza & Vinelli, 1997.

Quick Response (QR) has been used in the USA textile and clothing supply chain as a means to counter the rise in cheap offshore imports (Hunter & Valentino, 1995). The Hunter & Valentino study explains that the QR concept was that local manufacturers could respond more quickly to changing consumer demands for clothing. The report goes on to suggest that, the clothing sector is complex with a huge amount of product variety (for example, a large department store typically carrying 1.2 million items). Fashion changes make the shelf life of a product low and the supply base that is fragmented. After 10 years of trying QR the USA experience, reported in this study, was that productivity was no better and that the level of stock (inventory) was no better. It also found that consumers were still finding product shortages (stock outs) and forecasting accuracy was no better with an increasing frequency of "sales" and deeper markdowns of slow selling items. Relationships between retailers and suppliers had not moved from an adversarial one. Better techniques for modelling forecasts and better electronic links were then recommended.

A similar stock position has been shown to exist in the UK clothing supply chain (Jones, 2002) with industry clothing goods for sale stocks rising by 47% in the five years to 1997, possibly due to inaccurate forecasting and unpredictable markets.

There needs to be a flow of information ( Abernathy et al, 2000) to enable an entire supply chain to respond in the manner of a 'lean' model. Additionally the logistics aims

of a supply chain are to feedback information on demand from retail stores to suppliers. The QR flow of goods and demand information is shown below in Figure 2.11 (Abernathy et al, 2000). This study suggests that the problem remains however for local high wage economy manufacturers since they cannot compete with cheaper offshore production on the basic lines, even allowing for stock write downs in stores.

The overall conclusion of the Abernathy study is that local QR supply chains have not produced the expected benefits. It appears that the speed and response benefits of a local supply chain have yet to materialise to counter the attractions to retailers of cheap offshore garment supply at a time of deflation in clothing retail prices.

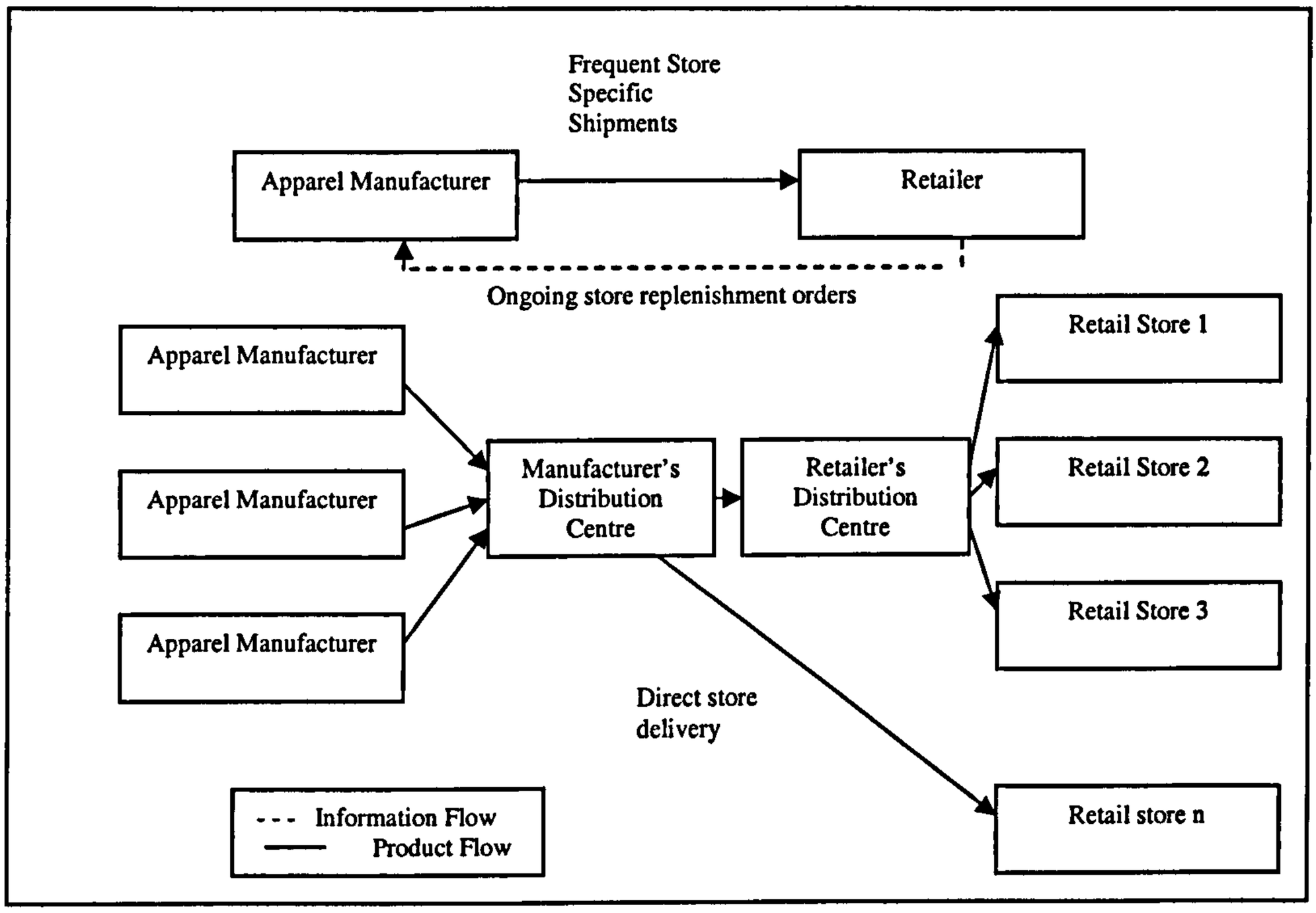



Figure 2.11. Flows of Information and product in a QR system. Source: Abernathy et al, 2000

The alternative to local supply for the retailer may not simply be wholly offshore supply. There may be a better solution in the use of a mixed supply approach (Warburton & Stratton, 2002). A mixed approach using a focus by local high wage manufacturers on only a proportion of the sales on the more unpredictable lines may be best. The authors here cite an example of a mixed sourcing approach. First the wholly

offshore route (Figure 2.12) with an assumed forecast error of 25%. Lost sales and lowering of margins are the end result.

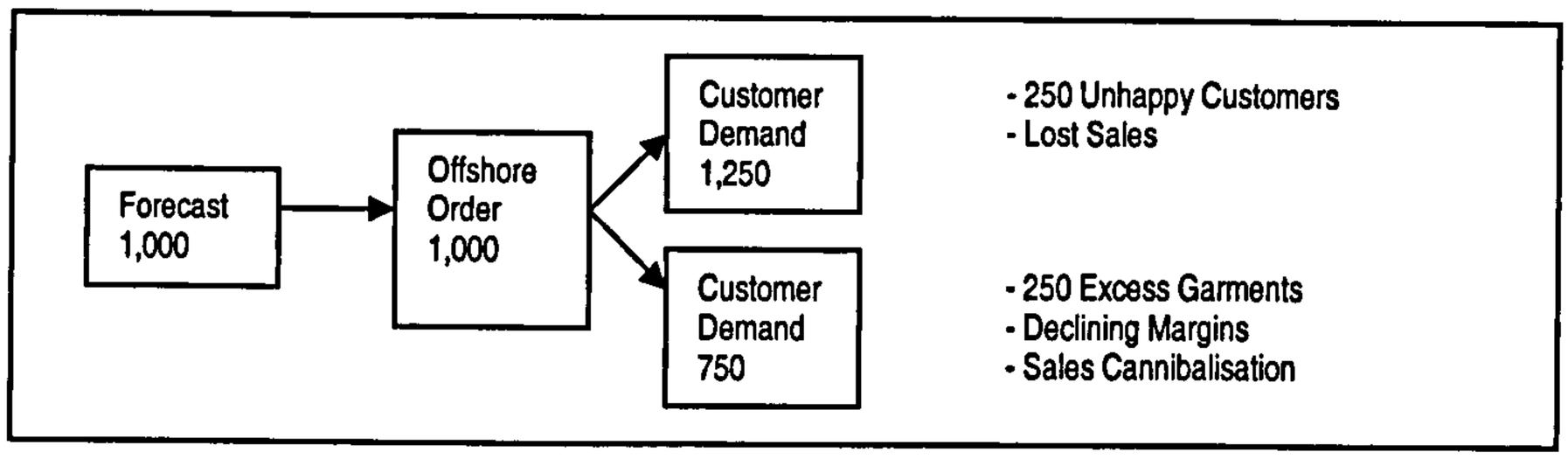



Figure 2.12. Offshore Forecasting Model. Source: Warburton &, Stratton 2002

The contrast is with the mixed offshore and QR route (Figure 2.13) where demand uncertainties can be accommodated and customer service improved.

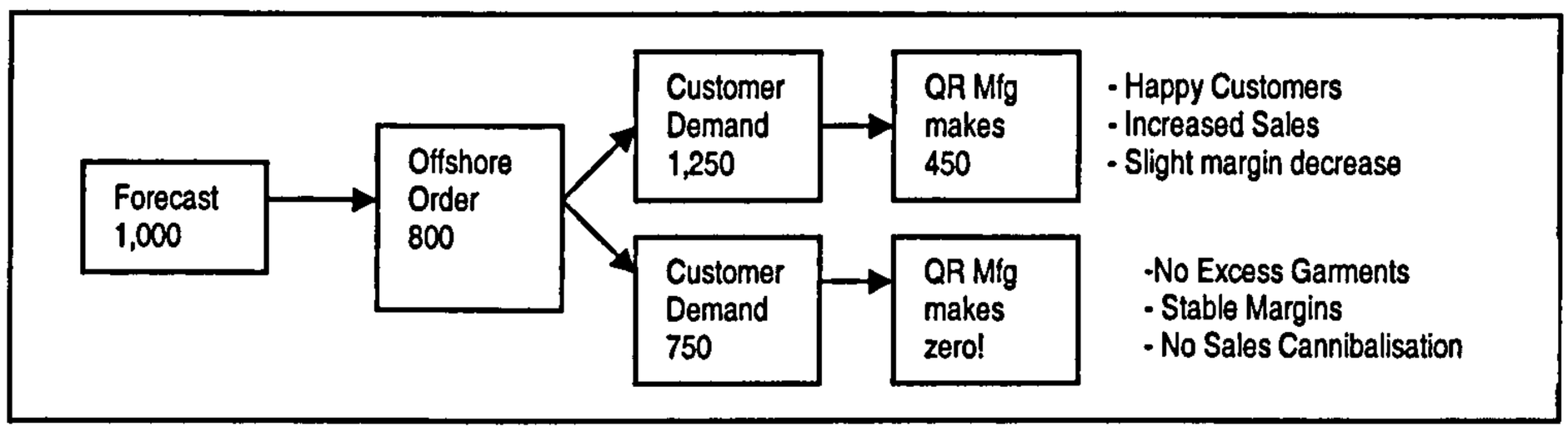



Figure 2.13. Domestic Quick Response Model. Source: Warburton & Stratton,, 2002

Perhaps the 'lean' responsive model of the supply chain does not apply to fashion.

It has been suggested that the fashion industry reflects more of the needs of an 'agile' model with high costs of obsolescence, due to the presence of high variety, volatile demand and a short product life cycle. Christopher & Towill (2001) cite the use of ordering of undyed yarn and colouring later to achieve this kind of quick response. The agile model is defined as the ability to achieve fast response through the use of shared information and information technology.

A high wage UK domestic clothing supply chain may then need to be much more responsive to fast changing consumer demand and adopt an agile approach. However the need for the collaboration within the supply chain may suggest a lean model.

There are difficulties in achieving both leanness (low production cycle time, but high inventory in the supply chain) and agility (fast response to volatile demand using I.T. and shared information) at the same time and the Textile and Clothing Supply Chain may be somewhere in the middle and use some aspects of both the lean and agile models (Bruce et al, 2004) as a result of the volatility of demand and low margins. Whilst not all garments have low margins the price *deflation* in the sector is undeniable.

The UKTCSC government strategy report suggested that, apart from having a more efficient supply chain, the UK needed to improve the degree of co-operation on innovation.

In a fast moving fashion environment new products are needed that can be developed quickly. Innovation may give a lever with which suppliers can compete with offshore cheap basic products.

The UK Textile and Clothing Supply Chain may therefore operate in a lean mode or an agile mode when responding to consumer demand. Before demand occurs however new seasonal products will need to be developed. How this development takes place in supply chains is therefore now considered.

### 2.3.3 Product Development in Supply Chains

The UK Textile and Clothing Supply Chain includes the manufacturing of fibres, yarns, fabrics and garments. The garments are ultimately made for retail distributors to sell to consumers. Many of the goods sold by UK clothing retailers are own brand. The large UK own brand retailers such as Marks & Spencer do not own clothing factories (Bevan, 2002). New clothing designs are then produced by necessity through collaboration with preferred supply chain partners. Large dominant retailers have however been seen as much stronger than the smaller suppliers (Bruce & Moger, 1999). Indeed power is a key factor in supply chain relationships, according to Cox (1999) who considers that supplying firms do not primarily enter into supply chain relationships in order to pass cost savings on to customers; they seek to appropriate value for themselves.

The collaboration with suppliers on new product development can nevertheless be a new source of competitive advantage (Birou & Fawcett, 1993) with the ability to respond quickly to changing customer needs, although adding to the complexities of the inter-disciplinary nature of NPD within most firms may be a major hurdle to the process. The authors cite the advantages of supplier involvement in Integrated Product Development (IPD) as:

- Reduced development time with fewer costly redesigns
- Better communication and a subsequent reduction in duplicated efforts
- Substantial cost savings from higher productivity and lower maintenance
- More reliable products with fewer recalls and enhanced customer satisfaction
- Improved financial performance

Whilst there may be agreement on the potential advantages of a supply chain, the risks of NPD in individual firms are already high and collaboration with suppliers (and others) may accentuate these (Littler et al, 1995). Although success may be hard to gauge (Bruce et al, 1995) the downsides of collaboration have been encountered in some industries, although as collaboration experience grows these fears may diminish. Bruce at al remind us that:

- there may be leakage of a firm's skills
- a loss of control over the NPD process
- costs may not in fact reduce
- the collaboration may acquire a life of its own and the project agenda be lost.

For supply chain innovation to work well there also needs to be a strong product champion with top management support in each collaborating company (Bruce et al, 1995) since, perhaps not unexpectedly, personalities and trust can have an impact on the outcome. Frequent contact is required between parties (Littler et al, 1995) and a clear perception of equal benefits. Bruce et al (1995), however, found that managers in 300 UK suppliers in the information and communication sector were somewhat weak in their support of the supposed benefits of collaboration. More partnership experience of suppliers did lessen the fears. Experience also leads to a greater sharing of information (Peterson et al, 2003) with early technology information sharing particularly helpful to suppliers when there is uncertainty about technology. Target pricing is often used.

Having suppliers truly involved in the NPD process as part of the development team led to higher achievement of project team goals in the Peterson study of industrial products.

Collaboration on development happens mostly at the concept stage (Melvor & Humphreys, 2004) with information exchange for all stages including market information, bought in component prices, technical suggestions, contacts, process capabilities, cycle time, process costs and process methods. Most suppliers used standard costing methods. Activity Based Costing and marginal costing were the least used methods. The concept stage discussions included definition of target markets, product architecture, building blocks of the product and key components.

Conceptually there may be different types of involvement of suppliers with a portfolio approach recommended for customers managing their supplier's involvement (Wynstra & Pierick, 2000). Some innovation relationships may require a low level of supplier involvement and be low risk and of a routine nature. Other collaborations may be higher risk and involve the supplier at a high level. Possible options are shown below (Figure 2.14). Buying firms are recommended to adopt a portfolio approach so that the appropriate level of resources can be managed on the relationship and project.

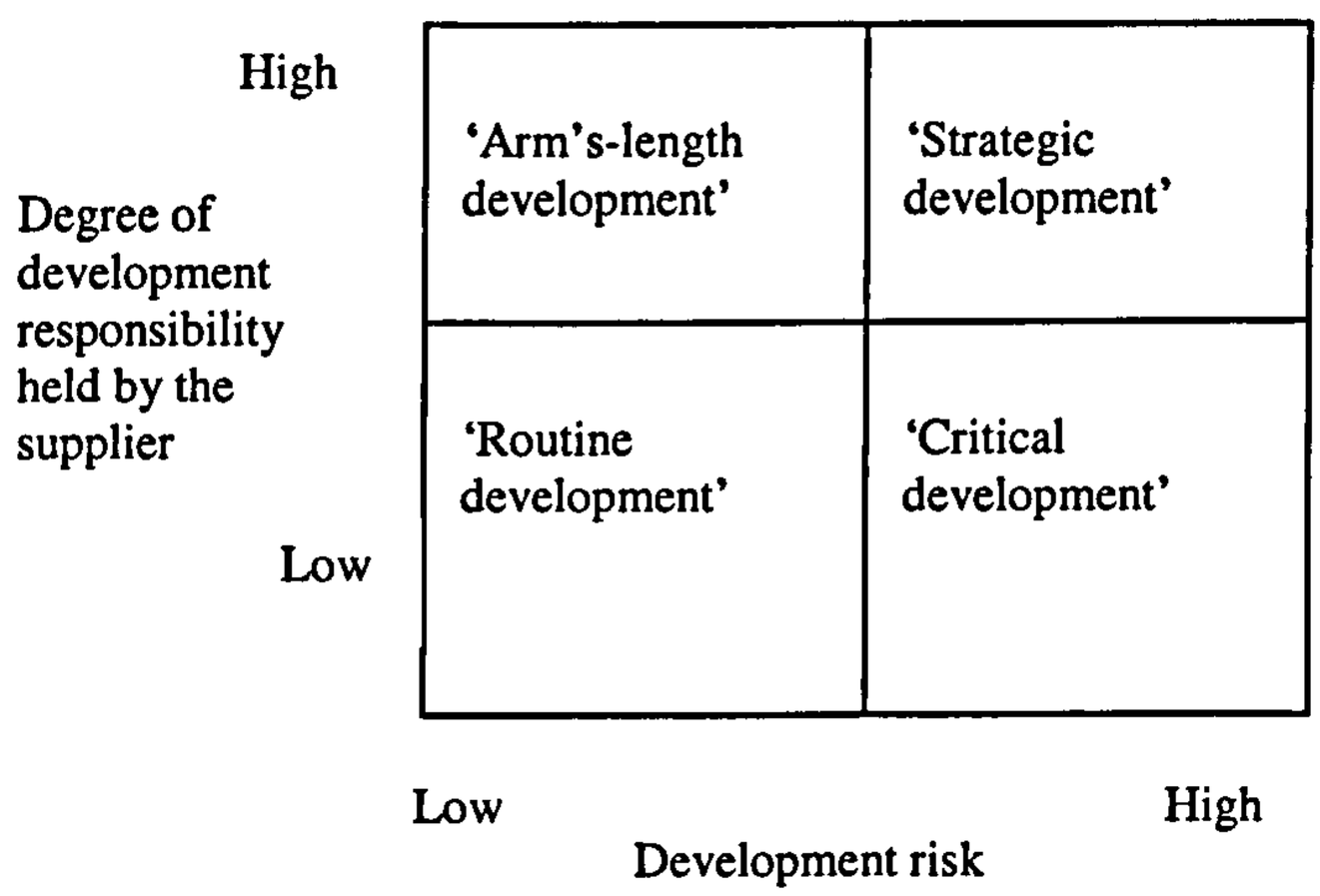



Figure 2.14. Supply Chain Portfolio Matrix. Source: Wynstra & Pierick, 2000

The vertical axis on the chart above is determined by reference to the degree to which activities are contracted out and the supplier given responsibility. At one extreme the contractor may be given a specification to produce an exact product. At the other extreme the supplier is given a broader global design responsibility and expected to

manage the detailed design and manufacturing validation themselves. The horizontal axis reflects the extent to which the production technologies are known or new and are therefore more or less risky.

## 2.4 The Supply Chain and the Research Propositions

New Product Development is known to be risky and difficult within individual firms and require specific stages, decision gates and organization within the firm to succeed (Cooper, 1994b). Partners in a supply chain might be expected to operate in different ways to firms developing new products independently.

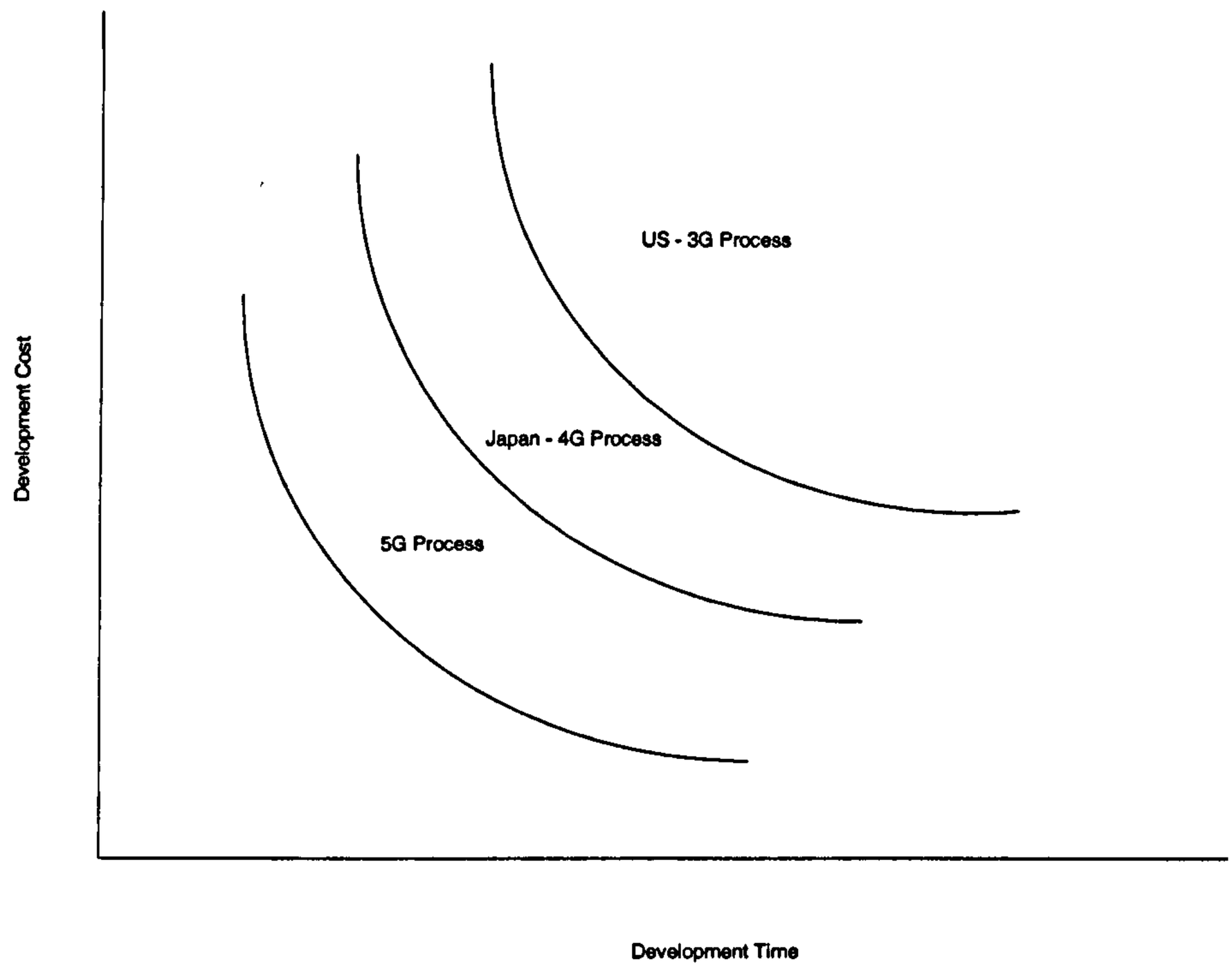
The literature regarding NPD is considered below and research questions posed that are answered in this study and give an insight into the methods and organization of NPD in the UK Textile and Clothing Supply Chain. Each NPD area of interest led to a research proposition relevant to the UK Textile and Clothing Supply Chain.

## 2.5 NPD Process Models

> **Today's second-generation systems have created dramatic improvements in the effectiveness of the process: for example higher success rates and fewer foul ups. Tomorrow's process will provide more efficiency – speeding up the process and better focus. (Robert G Cooper, 1994b)**

It has been shown that having a formal NPD process improves the success rate of new product projects (Griffin, 1997). There have been attempts by researchers to describe the various generations of NPD and innovation processes, usually as a preamble to discussion of their own latest model that irons out the weaknesses of earlier versions (Cooper, 1994b, Rothwell, 1994, Hart & Baker 1994).

Figure 2.15: Innovation Models. Source Rothwell (1994).




One such example of a new NPD model is where Rothwell (1994) makes the claim (Figure 2.15) that his 5th generation Innovation process will be cheaper and faster than the previous two generations. But what are the 1st and 2nd generation models and is anyone still using them? Does everyone agree that there have only been five models of NPD? According to Rothwell (1994) the evolution of innovation models is a move from technology push towards market pull. The first generation innovation model (Figure 2.16) had technology push. This model, Rothwell asserts, assumed that more R&D into basic science would lead to more inventions and therefore also lacked a market input being, as it was, dominated by R&D. Used in the Post War period the first generation innovation process method was a linear progression from scientific discovery, through technological development in firms to the marketplace.

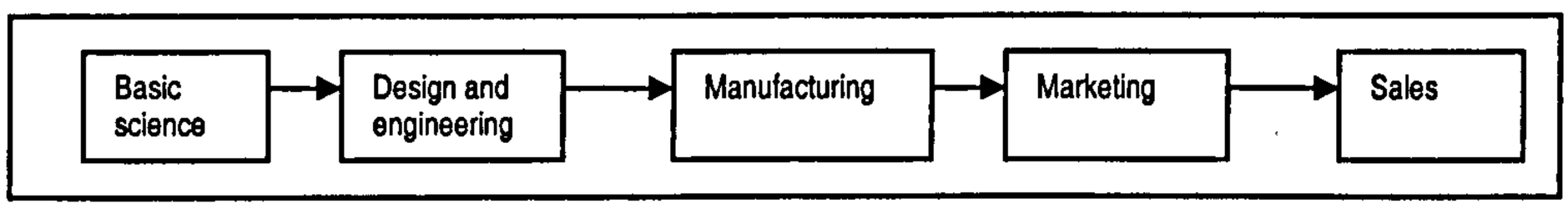



Figure 2.16:
The technology-push model. Source: Rothwell, 1994

Rothwell goes on to describe the 1970's second generation innovation process type of NPD (Figure 2.17) that saw the development of the first generation innovation process into more 'market-pull' where the market was the source of ideas that led to incremental adapting of existing product groups to meet changing user requirements.

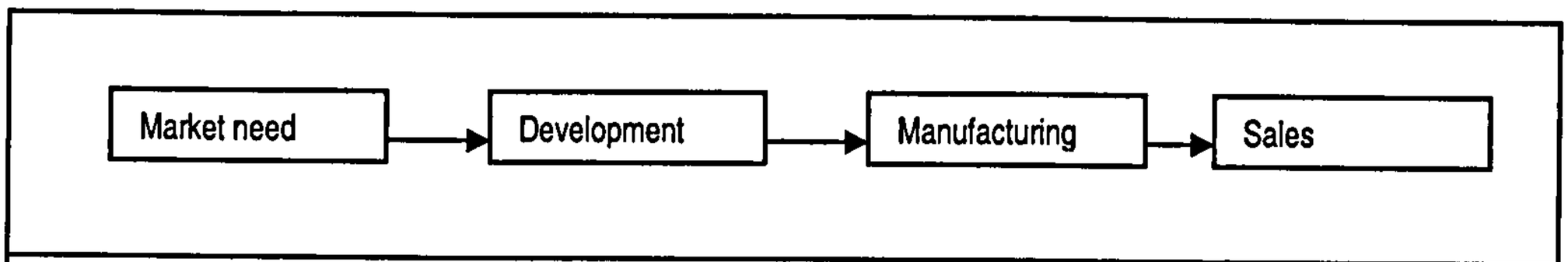
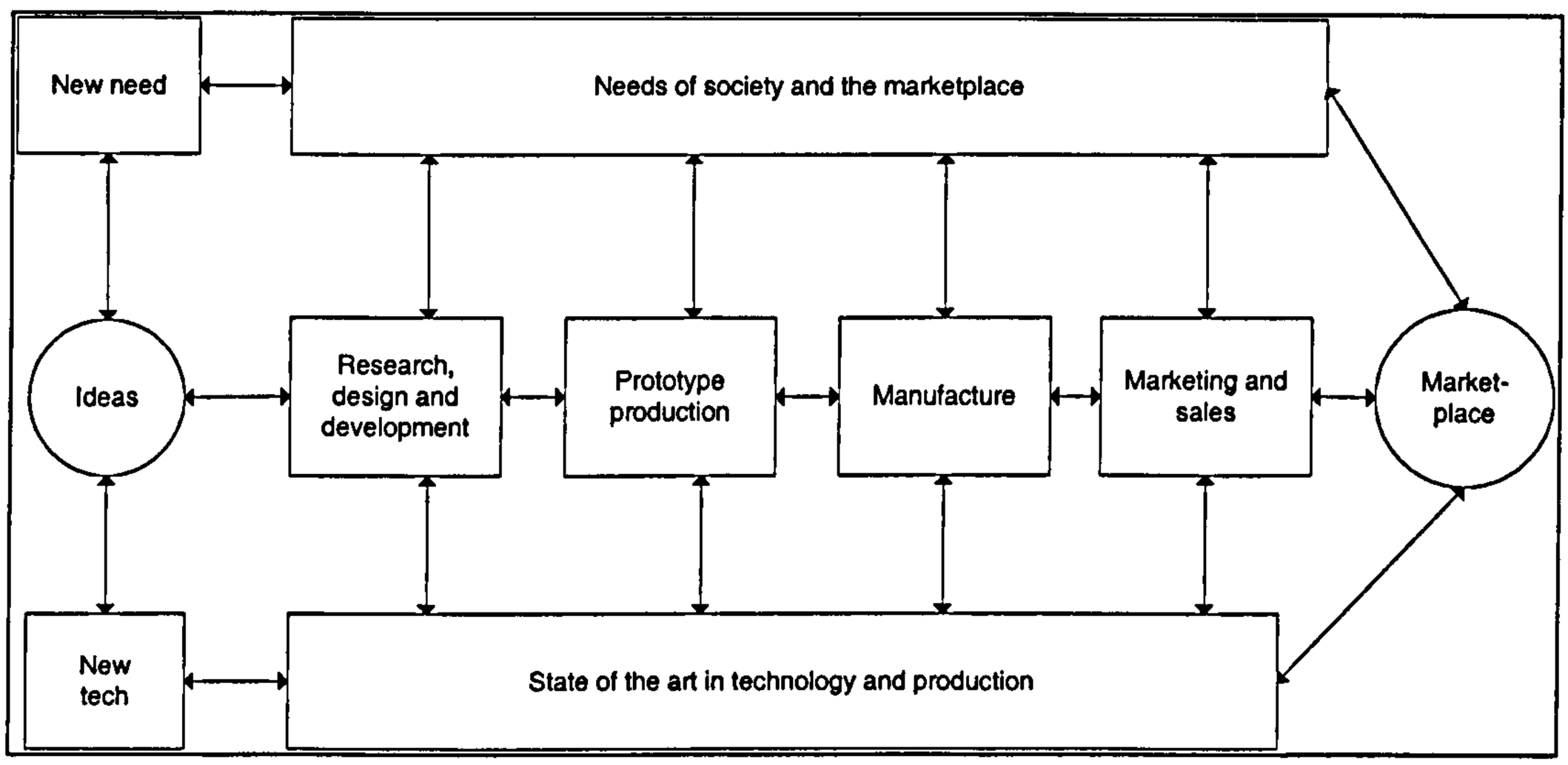



Figure 2.17: The market-pull model. Source: Rothwell, 1994

In the third generation model (Figure 2.18) the innovation process has progressed according to Rothwell (1994) into one with a 'coupling' model that had interaction between the parts of the process and the external organization.

Figure 2.18: The coupling NPD model. Source: Rothwell, 1994




In the third generation model we note that there are five stages from idea generation to sales and a constant reference at each stage to the needs of the market and the technological capabilities of the firm. The third generation model may be seen as a slightly different explanation of the Stage Gate Process model (Cooper, 2001, p130) discussed in more detail below.

The fourth generation NPD Model, described by Rothwell, takes up the idea used by Toyota in Japan and suggestions (Maylor, 1997) that the linear third generation

processes could be faster if there was 'parallel processing' or concurrent engineering'. This means that the process stages are not linear and some can start before others have been completed, thus speeding the whole process. The internal part of the process is shown in the diagram (Figure 2.19) below:

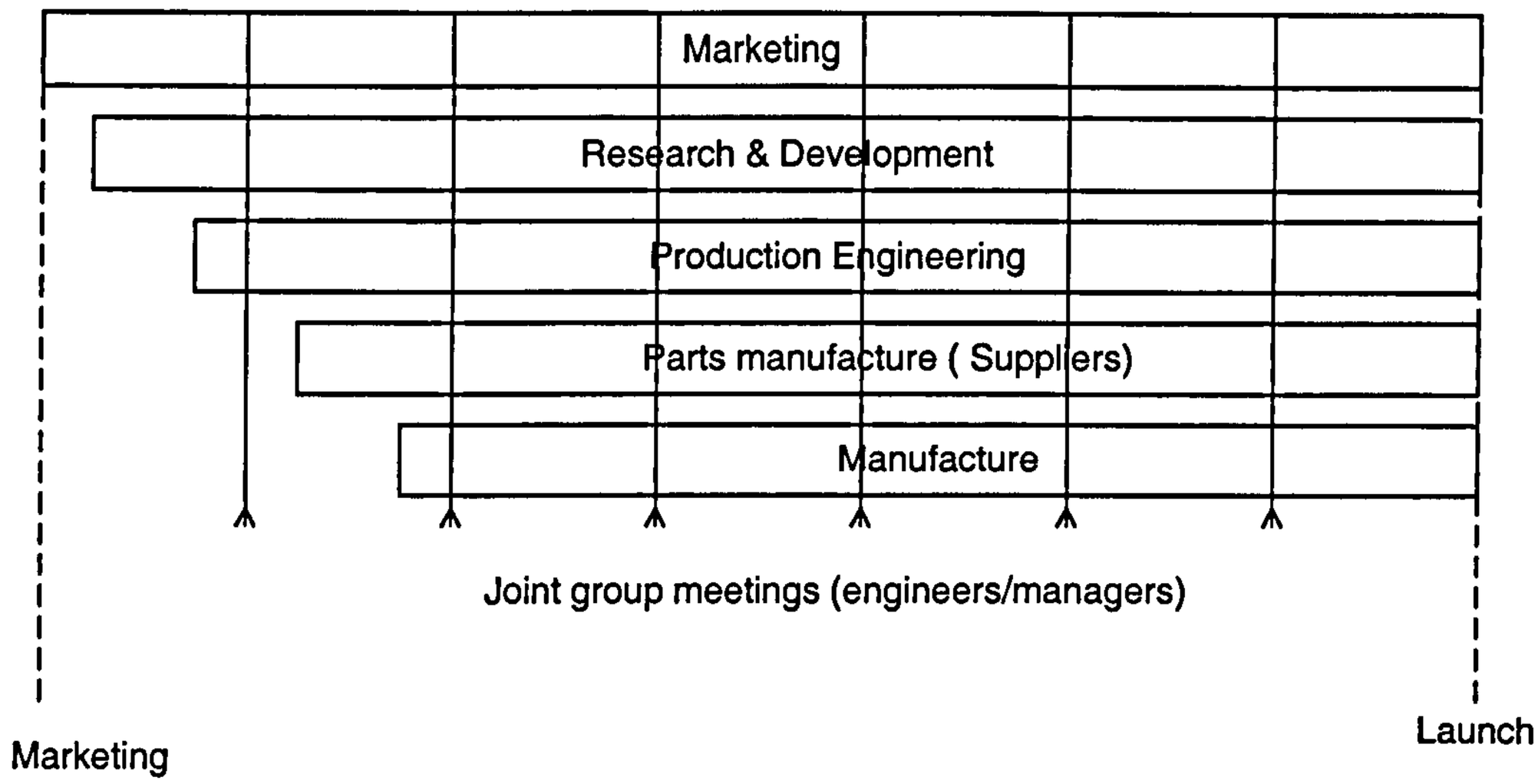



Figure 2.19: The lean Japanese model. Source: Rothwell, 1994

In the concurrent model the process is characterised by the use of concurrent engineering and integration of the functions along with techniques of cycle time reduction. We begin to see the concept of multi-functional teams meeting. The model remains focussed on the market but also integrates materials suppliers into the system. The 4th Generation Innovation process does have its weaknesses in that the speed improvement comes at an extra development cost. The hope is that being first in the market (or at least on time or fast) gives extra profits and higher prices before the competition catches up.

Maylor (1997) defines this concurrent concept as *'the parallel scheduling of activities and project-oriented organisational structures with strong cross-functional teams'*. Maylor contends that 'concurrent processes can provide ...the opportunity to improve new product development'. Maylor argues that the problem is that so far managers lack guidance and the methods of achieving the goals of concurrent systems. In a survey of

firms who had experienced Concurrent New Product Development (CNPD) Maylor (1997) investigated:

- The reasons for using CNPD
- Where the drive came from for using concurrent methods
- Which tools and methods were used
- The beneficial outcomes of their use and any adverse effects.

The Maylor study findings demonstrated that the motives for using CNPD were improved (faster) time to market, reduced development costs and less post launch support. Support for CNPD came mostly from senior management, engineering (design) and manufacturing staff. The study also found that the tools used in CNPD were:

1. Project management
2. Involving key suppliers
3. Multi-functional teams
4. Design for manufacture
5. Failure Mode Effect Analysis
6. Design rationalization
7. Involvement of customers
8. Computer-aided tools
9. Quality Function Deployment

According to Maylor the list of benefits includes:

- Product meets customer needs
- Faster time to market
- Improved product quality
- Product right first time
- Increased market share
- Lower product costs
- Improved serviceability
- Increased products performance
- Longer product life

- Improved manufacturability
- Lower product overhead costs
- Fewer change requests
- Reduced development time
- Reduced part count

The CNPD method appears from the lists to have many of the benefits required for a 'lean' supply chain, including involving customers and suppliers and fast time to market. We therefore postulated a proposition that the current research case studies would use the 4th generation concurrent type of NPD model rather than the earlier types.

Maylor also reported some adverse effects that were mainly due to the 'dissolving role of line managers' and a resistance to change from line management. Lack of skills such as cross-functional leadership and a desire for no change were additional obstacles to concurrent NPD cited by many firms.

Moving on to describe a proposed a new fifth generation innovation model Rothwell (ibid) suggests that some firms are managing to operate an efficient and fast version of the 4G Innovation model by using a combination of an explicit time based strategy that also focuses on quality, project control software and uses CAD methods with a wide climate of support for the project within the firm and cross-functional teams. There is incremental, (almost continuous) development, and upgrades. This 5G model is termed 'lean innovation' by Rothwell.

Whilst Rothwell put forward an account of NPD models, perhaps the most published author on NPD is Robert Cooper who is credited with the Stage-Gate Model. This model had five stages in similar order to the 3G process above, but Cooper makes explicit reference (2001, p132) to the gates in the model - the go/kill decisions (Figure 2.20).

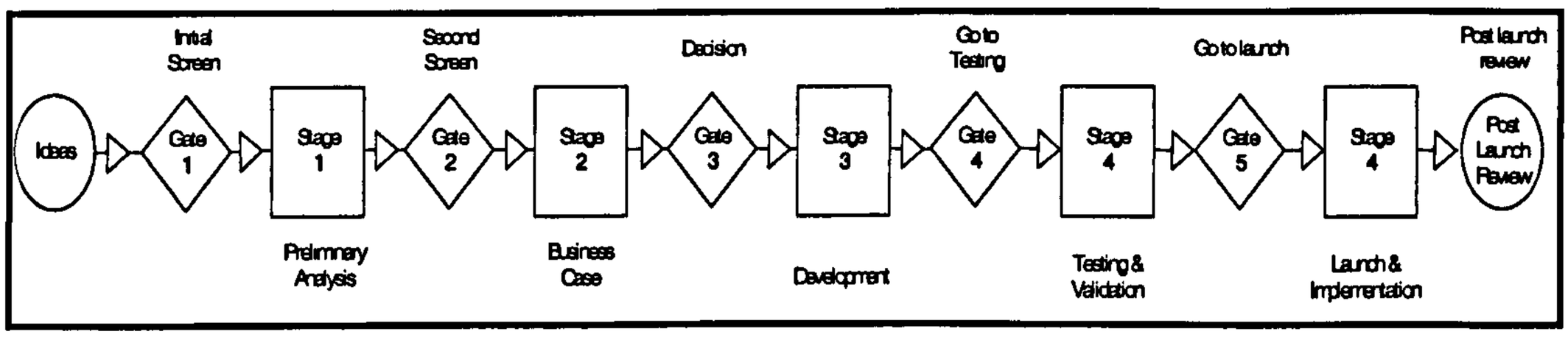
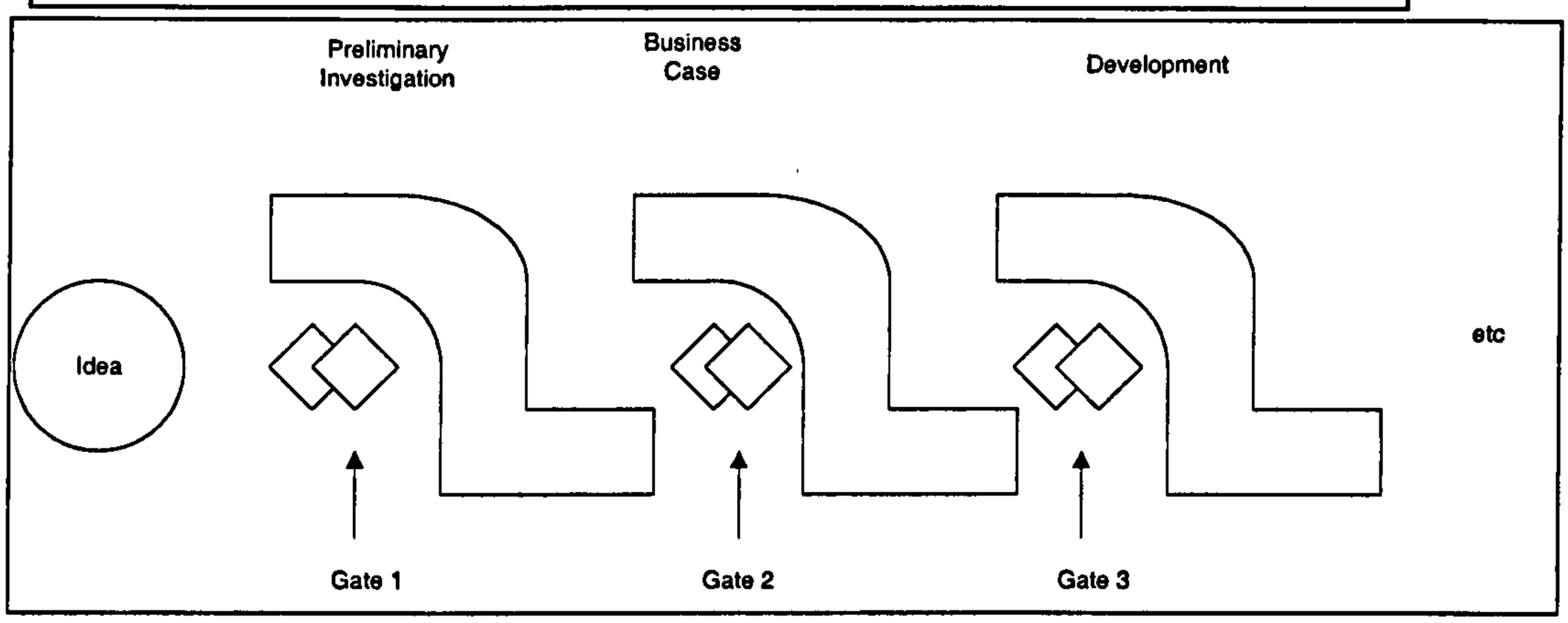



Figure 2.20: The Stage-Gate™ model. Adapted from Cooper, 2001, p130.

Between stages there are gates: these are the decision points where projects are checked by a senior management panel and those that meet the deliverables (targets) are passed through to the next stage where more resources are committed.

A number of researchers have discussed a next generation of New Product Development process that utilises the concept of fuzziness at the Gate stages. The new model is designed to deal with problems with earlier models and offer improvements. For instance Cooper (1994b) highlights the problems of the Stage-Gate process and the need for a new process model that is shown below in Figure 2.21.

Figure 2.21:
The fuzzy Stage-Gate model. Adapted from Cooper, 1994b.




The stages are now more fluid and adaptable. Activities need not be married to specific stages. Activities can be brought forward to the earlier stage. Cooper gives an example of training modules that are frequently found in the final commercialization stage but since they take a long time compared to other activities in the final stage can be brought forward to the testing stage. This is quicker. Fuzzy Gates are now employed. These allow *conditional* decisions. A project that has a task that needs completing can be given the go ahead to proceed to the next stage on the basis of the task being completed by a particular time or it will be halted. Cooper gives some caveats to these new types of gates and stages in that he feels that the fluid stages and fuzzy gates must be used with caution and knowingly and not with every project but only with good reason and with the risks assessed.

Cooper goes on to discuss other features of the new model. First there should be a portfolio approach to using resources so that projects will not be assessed against specific criteria but compared against other projects in the pipeline as well. He also

advocates the use of project management systems to help use the firm's resources efficiently. Finally Cooper suggests that the new model should have an authority shift. In the Stage-Gate model senior managers man the gates. In the new model the complexity of the flexible and adaptable system means that the project team is more likely to understand the complexities and so senior managers must rely on the project team and project leader to make the right decisions.

## *Research Proposition One*

Having examined the various NPD models there have apparently been improvements from the first technology push models to more market oriented approaches. Stage gate systems are however by definition sequential and this is seen as a weakness (Cooper, 1994b) in that projects have to go through all the stages and there can be delays. Concurrent processing methods and fuzzy gates are less rigid and allow a more flexible view of kill/go gates. The benefits are the speed improvements of parallel processing and the flexibility of conditional decisions that allow a project to proceed with caution. It is clear that most New Product Development process models have key features in terms of stages and review screens. Researchers generally agree on the main phases and the order they are carried out in, but there is still a concern about the need for iteration, looping back and perhaps the order of phases being less rigid (May-Plumlee & Little, 1998). Recent authors (Zhang & Doll, 2001) have argued that the front end needs special care since there is much that is unknown and also 'fuzzy'.

Supply chains aim to achieve a co-ordinated response to market demand. On the one hand a supply chain is primarily concerned perhaps with operational logistics and flow of product and information. On the other hand, new product development in a supply chain involves more strategic concerns about the ownership or influence on development facilities.

Models of NPD are recognized as important in understanding the relationships of functions in the NPD process in a single firm and may be useful in explaining responsibilities for product development in a supply chain. Therefore in order to investigate the UK Textile and Clothing Supply Chain NPD methods and organization, the NPD models in use in the current research case studies will be examined. The

benchmarks for NPD models will be the existing best practice literature on NPD as discussed above.

One basic question this study planned to answer is whether or not the Textile and Clothing Supply Chain firms used 'technology push 1st generation NPD or had moved on to the more modern NPD model versions including the advanced 'fuzzy' stage-gate model. Since a supply chain is lean and designed to offer a responsive system then we expected a fast, flexible NPD model to be used such as the 4th generation post stage gate model.

The research proposition one regarding NPD models was therefore:

**Textile and Clothing Supply Chain firms adopt 4th Generation faster, flexible NPD models.**

## 2.6 NPD Process Activities

It has been shown (Cooper & Kleinschmidt, 1996) that just having a formal NPD process alone is not enough to improve NPD success. What is needed is an efficient process that is actually followed in practice (Cooper, 2001, p65; Cooper & Kleinschmidt, 1996). However we need to understand just what the authors take to be the key stages and tasks of an efficient NPD process. There are a number of important stages in an NPD process and the tasks within the stages if carried out efficiently can contribute to NPD success (Cooper, 1993, p65). The literature is however divided on the right number of stages in an NPD process. Mahajan & Wind (1992) suggest ten stages including idea generation. Cooper & Kleinschmidt (1996) canvas for thirteen stages (1986) but exclude idea generation and found that only 2% of firms used all thirteen of these suggested stages. Page (1993) proposes eight process activities including concept search. Hart and Baker (1994) suggest ten stages and Phillips et al (1999) propose a four stage generic process with four gates after each stage. Griffin cites nine steps recently including idea generation (2002).

| Cooper & Kleinschmidt | Mahajan & Wind | Page | Hart & Baker | Phillips et al | Griffin |
|---|---|---|---|---|---|
| **1986** | **1992** | **1993** | **1994** | **1999** | **2002** |
| | Idea generation | Concept search | Strategy and budget allocation | Preliminary concept development | Line planning |
| Initial screening | Concept screening | Concept screening | Idea generation | Review | Strategy development |
| Preliminary market assessment | Detailed market study | Concept testing | Idea screening | Design and development | Concept generation |
| Preliminary technical assessment | Business/Financial analysis | Business analysis | Concept development | Review | Business analysis |
| Detailed market study/market research | Product development | Product development | Business analysis | Validation | Development |
| Business/Financial analysis | Customer tests of product | Product use, field testing and/or market testing | Product development | Review | Test and validation |
| Product development | Pre-market volume forecasting | Commercialisation | Test marketing | In-service product support | Manufacturing development |
| In House product testing | Market test/trial sell | Other process activities | Commercialisation | Review | Commercialisation |
| Customer tests of product | Market launch planning | | | | |
| Test market/trial sell | | | | | |
| Trail production | | | | | |
| Pre-commercialisation business analysis | | | | | |
| Production start up | | | | | |
| Market launch | | | | | |

Figure 2.22: NPD Stages Comparison

The table in Figure 2.22 compares the various suggestions. We can see from the table that there are some common steps that researchers have found that take place in NPD processes although the Cooper analysis stands out with more stages. Cooper & Kleinschmidt (1986) suggests that there should be a preliminary market assessment and a further business analysis after the trial production stage but finds that many firms do not carry out these steps and this may explain the lack of this stage in other models. Hart and Baker (1994) have included the concept of budget allocation at the start of the NPD process and Griffin suggests an initial strategy review step after line planning. There are some of the steps that progress the new product idea (stages) and other steps that are checks and reviews (gates) to reduce the many contenders for the scarce resources available to the firm for NPD. These stages and gates appear to denote a funnel shape to the NPD process (Iansiti,1997) where many ideas enter and there is a narrowing of the number of projects as they progress through the stages and gates as shown in the diagram (Figure 2.23) below:

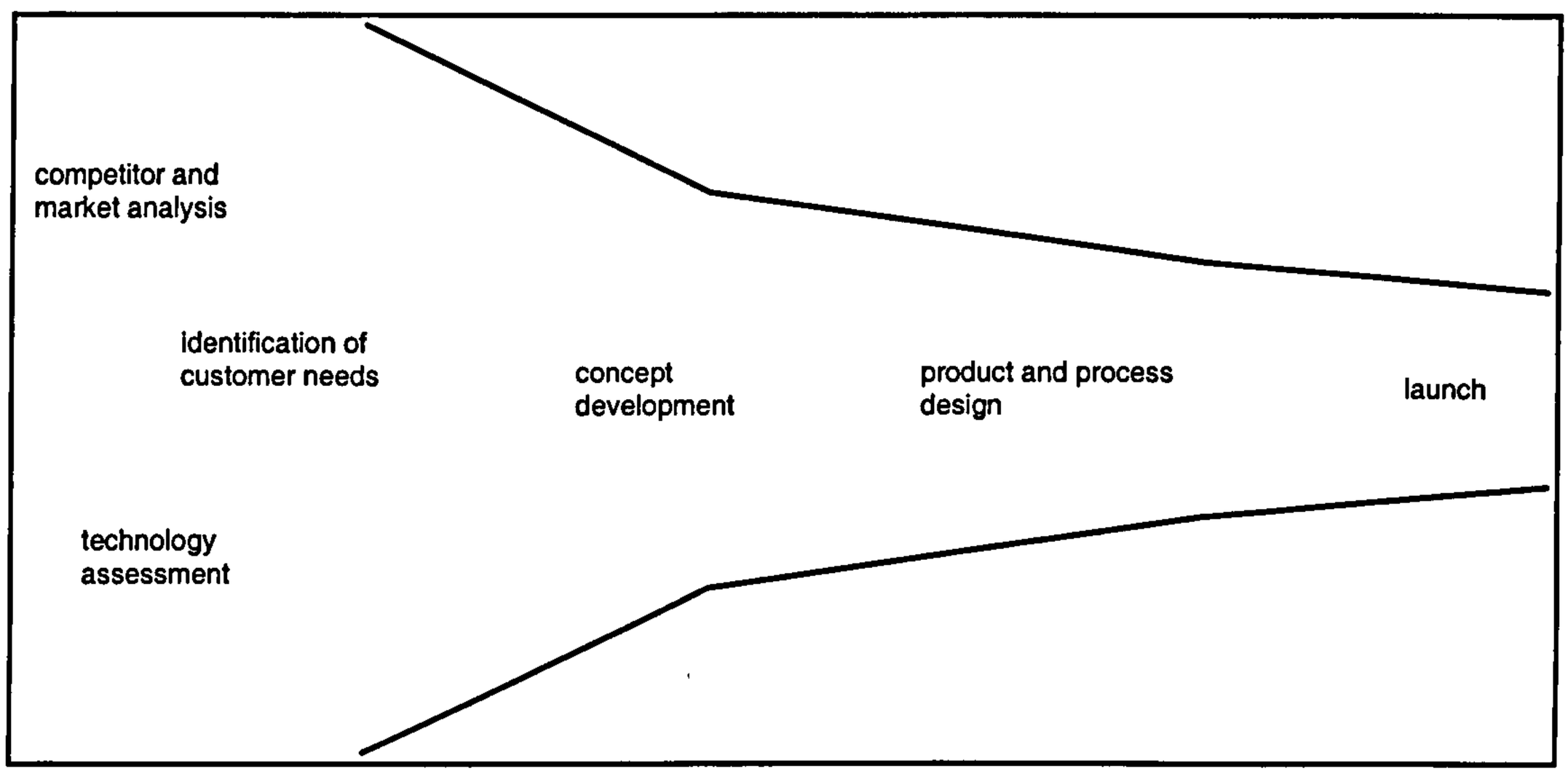



Figure 2.23. The Innovation Funnel (Adopted from Iansiti, 1997)

Here we see that there are also some activities, at the start of the process funnel, where the competitive environment and firm's strategy and capability are considered. Details of what takes place at each stage are often suggested by the names of the stages.

Researchers have many different names for the stages, phases, steps, etc. Some of the common names are shown in the table (Figure 2.24) below:

Figure 2.24: NPD Activity Names

| Names for NPD activities | |
|---|---|
| Initial screening | Market test |
| Product line planning | Market sell |
| Project strategy development | Market launch planning |
| Idea generation | Customer test of products |
| Concept generation | Test and validation |
| Concept screening | In house product testing |
| Idea screening | Concept testing |
| Detailed market study | Preliminary technical assessment |
| Financial analysis | Product development |
| Business analysis | Manufacturing development |
| Pre-volume market study | Trial production |
| Preliminary market assessment | Production start up |

Most of these activities listed in Figure 2.24 are included in Cooper's (2001, p130.) overview of the stages and gates of an ideal NPD process.

In the Cooper Stage-Gate™ Model there are five main stages after the initial idea generation and screening of new ideas as shown in the diagram (Figure 2.25) below:

- Scoping in the preliminary investigation
- Building the business case
- Development of the prototype
- Testing & Validation in house and with customers
- Launch

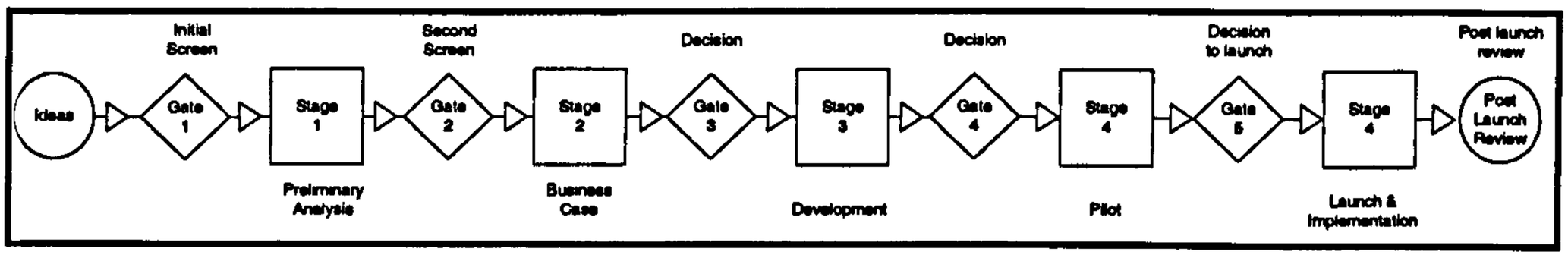



Figure 2.25: Stage Gate Steps

Whilst the stages may appear self explanatory, we need more information about the NPD activities themselves.

Cooper & Kleinschmidt (1986) have helped in this regard through an examination of the degree to which 123 firms and 252 new product developments carried out the key stages and review gates. The data from the study is reproduced in the chart (Figure 2.26) below.

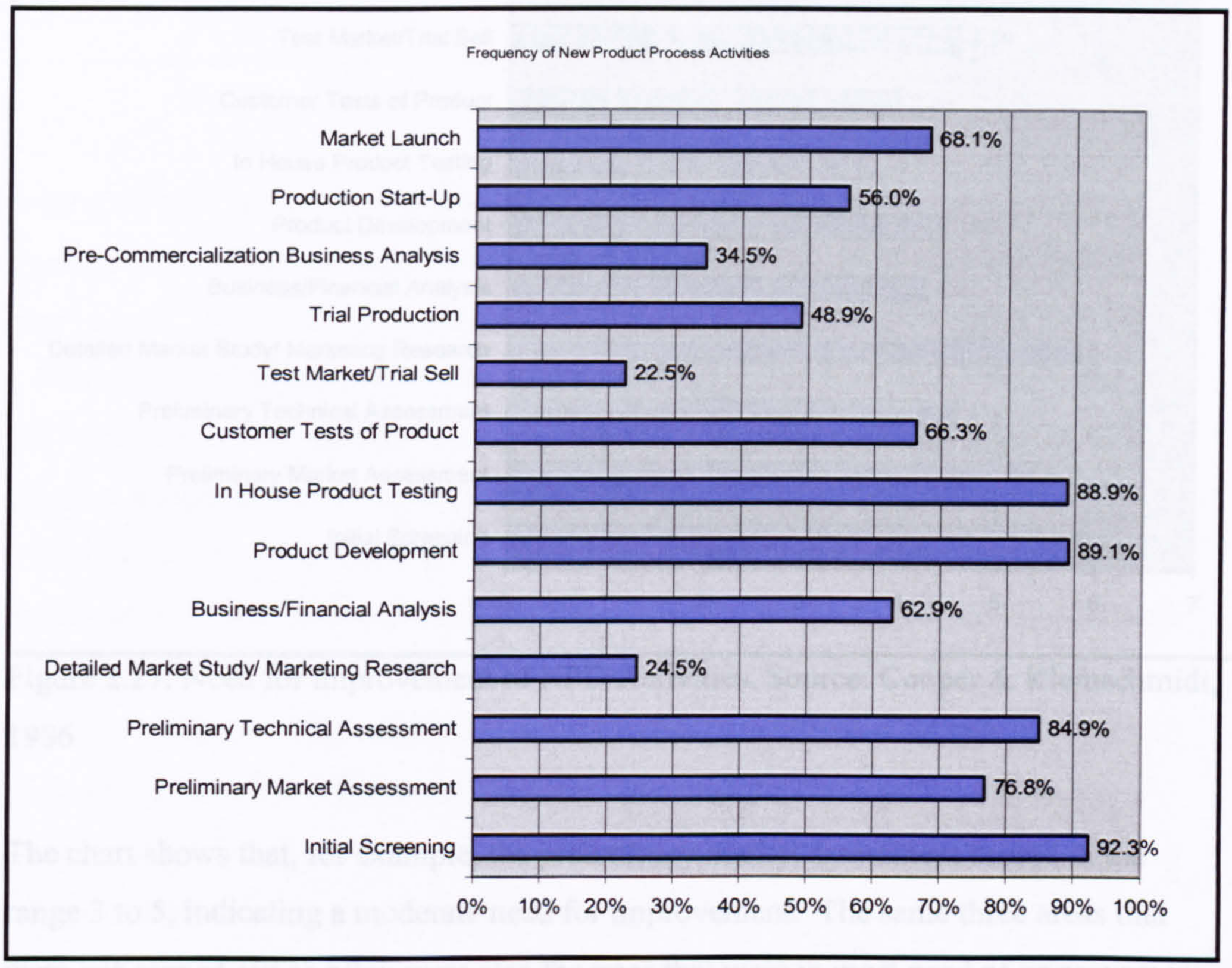



Figure 2.26: New Product Process Activities. Source: Cooper & Kleinschmidt, 1986.

The chart indicates that for example in 92.3% of projects the initial screening stage was carried out. It can be also seen that there are some activities that are carried out less often including detailed market study, test market/trial sell and pre-commercialisation business analysis. Cooper & Kleinschmidt (ibid) also asked the sample of firms which processes they wanted to improve the performance on. The chart below (Figure 2.27) illustrates the scores for need for improvement.

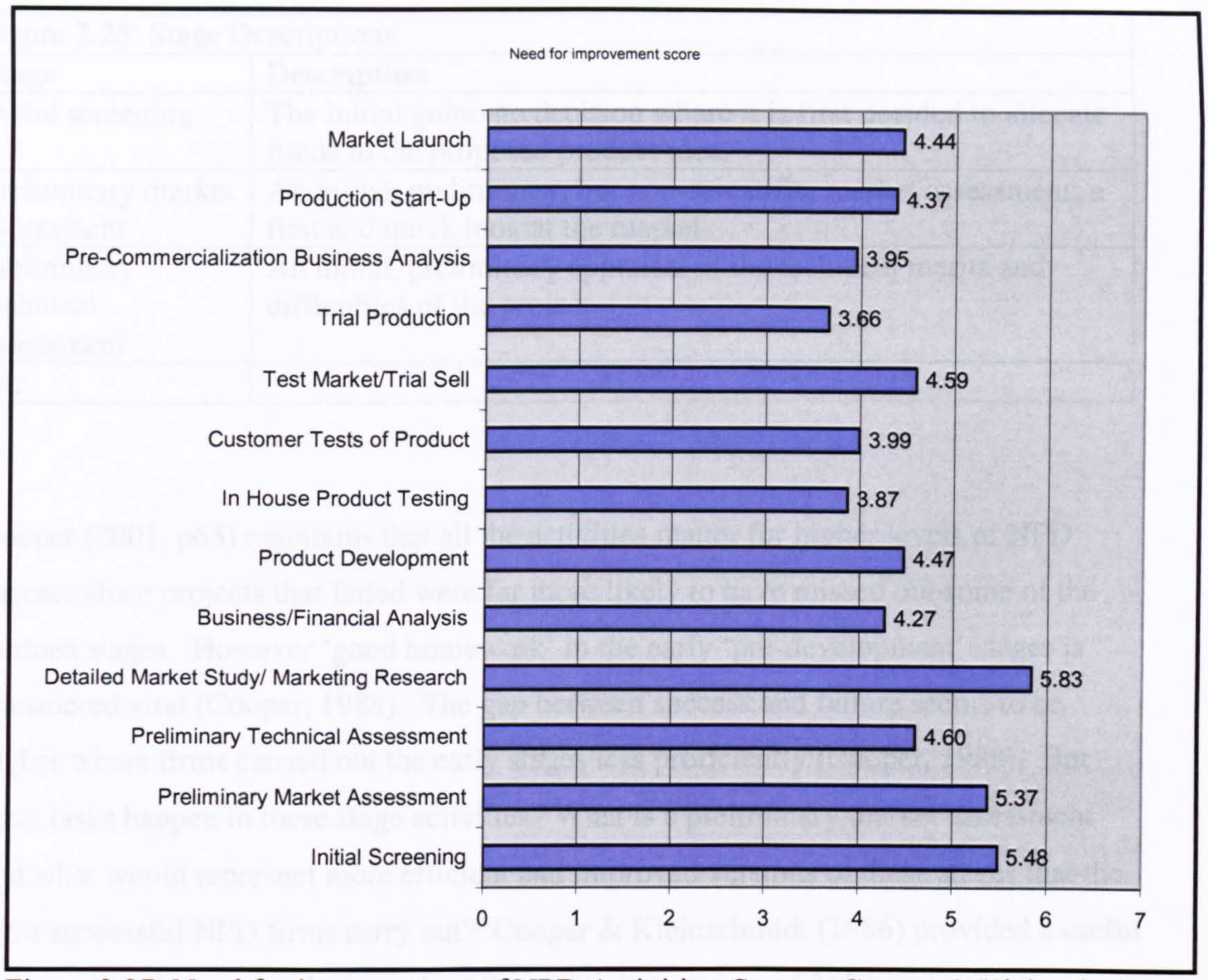



Figure 2.27: Need for improvement of NPD Activities. Source: Cooper & Kleinschmidt, 1986

The chart shows that, for example, the preliminary market assessment scored in the range 3 to 5, indicating a moderate need for improvement. The same three areas that were not carried out as often were also the ones that were in most need of improvement.

The list of 13 Stage Gate Process steps have been described broadly by Cooper and Kleinschmidt, (1986) although the descriptions mostly use the name of the step in the description and the place in the process. Some examples of descriptions are shown in Figure 2.28.

| Figure 2.28: Stage Descriptions | |
|---|---|
| **Stage** | **Description** |
| Initial screening | The initial go/no go decision where it is first decided to allocate funds to the proposed product idea. |
| Preliminary market assessment | An initial, preliminary, but non-scientific, market assessment; a first and quick look at the market. |
| Preliminary technical assessment | An initial, preliminary appraisal of the technical merits and difficulties of the project. |
| Etc | |

Cooper (2001, p65) maintains that all the activities matter for higher levels of NPD success since projects that failed were far more likely to have missed out some of the thirteen stages. However 'good homework' in the early 'pre-development' stages is considered vital (Cooper, 1988). The gap between success and failure seems to be higher where firms carried out the early stages less proficiently (Cooper, 1988). But what tasks happen in these stage activities? What is a preliminary market assessment and what would represent more efficient and improved versions of these stages that the most successful NPD firms carry out? Cooper & Kleinschmidt (1986) provided a useful guide to the choice of tasks in each of the stages in a review of 252 new product histories at 123 firms. The tasks listed for each stage provide detailed descriptions and these were useful when considering the extent to which the case study companies carried out the key stages and tasks. One example of the level of detail of the Cooper & Kleinschmidt survey was the initial screening:

Initial Screening

In the study (Cooper & Kleinschmidt, 1986), for this first stage after idea generation, the sample of firms had several approaches to idea screening when they carried it out, which had happened in 92.3% of projects. The break down of the approaches used by the firms is shown below. For example of those firms that used a screening method 23.7% had a single individual make an informal decision.

| Approach | % of projects |
|---|---|
| A group decision, based on an informal discussion – no formal techniques uses at all, e.g. no checklists of criteria, no rating forms, etc. | 59.5 |
| A single individual made the decision, again on an informal basis (no formal techniques). | 23.7 |
| A group decision, based on a formal checklist of criteria. | 11.6 |

Many firms had no criteria for screening new product ideas. These criteria might be developed if the firms had a strategy step before the NPD process started.

Further stages are described in detail in the Cooper & Kleinschmidt study. The descriptions give a detailed insight into the stages of an efficient stage gate NPD process model and have been used in chapter four for the case study research analysis.

For the most part these stages and tasks are not complex or expensive methods for firms to use. Yet there is evidence to suggest (Cooper & Kleinschmidt, 1986) that many firms do not carry out these stages and that those who do use them carry them out poorly.

## *Research Proposition Two*

The key to the success rate of new products is the thoroughness with which the detailed NPD process activities are carried out.

With many individual firms finding it difficult to carry out all the activities we might suppose that the supply chain case study firms are similar and miss out some of the activities. However we might also think that in a supply chain some activities that involve the customer might instead be carried out by the customer. Indeed it may seem reasonable to expect that the NPD process steps in a supply chain innovation project may not all occur within one firm but be shared along the chain. For instance, the retail customer in a supply chain may request a product from a supplier. Therefore in this situation the activities of concept development and market analysis may take place at

the retailer and not at the manufacturer/developer of the product. The supplier will then have a truncated NPD process and activities. On the other hand suppliers may have systems with a full stage process for developing their own new products separately that they then present to retailers. The research aimed to clarify this sharing of innovation activities in the Textile and Clothing Supply Chain.

The research proposition two was therefore:

**Textile and Clothing Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

## 2.7 NPD Strategy

> **"The firm's overall new product performance depends on ....Strategy: the firm's total new product strategy (as part of its corporate strategy)..."**
> **(Robert G Cooper and Elko J Kleinschmidt, 1995)**

Firms that have a clear NPD strategy have higher levels of new product success (Cooper & Kleinschmidt, 1995a). Griffin (1997) has also established that more of the 'best' (most successful at NPD) firms had a strategy step in their NPD process. Having an NPD strategy as part of a company overall strategy requires firms to have goals or objectives for the new product programme (Crawford, 1980). For example what proportion of total profits and sales will be from new products? These NPD objectives within the overall company goals, according to Crawford, should also be communicated within the company. Crawford also suggests that another feature of having an NPD strategy is that there are clearly defined areas of strategic focus in terms of products, markets or technologies. An NPD strategy with some long-term projects also helps success (Cooper & Kleinschmidt, 1995a). Crawford (1980) also suggests that better managed firms have an NPD strategy and goals in terms of target business arenas, sales and profits and a program of activities to achieve the goals. Crawford believes firms should try to exploit their strengths and avoid their weak areas. Cooper (1982) takes up this 'sticking to the knitting' theme and contends that firms which stay close to their

existing competencies have a higher rate of new product success. Cooper asserts that new products should be closely related to existing products, should have a similar end use function and fit well with the current product line. Cooper's NewProd studies (1992) proposed that firms should assess each new product project and the 'fit' or synergy with the firms existing skills and experiences in areas such as production methods, marketing skills and customers. For example firms should rate each new product project with the question "We have never made or sold products to satisfy this type of customer need or use before". A project where a firm had little experience would then score a low rating. Before this question is asked a firm would choose a level of risk and direction in a strategy review.

In practical terms the implications of these research findings about strategy are that firms should place NPD within a wider company strategy and this in turn implies the need for firms to consider the external and internal context within which NPD is taking place. Iansiti (1997), for instance, suggests that the new product development process should start with a review of the competition and market, the firm's own technology capabilities and customer needs, *before* any new product ideas are considered. The implication in the Innovation Funnel (Figure 2.29) is that this - strategic review step - at the start of the process narrows the options and gives focus to the NPD activities. The need for both the internal and external context to be assessed has been supported by Cooper (1975) who believes that there needs to be a balance between the strategic orientation of the firm in both technology and marketing if new product failure is to be avoided.

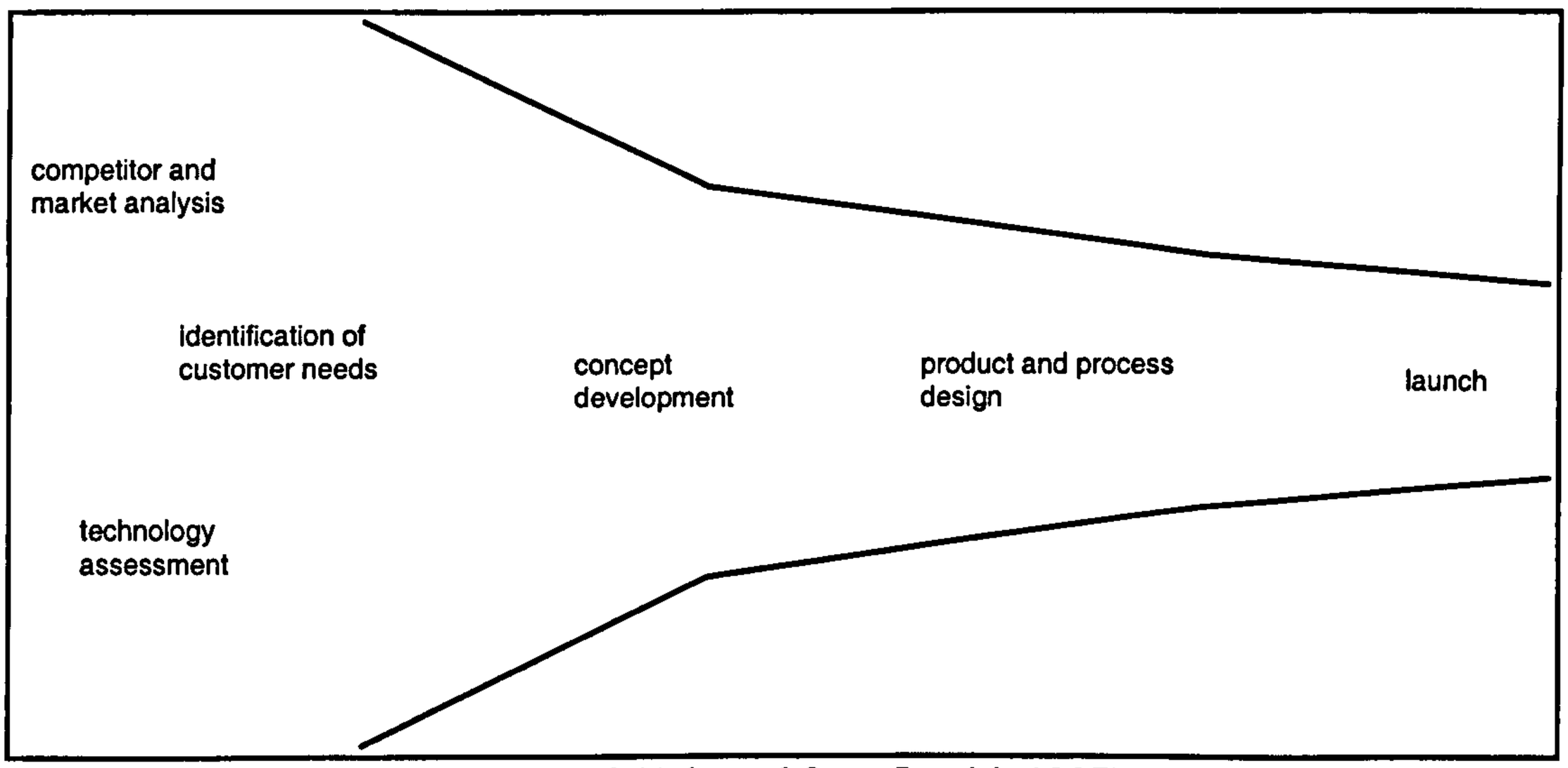



Figure 2.29: The Innovation Funnel (Adapted from Iansiti, 1997)

Cooper suggests that both technological capability and market needs should be assessed if new product failure is to be avoided.

## *Research Proposition Three*

Strategy then is a key part of NPD success and firms should focus NPD resources on the areas that they wish to concentrate on. This focus of resources implies that NPD project teams should be aware of the areas to concentrate on; that the teams have the resources allocated by senior managers to carry out the task and that the NPD and wider organization and culture is in place to allow the teams to function effectively. Most importantly a strategy review that sets out the NPD arena should take place before any product development begins so that any development is then aligned with strategic goals.

As we have seen supply chains may be influenced by the lean paradigm factors and there will collaboration between customers and suppliers and a need to be responsive to changing market needs. Suppliers who are developing new products have choices regarding strategy and the kind of markets (existing or new) that they are seeking to develop. The choices for a new product development strategy also concern the degree to which development resources are focussed on short term or long term projects or on market development rather than technology development of for instance production methods. In a supply chain the NPD strategy regarding markets and timescale may be heavily influenced by the existing customers and their need for fast cycle (lean) new product development. In other words a supplier may *have* to devote development resources to the ongoing market relationship and the supply chain customer's immediate new product needs rather than use those resources for long term internal technology development.

The research proposition three is therefore:

**Textile and Clothing Supply chain firms select an NPD strategy that focuses resources on existing customer's short-term new product needs.**

## 2.8 Measures of NPD success

**"With so many variables to consider and so many stakeholders involved, managers face a difficult challenge just deciding which measures are useful for measuring product development success." (Griffin & Page, 1996)**

Griffin and Page (1993) have researched into the subject of how firms and academics measure new product development success and failure. Analysing 77 papers on the subject of NPD from 61 different research projects the researchers found that there were 46 measures of success reported by academics. A second source of measures used by the researchers was a questionnaire completed by New Product Development practitioners at two Product Development and Management Association (PDMA) conferences. This generated 34 measure currently used by firms. The PDMA respondents also indicated that there were 45 measures they would like to use. However only 21% of all the measures occurred in each sample and Griffin & Page have therefore narrowed down the common ones into 15 core product level measures that have been split into three main categories:

- Customer Acceptance Measures
    - Customer acceptance
    - Customer satisfaction
    - Met Revenue Goals
    - Revenue Growth
    - Met market share goals
    - Met unit sales goals

- Financial Performance
    - Break-even time
    - Attain margin goals
    - Attain profitability goals
    - Internal Rate of Return/Return on Investment

- Product-Level Measures
    - Development Cost
    - Launched on time

- Product performance level
- Met quality guidelines
- Speed to market

(Additionally there was an overall programme measure used of % of sales that came from new products). Looking at both core and other measures and who uses them the authors concluded that some are used by both researchers and companies, but firms tend to concentrate on customer level and financial measures whereas academics tend to look at product related measures and programme level measures. The table in Figure 2.30 below illustrates this:

Measures Used by Researchers and Companies

**Used by Both Researchers and Companies**

Met revenue goals (type - customer focus)
Met profit goals (financial)
Got to market on time (product)

| **Companies Use More** | **Researchers Use More** |
|---|---|
| Customer Measures<br>• Market Share<br>• Volume<br>• Customer Acceptance<br>• Customer satisfaction | Firm Level Measures<br>• % of sales for New Products<br>• Success/failure rate |
| Financial Measures<br>• Margin level | Product Related<br>• Performance<br>• Speed to market<br>• Completed within budget<br>• Subjectively 'successful'<br>• Technically successful |

Figure 2.30: Success Measures. Source: Griffin and Page (1993).

The table in Figure 2.30 demonstrates the fact that there are only three measures used by both researchers and companies. The authors suggest that these differences are caused by the ease of access to information. Firms find it easier to gather information about customer type measures than do researchers. Companies may be more open to giving out broad subjective programme level information to researchers rather than sensitive detailed financial and market data. The Griffin and Page study concluded that firms are more interested in measuring the outcomes of specific projects. Even then, firms only used a limited number of measures of New Product Development success. The average

number of measures used was 3.7 measures. One common measure was customer acceptance (the authors cite an example of a firm measuring customer acceptance by the level of sales) and another well used measure was financial success Researchers have tended to look at broad programme or firm success. This stems from researchers interest in how the firm manages New Product Development and finding out what factors, tools and techniques affect overall New Product Development success that can be applied across other organisations and sectors. Researchers want to use examples of organisational behaviour that makes a firm more successful in the long run and not have to explain behaviour that worked for one project within a firm but then failed on the next project. Researchers use on average three measures. Firms however are not researching into methods and techniques and just want to use any method that will get the new product developed on time and they also have difficulty finding the time to do more measuring of success according to Griffin & Page (1993).

The research showed that there were multiple dimensions to new product success.

With 16 core measures that everyone would like to use ( Griffin & Page, 1993) or do use and only 3 or 4 in use by most of those involved, there is clearly a gap between what is measured about New Product Development and what firms would measure if they had the time, culture or systems to do it. For example, about 5 times as many respondents would like to measure customer satisfaction than currently do measure it.

The multi dimensional nature of success is important and much depends on what the strategy of the firm is with regard to New Product Development and what it is trying to achieve. Firms do not all have the same targets for sales, or margins and so success depends on how the respondents to research surveys view their own targets. Studies by researchers tend to be relatively simple in their ratings and use questionnaires that are mainly subjective according to a meta study by Ernst, (2002). The subject of success factors in this field is important to researchers who are trying to show that there are links between the methods that firms use for New Product Development and the degree of success. Clearly if there is little consensus about what constitutes success then it is hard to show that a particular characteristic of New Product Development has any bearing on the level of success. Jan Hultink and Robben (1995) reviewed several studies about measures of New Product Development success. The table in Figure 2.31 summarises some of the findings.

| Author | Measures |
|---|---|
| Venkatraman and Ramanujam, 1986 | Two dimensions:<br>1) Financial – Profit, sales growth, turnover and ROI<br>2) Operational- innovativeness, market standing and social responsibility |
| Cooper, 1984 | Three independent dimensions:<br>1) Impact of the project on the company sales and profits<br>2) The track record of success rates of the products developed<br>3) Overall performance relative to objectives, to competitors and profits v costs |
| Cooper and Kleinschmidt, 1987 | Three independent dimensions:<br>1) Financial performance relative profits to sales, profitability level and payback period<br>2) Opportunity window in the degree to which the new product opened up new opportunities to the firm in terms of new product categories and a new market area<br>3) Market impact in terms of domestic or foreign market share |

Figure 2.31: NPD Success Measures. Source: Jan Hultink and Robben (1995)

We can see from Figure 2.31 that sales level and profits are common measures. More recently Cooper and Kleinschmidt (2000) have added the ability to reduce cycle time as a proxy for success in some fast-paced companies. Cooper & Kleinschmidt go on to criticise the approach of one-dimensional independent variables with regard to success factors. They propose a multi-dimensional flavour and introduce the concept of *types of projects* that have been mapped onto three dimensions. They came to the conclusion in this study that whilst there were ten success characteristics, they were not independent and statistical analysis showed that three performance dimensions could explain most of their results. These dimensions are given as:

1. *Financial Performance.* The first factor captures how well the projects did from a financial standpoint: whether they were financial successes, their return on investment, whether they met their sales objective, and their profit rating.
2. *Efficiency.* This next factor portrays the efficiency and time performance of projects-whether they were done on time and in a time-efficient manner. Being on budget also is part of this rating.
3. *Window of Opportunity.* This final factor indicates whether the project opened up new windows of opportunity for the business- for example,

access to new markets, or paved the way for other new products. Included here is the technical rating.

Using these three dimensions Cooper and Kleinschmidt develop various types of successful project descriptions. For example a project could be a financial success but not go far on the other two dimensions in terms of being fast or giving the firm new market opportunities. These are termed *Close-to Home Projects.*

Griffin (1997) statistically grouped seven measures into three broad success measures to differentiate firms between 'the Best' and 'the Rest' in a questionnaire returned by 383 large US firms. The broad measures in the questionnaire were:

1. Overall success. Your "position in your industry" (most successful, top 1/3, middle 1/3, bottom 1/3).
2. New Product Development Programme success relative to the meeting of the Programme objectives. (1 completely agree –9 completely disagree).
3. Market/Financial success of projects in the past 5 years. A scale of the average of four measures (% of total sales from new products, % of total profits from new products, % of products categorized as successes, % of products categorized as financial successes). (0-100%).

Hultink and Robben (1995), on the other hand, do not think that enough notice had been taken in studies of the perspective of time and suggest that the importance of success measures will vary dependent on the timescale. They looked at 16 measures to establish this relationship, across 92 large Dutch companies. The table below in Figure 2.32 shows some of the measures where time had an influence so projects were important on either a short term or long term timescale.

| Measure | Long term importance | Short term importance |
|---|---|---|
| Launched on time | 1.8 | 3.1* |
| Speed to market | 2.1 | 2.7* |
| Met revenue goals | 2.3 | 1.8** |
| Met unit sales goals | 2.4 | 1.9** |
| Attain margin goals | 2.7 | 1.6* |
| Attain profitability goals | 2.7 | 1.4* |
| IRR/ROI | 2.7 | 1.8* |
| Development cost | 2.7 | 3.1** |
| Met market share goals | 2.7 | 1.8* |
| % of sales by new products | 3.5 | 2.7* |

Figure 2.32: Success measures and time. Source: Hultink and Robben (1995).
1= Very important, 5=Not at all important
* significant at 1% level
** significant at 0.1% level

However the authors note that not all the measures were considered important regardless of the timescale. Only 4 measures had a score on both timescales of 2.0 or better. (Important or Very Important). The average of both on the 'basic' measures is shown in the table in Figure 2.33 below.

| Average importance score on both short and long term | Measure |
|---|---|
| 1.5 | Customer satisfaction |
| 1.5 | Customer acceptance |
| 1.5 | Whether quality guidelines were met |
| 1.9 | Product performance measures |

Figure 2.33: Success measures – importance of time.

The authors concluded that short and long-term customer satisfaction was the most important aspect to measure.

In addition to the four 'basic' measures only one measure in this study was found to be uniquely important from a short-term perspective. This was - launch on time.
Six measures were uniquely important from a long-term perspective:

- Met revenue goals
- Met unit sales goals
- Met market share goals
- Attain profitability goals
- IRR/ROI
- Attain margin goals

Zhang and Doll (2001) list success variables under three headings based on an analysis of literature by leading researchers. The table in Figure 2.34 gives a definition of each variable and demonstrates the lack of common definitions of success in empirical studies.

| Success of NPD | Definition | Source Literature |
|---|---|---|
| 1. *Process outcome* | | |
| 1.1 Time-to-market | Product development time from concept generation to market introduction | Rosenthal & March, 1988 |
| 1.2 Engineering change time | Time to prepare for new engineering design from old engineering design | Rosenthal & March, 1988 |
| 1.3 Product development cost | Cost of developing new products from product concept to manufacturing | Griffin, 1997 |
| 1.4 Team work | The extent of collaborative behaviour of product development teams | Griffin 1997; Truman and Jobber, 1998 |
| 1.5 Opportunistic learning | The extent of improving team learning through the product development process | Clark and Wheelwright, 1992 |
| 1.6 Supplier performance | The extent of supplier's meeting the requirements of product development | Handsfield and Pannesi, 1996 |
| 2. *Product outcome* | | |
| 2.1 Product performance | The extent of the product's technical function and perception of users | Clark and Wheelwright, 1992 |
| 2.2 Product cost | The cost of materials and labour for manufacturing the product | Clark and Wheelwright, 1992 |
| 2.3 Value to customer | Value of new products in meeting customer needs | Slater and Narver, 1995 |
| 2.4 Design integrity | The extent of producing multiple-generation products from the product platform | Clark and Fujimoto, 1991 |
| 2.5 Product specification flexibility | The extent of easiness of modifying products | Clark and Fujimoto, 1991 |
| 2.6 Product manufacturability | The extent of easiness of manufacturing and assembling new product | Clark and Fujimoto, 1991 |
| *3 Financial outcome* | | |
| 3.1 Market share | The extent of product's meeting the target in terms of market share | Cooper and Kleinschmidt, 1994 |
| 3.2 Return on investment | The extent of the product's meeting target in terms of ROI | Griffin and Hauser, 1996 |
| 3.2 Profit | The extent of the product's meeting target in terms of profitability | Clark and Fujimoto, 1991 |

Figure 2.34: Definitions of success measures. Adapted from Zhang and Doll (2001)

Zhang and Doll consider the NPD process outcomes are the least understood and utilized weapon in innovation practice.

Griffin and Page (1996), however, recommend that measures for product development success and failure depend on the strategy of the firm. In particular they reason that the type of strategy relating to product and market newness affects the appropriateness of the measures used. The research used an interesting technique in asking managers to imagine different scenarios based on six levels of product/market newness and asked respondents to decide which of 16 measures they would use for each scenario and score

the relative usefulness of each measure used. They also asked respondents about the type of New Product Development strategy their own firm had. The results showed that measures did vary in usefulness according to the market strategy of the firm. The authors make the important point that achieving one measure can be at the expense of another measure citing the computer mouse that has had enormous customer acceptance. However since Xerox invented it, but did not commercialise the mouse, this meant that Xerox did not gain from it financially. So the mouse is a success but not for the firm who invented it. The Kodak instant picture camera, another example, gave Kodak a 35% share in two years and expanded the whole market but much of the profit was dissipated on paying for Polaroid patent infringements.

A number of themes run through the studies into how New Product Development success is measured:

- Firms and researchers use many measures to assess success - Authors have then grouped measures into themes such as Financial Performance and Product Performance.
- Research into NPD success has looked at either specific projects or general firm performance - Studies either look at tracking specific projects over the development, launch and commercialisation cycle or they look at the overall performance of the firm.
- Financial performance including ROI, sales and profits - Since many projects are given the go ahead on the basis of their projected financial returns it makes sense that when projects are completed the level of achievement against the original criteria is measured.
- Timeliness and speed of projects - projects that drag on and do not reach the market on time will not then achieve the sales and profits in the expected timescale. Therefore project time is a favoured measure.
- Customer satisfaction - Customers who like the new product will buy it and this will then allow the achievement of the sales and financial goals. Satisfaction may also help the achievement of market share and margin targets.
- Technical performance - This measure assesses the degree of innovation but also the quality standards achieved. Customers want up to date features and they want them to work. This may be particularly true of industrial products where

the need for the product to work well and be technically advanced will help the customer in their own product development efforts.

- The cost of developing the new product - High cost projects are likely to be important to firms and to managers. The cost of development needs to be on target or budget otherwise the Return on Investment criteria will not be reached.
- Firms have their own targets and goals that new products need to meet.
- Firms should use the measures to help in their portfolio management – Projects can be rated on their likely level of achievement based on the market and technical assessments.

## *Research Proposition Four*

There are no universal standards for success measures. Each firm sets its own criteria for success and even where a target has been set for sales or profits this will depend on the views of the managers on what is a feasible target. A project that meets the budget sales is then successful, although the level of the budget will vary between firms.

[It is worth noting that some firms did not want to take part in NPD success factor surveys. Perhaps firms may naturally want to guard their commercial position and may not be keen to give out detailed financial details and they may also want to keep any new product advantages to themselves.]

The literature shows that New Product Development success is a multi-dimensional factor. This may not be very surprising since new products covers such a wide range of different ideas, customers, firms and markets that each have their own unique characteristics. Success measures are then only useful in business if they help the firms themselves to decide on the best projects to back by using the measures in portfolio management. In the UK clothing and textile supply chain we might expect that sales are, to an extent, partially committed and perhaps other measures that are not sales related might be used to judge success.

The research proposition four is therefore:

**Textile and Clothing Supply Chain firms use non-sales based measures for new product success.**

## 2.9 Newness

**"Surprisingly, a good number of organizations are not developing true 'innovations'; instead they are relying on pursuing more defensive approaches." (Hanna et al, 1995)**

One aspect of NPD strategy is the view the firm has of where it is and wants to be on the scale of innovation and newness. Kleinschmidt & Cooper (1991) has shown that the degree of innovativeness impacts on NPD success and that there are dangers in being in the middle of the scale. But what is newness in new product development?

How new is new and new to whom? Is NPD largely concerned with 'new to the world' products that are ahead of the competition? Does NPD activity that is a line extension or trying an existing product in a new market also have its risks of failure? The question of how new is new has been raised by many researchers and is really about the definition and range of any New Product Development project. In turn this focus and definition of newness can depend upon the portfolio of the existing products and the strategy of the firm to either stay where it is or change its products or markets.

The drivers of New Product Development are (section 2.0) as we have seen:

- Technological advances
- Global competition
- Changing markets and consumer needs
- Speed of product development

But a firm may have much more local and limited drivers. The existing product may be quite satisfactory in generating sales and profits and only need some new improvements to make it perform better and to the greater satisfaction of the customers. There may be a need to newly engineer the cost down to accommodate some wage inflation pressure. In an economy where service industries are expanding can services have new products too? Was Drucker (1996, p38) right to say that every section of the company must strive to improve the way it carries out its functions? Is a new technology used to manufacture or deliver a new product then a part of the New Product Development process?

So what is newness?

Johannesenn et al (2001), looking at innovation and defined six types of innovation:

1. new products
2. new services
3. new methods of operating
4. opening new markets
5. new sources of supply and
6. new ways of organizing

The survey asked a sample of 696 industry firms CEO's and 200 small IT-sector firms the degree to which they had made any changes in the items on the list in the past three years. The authors consider that innovation lacks an agreed definition and good measures. They suggest that innovation is generally about newness and hoped to reach a better definition through their study.

Johannesenn et al started with the premise that "Innovation is any idea, practice, or material artefact perceived to be new by the relevant unit of adoption". They argue that newness to the market or newness to the firm is too narrowly focussed on product innovations. Some innovations have a far reaching impact. An example given is the DOS computer operating system which has had an impact on sectors far removed from the software itself. The results of their survey showed that innovation could be defined and measured as a single construct, distinguished only by the radicalness. In other words there is no need to split up innovation into many facets since it is only a question of how radical people think that an innovation is.

Innovation then, is in the eye of the beholder, and can occur across any of the six items on the above list. Cooper (2001, p 14) takes a less theoretical view and concentrates on new product innovation. He defines newness along two dimensions:

a. New to the company
b. New to the market

With each dimension having two categories ranging from low to high this gives several possible types of new product project:

1. New to the world: Products that are completely new and create a new market. Only 10% of products are in this category. Post it notes is an example.
2. New product lines: these products are new to the firm but similar types already exist in the market. Cooper cites the IBM laser printer that was new for IBM but HP already had one on the market. 20% of products are in this category.
3. Additions to existing product lines: Here firms may introduce a new model but to a different market. The home PC market laser printer from HP is cited as an example. The 'baby' jaguar car is probably another. 26% of new products are in this group.
4. Improvements and revisions to existing products: Where firms may upgrade a product. The market is the same and the product is much the same. Again 26% are in this group.
5. Repositionings: These are the same product but a new market is found for it. Cooper cites aspirin that has moved from a headache cure to a heart attack and blood clot preventer. Only 7% of new products are in this category.
6. Cost reductions: The firm may well have put in new technology to make (and sell) the product more cheaply but it remains the same and sold mainly to the same market, although the lower price may bring in previously excluded customers and this is a new market size. 11% of new products are in this group.

Cooper goes on to show that the averages above vary depending on sector with high technology firms being loaded towards product and market newness and introducing less repositionings and cost reductions. Cooper thinks that firms must use measures in their portfolio management techniques to plan the types of New Product Development.

Hanna et al (1995) also make the point that truly innovative products were a rarity for consumer products citing a study where only 6% of all consumer products introduced in a six-month period were innovative. The vast majority of new products were extensions of lines. Hanna et al (1995) consider there to be six types of new product idea and that there were marked differences between consumer and business products in the ratios of each used. The table in Figure 2.35 shows that consumer products were more likely to be totally new compared to business products.

| Sources for New Product Ideas | Consumer Products | | Business Products | |
|---|---|---|---|---|
| | N | % | N | % |
| Totally New Product | 54 | 85.7 | 57 | 67.9* |
| An extension of the product line | 60 | 95.2 | 71 | 84.5* |
| Tangible quality improvement of current product | 39 | 61.9 | 51 | 60.7 |
| New use/market for existing product | 38 | 60.3 | 59 | 70.2 |
| Adding features to current product | 21 | 33.3 | 42 | 50.0* |
| Added value to current product through distribution, promotion and pricing actions | 24 | 38.1 | 35 | 54.7 |
| Other | 4 | 6.3 | 6 | 7.1 |

* Significant at the 95% level.

Figure 2.35: Sources of new ideas. Adapted from Hanna et al (1995)

Craig and Hart (1992) mention the 'continuum from product modifications to radically innovative' and go on to discuss the difficulties of finding out which point on the continuum research studies have been focussed on. They cite two dimensions for product types or degrees of product development:

1) newness of the technology used by the firm developing the product
    - On existing products
    - On new products
2) newness of the marketing practises

In these cases the newness is viewed from the firm's perspective.

Hultink and Robben (1995) whilst looking at the time impact of success measures also studied the effect that type of product innovation had on the success measures used by firms and hypothesised that revenue growth and unit sales goals were more important for new products, with slight improvements, than on new to the world products. The results did not support their view.

Jenkins et al (1997) argue that the strategy that a business has for New Product Development must start with a definition of the type of product that the company

wishes to develop in order to set a framework within which decisions will be taken and to guide the product development teams when defining new products. They consider that there are two main strategies for new products:

(a) New product line innovation and
(b) Product line expansion with the following sub approaches:

- Low end products that target new market segments and offering more affordable products to new groups of customer
- Cost reduced products that replace existing products and expand their product life since they are more competitive
- High end products that have new features and characteristics that appeals to a new segment that will pay more.
- Next generation products that replace the current product line with products that have higher performance and better functionality but at the similar price
- Breakthrough products that both increase performance and functionality but at a lower price tending to make existing products obsolete

(The authors discuss a portfolio management approach where a company continuously evaluates the direction that each product line is taking to ensure the correct mix. The authors show how a product line evolution can be mapped over time and argue that how NPD and new technology resources are obtained and decided on can be helped by this process of categorizing products). This is the framework for new and different product lines. The degree to which the new product is a departure from the existing product, technology and market can be looked at in three dimensions; technology, market and product. The further away from the known the more risky it is and incremental moves may be wisest, but since products that are uniquely superior have the best chance of success so it may be that larger leaps are worth it. Jenkins et al (1997) argue for firms having a match between how the resources are directed and the strategy of the business.

Researchers seem to agree that there are various types of new product and that only a small percentage (6-10%) of new products are actually new to the world. Newness exists on a continuum and can be seen either from the firm's perspective or the customer's view. Firms are generally more involved in extending and upgrading

existing products. Finding new markets for existing products is categorised as a new product activity by many researchers. Similarly using new technology or using new marketing methods is also classed as new product development activity. The type of new product focus depends on the sector the firm is involved in with consumer products and high technology more likely to develop totally new products. Saunders and Jobber (1994) suggest that firms can have a product replacement strategy that includes choices about the degree to which the product changes or is repositioned in the market, the extent to which the marketing is conspicuous and the timing or phasing of the change of product.

## *Research Proposition Five*

Researchers recommend that firms recognise the different types of new product development and use portfolio management techniques to manage their strategy and plan resource allocation and new product development activities. The degree of newness matters to the extent that it is related to strategy and firms need to recognize:

- where they are on the continuum of newness and
- where they want to be and also decide
- what particularly is driving innovation in their market sector.

If the market is above all seeking cost reductions then having no resources devoted to this aspect of NPD, and no long term projects looking at efficiencies or new cheaper technologies, would be a risk.

In the clothing supply chain there can be newness at various points along the chain from new raw materials to a radical style of clothing design. With fast response required from a supply chain we might expect that newness for the firms involved would be limited to line extensions with new to the world products requiring a longer-term timescale.

The research proposition five is therefore:

**Textile and Clothing Supply chain firms develop new products that are line extensions.**

## 2.10 Senior Management

Top management may set out the strategy but they can also have a more direct influence on NPD project and programme success. Senior managers have to make choices of a strategic nature about the innovation goals, the allocation of resources to innovation activities, assessing the risks in innovation, deciding about new product timing on new introductions to the market and taking a long term perspective (Ramunjam & Mensch, 1985). Having produced a strategy, top managers will also then show more or less commitment to it.

Early work on the SAPPHO project showed that high quality managers who were more interested in NPD were more likely to be successful (Rothwell et al, 1974):

**"Although the use of various formal management techniques can be of great assistance to management, they are no substitute for managers of high quality and ability. The individual whose presence differentiates most strongly for success....is generally an individual who is enthusiastic towards innovation....who has...sufficient authority and power to affect the course of the innovation"** (Rothwell et al, 1974).

Senior management has an influence on New Product Development (Ernst, 2001) in terms of their role and commitment where top managers may be influential in their support for projects and be involved in the allocation of resources. The style of managers may be participative or authoritarian (Balbontin et al, 2000). Cooper and Kleinschmidt (1987) in developing a construct that NPD success in projects was related to senior management support used three sub questions concerning commitment to the project, involved in day-to-day management of the project and top management providing guidance and direction. They found only limited support for the hypothesis in US firms although top management support correlated positively with NPD success in Japan (Song & Parry, 1996).

Creating an organizational climate that is conducive to good co-operation between departments is also a key top management responsibility that can impact on NPD since better levels of co-operation help NPD success (Gupta & Wilemon, 1988). Measures to

create the organizational climate might include job rotation, visits by R&D staff to see customers with marketing staff, joint R&D/marketing idea sharing seminars or workshops and joint rewards for R&D and Marketing staff. Managers were also advised to be more tolerant of failure, encourage risk taking and be more supportive of marketing and be more balanced towards the importance of both R&D and marketing functions.

One issue that may involve senior management closely with NPD is in making go/kill decisions that support the firm's NPD strategy and weed out unsuitable projects whilst allocating resources to the projects most likely to succeed (Cooper, 1994b). The chart (figure 2.36) below shows the Stage-Gate™ NPD Model where senior managers meet at the gate reviews.

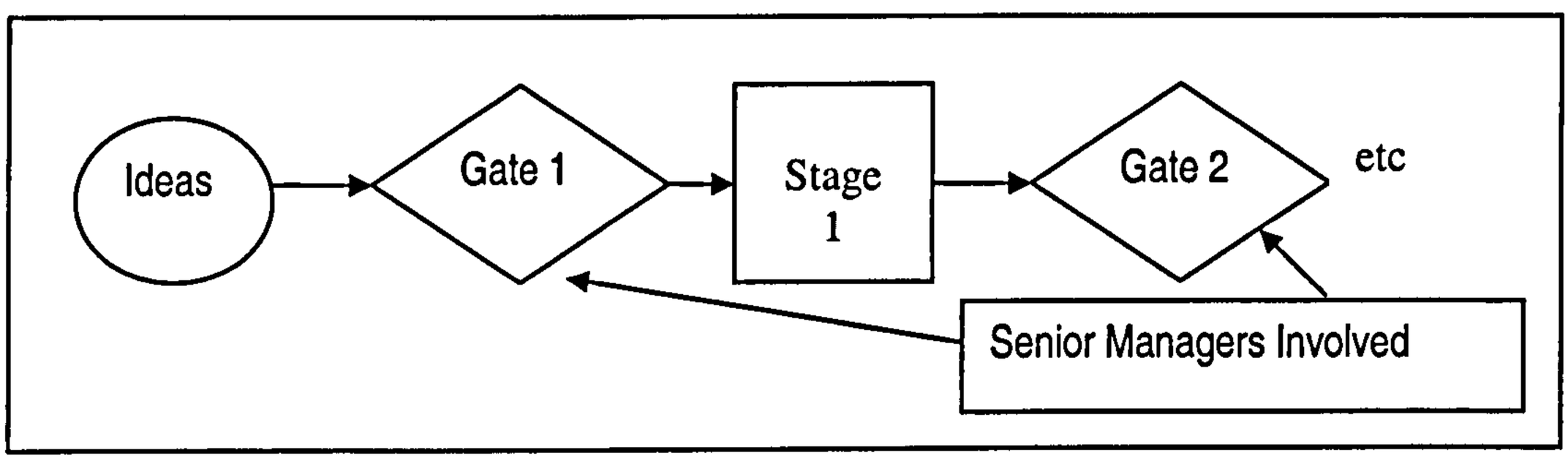



Figure 2.36: Stage Gates

However there may need to be a faster, less sequential process that also shifts authority and empowers project teams to make these gate decisions.

The impact of top management has not been adequately addressed in research (Montoya-Weiss and Calantone, 1994) and there have been few studies on the different perspectives of top management and other functional groups about NPD success factors. Yap and Souder (1994) considered that early senior management involvement would enhance NPD success rates although they also discovered that an autocratic project leader helped except in conditions of high technical uncertainty. Balachandra (1984, cited in Ernst, 2002) found that top management support made it less likely that a project would be terminated. However it was thought that top management may unwisely hold on to pet projects. Managers and senior managers themselves (Thamhain, 1990) consider that organizational support (through 'involved, interested supportive'

management) had a strong correlation with innovative better performance. Hanna et al (1995) cite lack of top management commitment as one of the main causes of failure. Top management (Craig & Hart, 1992) are known to be influential in setting the managerial orientation towards a balanced support of both marketing and technical inputs, in making strategic and operational choices about goals and resources and in setting the organizational climate for management of people and departmental functions. Senior management also influences the balance between the importance attached to technical and production issues and the needs of the market (Voss, 1985). Top managers should use their authority to support the NPD process but not 'micro manage' it (Cooper, 1999); top managers in particular should ensure the decision stage gates work and that the rules are stuck to so that pet projects are not favoured.

## *Research Proposition Six*

Whilst there are limited empirical studies on top management impact on NPD success and only some weak correlation between top management and success found in the studies, researchers have suggested that senior management is nevertheless responsible for setting the organizational climate for innovation, organizing the NPD structure and encouraging inter-functional co-operation. Senior managers could be responsible for the gate reviews and go/kill decisions but recent work suggests this slows down NPD and that more empowerment of teams is faster. Committed and supportive senior managers can show interest in projects, be involved on a day-to-day basis and give guidance to project teams although the interest can be overdone. Senior managers have an impact on the orientation of the firm and the balance of technical and marketing.

In Textile and Clothing Supply Chains senior managers can influence the relationships with customers and suppliers and retail managers must make strategic decisions about how much to involve suppliers and allow them control and design responsibilities. Supply chains may have various decision points in NPD processes and therefore senior managers may be involved in go/kill decisions although this may add to the level of bureaucracy and cycle time. More empowerment of project teams may be best for development speed. Equally day-to-day involvement of senior managers in individual projects may be difficult in a high volume fast cycle NPD environment such as Clothing Supply Chains.

The research proposition six is therefore:

**Textile and Clothing Supply chain firms' senior managers are not involved in the individual project decisions.**

## 2.11 Organising for NPD

> **"Overall organizational integration was found to be significantly associated with new product market success". (Millson & Wilemon, 2002)**

Having an NPD strategy implies that senior management must allocate resources to new product projects and make arrangements for the organization of the NPD staffing structure within the organization. This leads naturally to the question of what type of organization structure is best for NPD. Should NPD take place within the on-going operation of the existing business or be a separate function? Page (1993) has reviewed the type of structure in 189 firms with six different structure options:

- A multi-disciplinary team
- A new products department
- A product manager
- A new product manager
- A new products committee
- A venture team

Page reports that 76% of these best practice firms used multi-disciplinary teams. However it should be noted that the term 'best practice' was due to the respondent being a member of the Product Development Management Association. The survey nevertheless showed a trend to having more than one of the structures in the above list. Almost a quarter of firms, for instance, had multi-disciplinary teams and a product manager. A fifth of firms had a team and a new product manager and a similar proportion had a team and a new product department. With the types of NPD stages and tasks described above it is clear that departmental functions are also involved in NPD. Page examined the proportion of firms that had functional involvement in NPD

and the proportion of the department time spent on NPD. The results are summarized in the table in Figure 2.37 below:

| Function | Proportion of companies who report functional involvement in NPD | Department time spent on NPD |
|---|---|---|
| R&D | 70% | 56% |
| Engineering | 57% | 34% |
| Marketing | 82% | 28% |
| BU General manager | | 18% |
| Manufacturing | 43% | 14% |
| Sales | 24% | 10% |
| Corporate management | | 10% |
| Finance | 21% | 7% |

Figure 2.37: Management involvement in NPD. Adapted from Page, 1993.

Here we can see that marketing, R&D and Engineering are the most likely functions to be involved in NPD and they are also the departments who spend the most time on NPD. Griffin (1997) has also shown that multi-disciplinary teams have a positive impact on NPD programme success. However NPD still tended to report to functional areas and be the responsibility of the process owner and Griffin could find no best structure in terms of NPD ownership with R&D, engineering and marketing equally good choices.

Another main question for the organization of NPD is the use or otherwise of a project leader. It appears that having leadership for a new product development project beyond ownership by a multi-disciplinary team is widely used. A new product project leader was found in 60% of firms (Griffin, 1997) and a product champion in 40%. There seems to be no difference between these roles in terms of new product success. It has been suggested (Larson & Gobeli, 1988) that certain project leader structures produce better results in some pre commercialization aspects of success. Functional NPD structures were inferior in terms of projects being on time, on budget cost, technically successful and for 'overall' success. Beyond that there seems to be no difference between the structures of project team, project matrix or balanced matrix. This study is useful in that it explains the exact nature of responsibility of the various NPD structures. The table in Figure 2.38 below lists the typology descriptions.

| Structure | Description |
|---|---|
| Functional | The project is divided into segments and assigned to relevant functional areas and/or groups within functional areas. The project is coordinated by functional and upper levels of management. |
| Functional matrix | A project manager with limited authority is designated to coordinate the project across different functional areas and/or groups. The functional managers retain responsibility and authority for their specific segments of the project. |
| Balanced matrix | A project manager is assigned to oversee the project and shares the responsibility and authority for completing the project with the functional managers. Project and functional managers jointly direct many work-flow segments and jointly approve many decisions. |
| Project matrix | A project manager is assigned to oversee the project and has primary responsibility and authority for completing the project. Functional managers assign personnel as needed and provide technical assistance. |
| Project team | A project manager is put in charge of a project team composed of a core group of personnel from several functional areas and/or groups, assigned on a full time basis. The functional managers have no formal involvement. |

Figure 2.38: Typology of NPD Organization. Adapted from Larson & Gobeli, 1988

What is clear from this table is that project leadership is also a key feature of non-functionally led NPD organization.

With various functions involved in NPD plus multi-functional project teams and project leaders there is scope for misunderstanding and conflict. Mechanisms for improving understanding range from simply meeting together every week to those involved attempting to avoid creating problems for each other or having mutual new product goals (Millson & Wilemon, 2002). These integration mechanisms did improve NPD success whether those involved were internal (functional departments) or internal and external groups.

Pinto & Pinto (1990) have given some insights into the detailed processes of how these functional groups communicate, including the modes, purposes and regularity of communication. For example modes of communication range from project team meetings, written letters or memos to making telephone calls. The purposes of communication include resolving problems, exchanging ideas, resolving conflicts and obtaining feedback and approvals for tasks. Having the same goals in different parts of an organization may not lead to a common view of what is needed.

Griffin & Hauser (1996) suggest that two of the main functions involved - marketing and R&D - have different perspectives. The table in Figure 2.39 below shows how the two functions differ across many dimensions. It can be seen that the two functions have a different approach in many areas and this may explain the need for integrating mechanisms.

| | **Functional Position** | |
|---|---|---|
| **Dimension** | **Marketing** | **R&D** |
| Time orientation | Short | Long |
| Projects preferred | Incremental | Advanced |
| Departmental structure | Medium | Low |
| Ambiguity tolerance | High | Low |
| Bureaucratic orientation | More | Less |
| Orientation to others | Permissive | Permissive |
| Professional orientation | Market | Science |

Table 2.39: Marketing v R& D perspectives. Source: Griffin & Hauser, 1996.

## *Research Proposition Seven*

Organizing for New Product Development concerns the choices that firm's make about the passing of projects from department to department as the project makes its way along the NPD process. The firm may use of Multi-Disciplinary teams to co-ordinate project management. Communication between functional departments is important and the use of structured methods is encouraged.

We might expect Textile and Clothing Supply Chain firms to have problems of integration and need formal communication methods for New Product Development both within the firm and between firms.

The research proposition seven is therefore:

**Textile and Clothing Supply chain firms use structured communication methods with each other in the NPD process.**

## 2.12 Tools, Methods and Portfolio Management

The question of how to improve the success rate of NPD has not only seen investigation into the process steps and organization but research has also sought to find the additional techniques firms used to help the NPD process at various times. Nijssen & Lieshout (1995) have investigated the use of these tools and methods and found over 600 in use. The authors have classified all these models and methods as helping to answer 4 basic NPD questions:

1. Which product should be designed?
2. How must the product be designed?
3. How should the product be introduced to the market?
4. What is the anticipated success rate of the new product?

It is suggested in the study that certain well-known NPD tools are used to answer particular questions as shown in the diagram below in Figure 2.40.

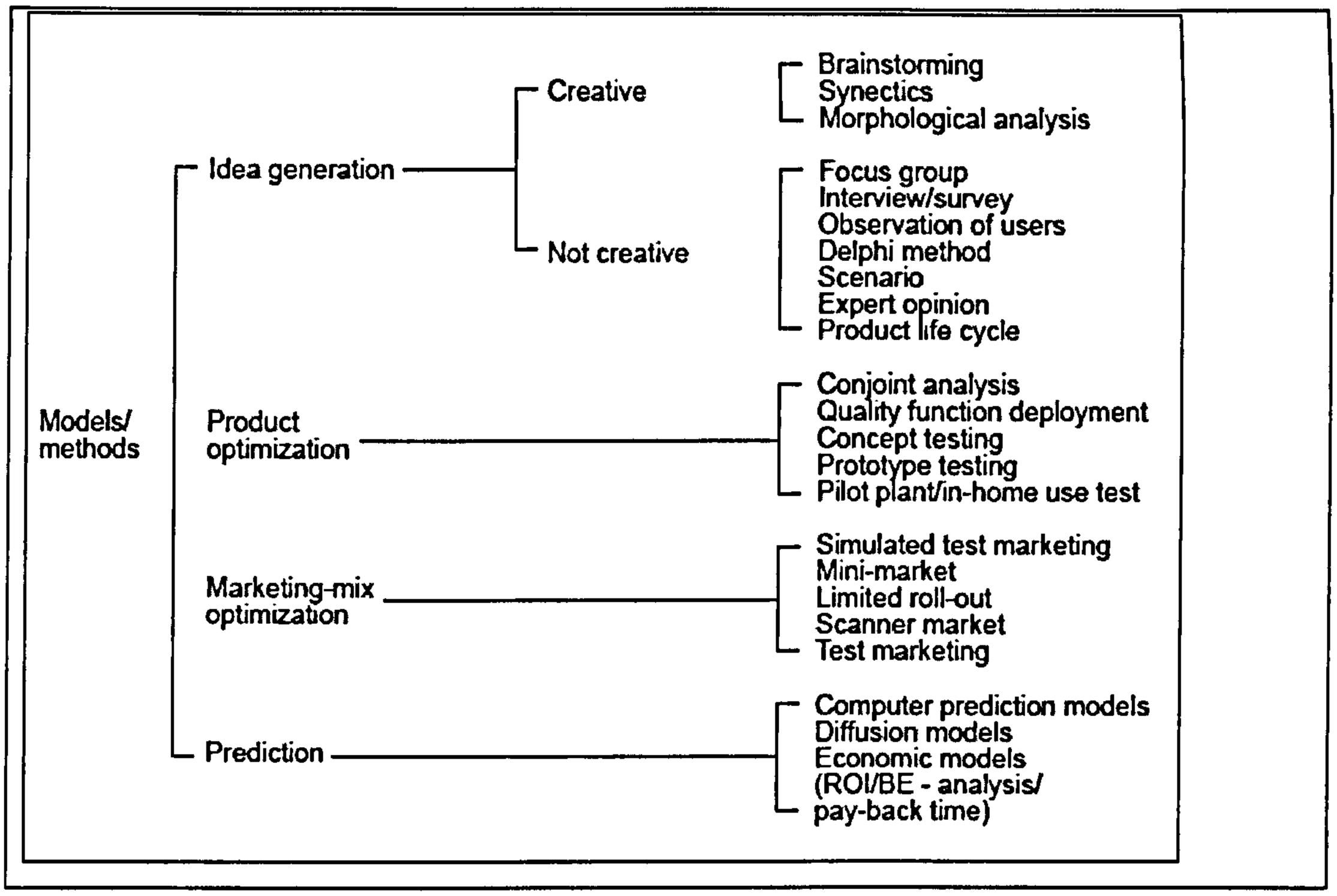



Figure 2.40: NPD Tools. Adapted from Nijssen & Lieshout, 1995.

The Nijssen & Lieshout study demonstrated that only a few methods were known about by name in the industrial products sector (Figure 2.41), although the methods were more understood once the method was described.

| | % knew method | % knew name |
|---|---|---|
| Brainstorming | 97 | 96 |
| Concept testing | 88 | 29 |
| In home use test | 82 | 51 |
| Product life cycle | 81 | 65 |
| Focus group | 71 | 63 |
| Morphological analysis | 54 | 14 |
| Conjoint analysis | 51 | 4 |
| QFD | 32 | 7 |
| Limited roll-out | 29 | 3 |
| Synectics | 28 | 6 |
| Delphi method | 18 | 0 |
| Average | 57 | 30 |

Figure 2.41: Knowledge of NPD Tools. Source: Nijssen & Lieshout, 1995.

Tools were not widely used. Brainstorming and product tests were more common, but the customer focussed Quality Function Deployment was less well used (Figure 2.42).

| | % Use | % Former use |
|---|---|---|
| Brainstorming | 61 | 9 |
| Concept testing | 61 | 1 |
| In home use test | 60 | 0 |
| Product life cycle | 39 | 3 |
| Focus group | 38 | 1 |
| Morphological analysis | 29 | 1 |
| Conjoint analysis | 17 | 0 |
| QFD | 17 | 1 |
| Limited roll-out | 17 | 0 |
| Synectics | 10 | 0 |
| Delphi method | 6 | 0 |
| Average | 32 | 2 |

Figure 2.42: Usage of NPD Tools. Source: Nijssen & Lieshout, 1995

The study also confirmed the widespread use of some techniques like brainstorming *at all stages* and not only at the idea generation stage.

The findings confirm to a degree the work of Mahajan and Wind (1992) regarding the use of a limited set of tools to assist NPD (Figure 2.43) where focus groups were the most popular technique. In this study the tools were largely used to try and improve NPD success but there were a number of shortcomings reported including the high cost in terms of time and cost and methods were felt to be unreliable or unable to capture the complexities of the problem.

| Model/method | % Businesses |
|---|---|
| Focus Groups | 68 |
| Limited roll out | 42 |
| Concept tests | 26 |
| Show tests and clinics | 22 |
| Attitude and usage studies | 19 |
| Conjoint analysis | 15 |
| Delphi | 9 |
| QFD | 9 |
| Home usage test | 9 |
| Life cycle | 8 |
| Synectics | 8 |

Figure 2.43: Limited use of NPD Tools. Source: Mahajan and Wind, 1992.

In another study (Coates et al, 1996) 81% of respondents used idea generation techniques, with brainstorming, lateral thinking and product checklists the most popular methods. Firm typically used three idea generation methods often involving customers but the methods did not appear to lead to a higher likelihood of the product idea being launched.

Many firms use competitor products, store visits at home and abroad as a source of new ideas (Sowrey, 1989).

It has been argued that managers need good methods for making gate decisions. Stage-Gate™ models of NPD processes have gate stages where senior managers need to make go/kill decisions based on predetermined criteria (Cooper, 1995). The weakest part of some NPD processes is the gate stage (Cooper, 1996), since projects often get to move along the process 'without serious scrutiny' and the goal should be to move from a funnel to a funnel where mediocre projects are culled out. However there should still be a flexible approach with some stages and decision points skipped or moved forward. It is argued that product portfolio management is about the allocation of scarce resources and the balancing of resources to projects (Cooper et al, 1999).

Methods used for project go/kill decisions include financial models and indices such as Net Present Value and Internal Rate of Return, Boston Consulting Group matrix and scoring models. Some businesses 'shoot from the hip' and do not use project selection methods where others use them but are not convinced about their usefulness (Cooper et al, 1999). The good businesses use a portfolio method that leads to six goals:

- Having the right number of projects for the resources
- Avoiding project pipeline gridlock by having on time projects and sticking to the timetable
- Have a portfolio of high value projects that are profitable and have good commercial prospects
- Have a balance of short term and long term, high risk and low risk
- Have a portfolio that aligns with the business strategy
- Have a portfolio where the spending breakdown mirrors the strategic priorities

The most popular portfolio selection methods were financial with 77% of firms using them. The use of allocation of money as strategic buckets was also popular (64%) with projects ranked within the bucket. The best firms use both these methods. However financial methods often led to poor value project portfolios with low on time performance.

Scoring methods that take account of market fit, technical fit, risk and uncertainty are also suggested (Calantone et al, 1999). The NewProd system has a similar set of scoring choices (Cooper, 1985b).

One might expect that different techniques would be used at the different gates in the NPD process with for example financial measures at the business case decision stage and market acceptance measures at the test marketing stage (Hart et al, 2003). However this study in the Netherlands and the UK found that whilst technical feasibility is often examined at the early idea screens the market acceptance level was more likely to be measured after launch.

There are some differences in the NPD tools used in Europe compared to the USA (Balbontin et al, 2000) with more CAD/CAM used in the US at the design and validation stage and more critical path and PERT used in the UK for project management.

Supply chains firms might focus on tools to measure cycle time of product development if they wish to achieve fast response. Many firms report shorter development cycle times (Griffin, 1993) and firms have a variety of possible measures that can be used for

cycle time outcomes including project timing from start to finish although it is often difficult to decide when a project starts as an idea (Cooper and Kleinschmidt, 1994) and being on time with a project may be just as important. Other measures include cost by phase and time to market. Product complexity and the degree of similarity with previous products affect cycle time with more complex and less familiar products taking longer. Firms who measure cycle time are better able to plan the introduction of new products. New to the world products in one study (Griffin, 2002) took 53 months compared to 9 months for incremental improvements although the study also found no data to suggest that fast development was more successful. Reducing the number of steps in the NPD process also led to shorter development times (Griffin, 2002). Consumer products were found to be faster than industrial products regardless of the level of innovation. There have however been relatively fewer studies into the speed of development (Montoya-Weiss & Calantone, 1994) although one study ( Cooper & Kleinschmidt, 1994) found that projects managed by a cross functional team, led by a strong leader with top management support were fastest.
Lead-time reduction in supply chains can be achieved through the use of I.T. support including CAD/CAM and three main approaches (Jayaram et al, 2000) including concurrent engineering, standardization and value analysis.

## *Research Proposition Eight*

Firms use a variety of NPD tools and methods that should be related to the particular stage in the process to help them answer NPD related questions. Methods used internally to improve the success rate of the NPD process include idea generation methods like brainstorming, business case evaluation methods like Internal Rate of Return and scoring systems that seek to rate projects against a variety of variables including technical feasibility, synergy with skills and risk. It is important to use these screening methods formally to weed out poor projects and use the firm's resources wisely.

Information Technology can be used at various stages including Design and Development and the tracking of cycle time. Managers find it difficult to find the time and resources for use of tools and methods. Cycle time can be reduced through the use

of I.T. techniques such as CAD/CAM, but measures of time might also include staying on schedule.

A Textile and Clothing Supply Chain has by definition a set of supply and purchase relationships and therefore suppliers have an existing customer or are a preferred supplier. The lean paradigm associated with supply chains suggest that firms involved in the supply chain will have an interest in speed and this may extend to product development. There is an acknowledgement that the decision gates of the Stage Gate slow down the NPD process. We have seen that Textile and Clothing supply chains are working towards a launch date for seasonal new products (Forza & Vinelli, 1996). Therefore there may be more focus in Textile and Clothing supply chains towards less use of NPD tools for idea generation or for gate decisions and portfolio management. We might expect a supply chain to use more NPD tools that monitor time and project progress.

The research proposition eight is therefore:

**Textile and Clothing Supply chain firms use tools to monitor adherence to the product development schedule.**

## 2.13 Research Propositions Summary

The literature review and background to the research in a supply chain has led to the following research propositions:

1. **Textile and Clothing Supply Chain firms adopt 4th Generation faster, flexible NPD models.**
2. **Textile and Clothing Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**
3. **Textile and Clothing Supply chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**

4. **Textile and Clothing Supply chain firms use non sales based measures for new product success.**
5. **Textile and Clothing Supply chain firms develop new products that are line extensions.**
6. **Textile and Clothing Supply chain firms' senior managers are not involved in the individual project decisions.**
7. **Textile and Clothing Supply chain firms use structured communication methods with each other in the NPD process.**
8. **Textile and Clothing Supply chain firms use tools to monitor adherence to the product development schedule.**

## 2.14 Conclusion

This chapter has outlined the existing literature themes about NPD and introduced the research subject of the UK Textile and Clothing Supply Chain and the general proposition that a 'lean' supply chain like this will have different methods and organization of NPD to the single firms that have generally been studied so far.

The next chapter discusses the potential methods for an investigation of new product development in the UK Textile and Clothing Supply Chain and then justifies and describes the actual method for the current research.

# Chapter Three - Methodology

## 3.0 Introduction

This chapter contains a detailed discussion of the investigation methods available and the justification for the actual choice of method. The units of analysis are explained and the data collection methods are illustrated by the example of KnitwearCo.

## 3.1 Justification for the research methodology

Research design has been seen to flow naturally from the base of the research question. Robson (2002. p79) puts this simply:

> **"Design is concerned with turning research questions into projects."**

He goes on:

> **"The general principle is that the research strategy or strategies, and the methods or techniques employed must be appropriate for the questions you want to answer.**

If the method proposed and the possible sampling strategy do not seem compatible with the research questions then possibly a different question should be studied. Robson argues that the research question is central to the research design and that there needs to be a high degree of compatibility between the elements of the design framework as depicted in the diagram in Figure 3.1 below:

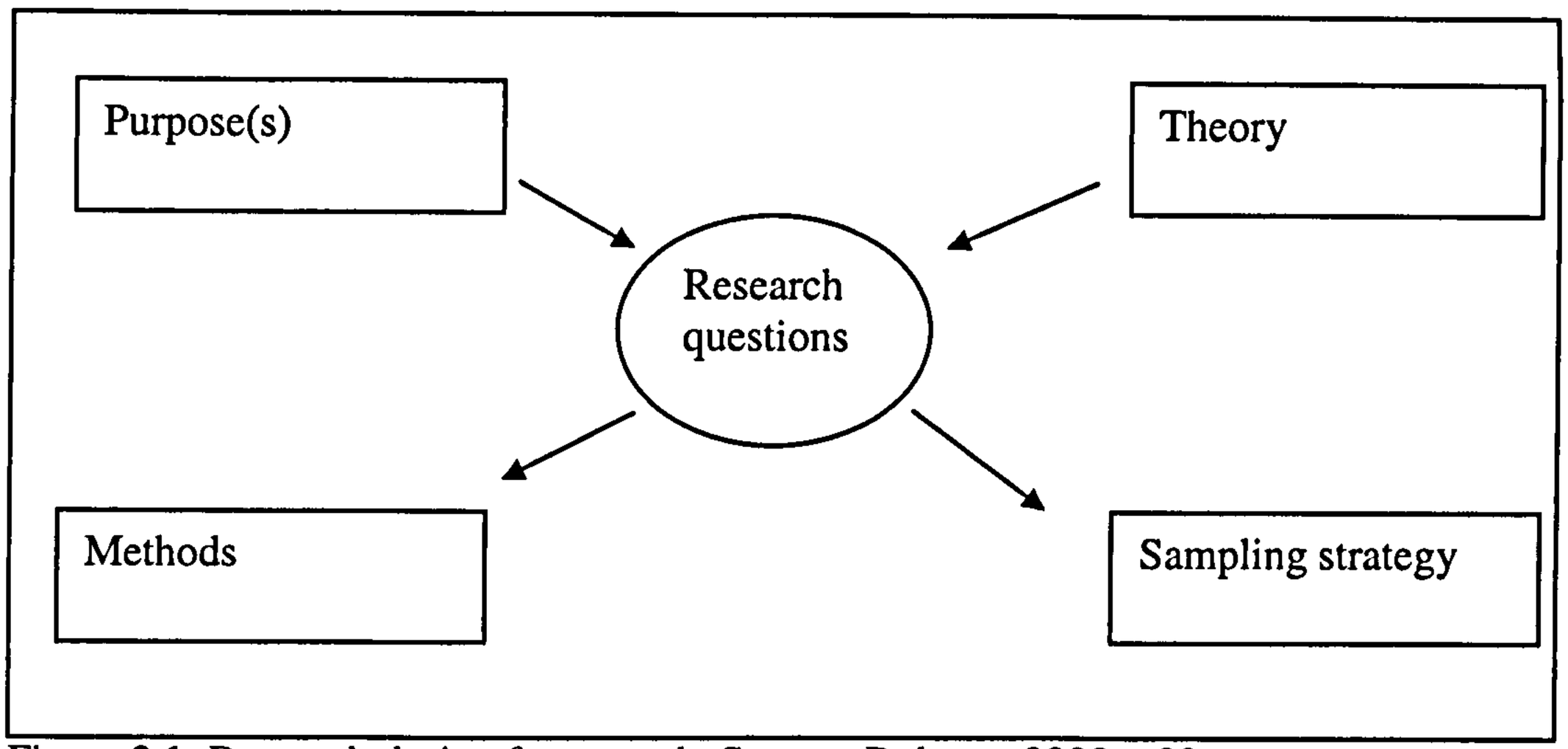


Figure 3.1: Research design framework. Source: Robson, 2002, p82.

In this model we can see that the methods element is separate from the data collection (Sampling) element and both stem from the research question that in turn depends on the purpose of the study and the existing theory that the study is being linked with. But what makes a particular method more appropriate for one research question than another method?

Creswell (1994, p1) suggests that the main choice for researchers is between qualitative and quantitative approaches. He defines these approaches as follows:

> **"A qualitative study is an enquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting". (Creswell, 1994, p1).**

The qualitative paradigm has been described as a naturalistic, interpretative, post - positivist, post-modern or constructivist approach.

On the other hand:

> **"A quantitative study is an enquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures in order to determine whether the predictive generalizations of the theory hold true." (Creswell, 1994, p2).**

This quantitative paradigm has been termed the traditional, experimental, empiricist or positivist approach. On this basis if we are interested in describing how the world works as seen by the views of the informants in a study, we should use a qualitative approach. If, however we are anxious to get at the outcomes of a particular set of variables where we are predicting an effect (from our own developed theory) we might use a quantitative approach.

We must therefore first decide if we see the world as a set of theories and variables that we can test by experiments or perhaps we see the real world as a messy set of points of view seen by those who have the problems. There is a philosophical bigger picture and there are philosophical questions that may need to be considered before the research method is decided upon. Indeed the assumptions that we make as researchers about the way the world works may need to be considered first. Cohen et al (2001, p5) considers there are three types of assumption:

1. Assumptions about the nature of reality. Is reality 'out there' in the world, or is it created by one's own mind. Realists see the ontological position as objects having an independent existence and are not dependent on being known about. Indeed the nature of social reality is that it is external, objective and imposes itself on individuals from without. The opposite ontological view is held by the nominalist school that see social reality as the subjective product of an individual's consciousness. Nominalists see objects as existing only in thoughts and words and that then the meaning of the words is not independently accessible.
2. Assumptions about the very basis of knowledge. Is knowledge capable of being acquired or does it have to experienced? Some epistemological assumptions are at either end of these extremes since the positivist sees knowledge as hard, real and capable of being transmitted in tangible form whereas the anti-positivist sees knowledge as more subjective, soft, and even spiritual and based on personal insights and experience.
3. Assumptions about human nature and their relationship with their environment. Do humans respond in mechanistic ways to their environment or do they initiate their own actions?

Clearly these assumptions will have an influence on the type of research method since for example the researcher who believes in the positivist assumptions will try to use the traditional research methods of experiments and surveys as if the humans are in a way behaving in a similar way to natural phenomena and under controlled circumstances will behave in a predictable way. The anti-positivist will use a range of more recent and emergent methods of participant observation and interviews. Creswell (1994, p6) adds some further assumptions to assist in the choice of the qualitative or quantitative approaches and the axiological assumptions about values. Qualitative methods are said to be favoured by those who assume that the opinions (values) and bias of the researcher (and the informants) should be an admitted and reported part of the study and the language of the reports should be first person and personal. The researcher will be closely involved in the study and have a point of view along with the informants. Creswell asserts that quantitative research conversely should concentrate on 'facts' and 'evidence' with values and bias left out of statements and language impersonal. Experiments and surveys will use sampling methods to avoid bias. The researcher will avoid personal contact and use experiments and surveys. The language of the study will use well-defined and accepted concepts and variables in a quantitative study. On the other hand a qualitative study will be more informal, personal and emerge from the particular study. Having decided on the philosophical assumptions and qualitative and quantitative paradigms outlined above the method to an extent will follow. Creswell (ibid) suggests that quantitative approaches are associated with experiments and survey methods. The qualitative paradigm is associated with ethnographies (culture group field observations), case studies, phenomenological studies (the living experience) and the grounded theory multiple stages of data collection.

Yin (2003, pp5-9) suggests that the type of method depends first on the form of research question, but then both on the opportunity or need to control behavioural events and also on the time frame under review. Experiments, Yin suggests are used when the form of research question is a *how* or *why* type, the timeframe is contemporary and there is control over the behavioural events. An example might be a social experiment where the researcher can be sure of manipulating behaviour in precise, direct and systematic ways in a laboratory setting where the focus is on one or two isolated variables. Case studies are also used for *how* or *why* type questions where the focus is also on contemporary events but control over behavioural events is not possible or necessary. Case studies involve direct observation and interviewing as means of data collection.

Historical methods of research can also help to answer '*how* or *why*' type questions, but interviews are not possible since the timeframe is in the past and the informants are usually no longer alive and clearly there can be no control over behaviour!
Other types of question are *who, what, where, how many* or *how much.* Yin considers that these questions do not have to be answered by having control over behavioural events. Surveys or archive analysis are recommended for these questions. In the situation where the focus of research is, for example 'What have been the outcomes of a management re-organization?' a survey or archival search method is suggested. A survey might also be used in a question such as 'Who participated in riots?' On the other hand 'How much damage was caused in the riots?' would use an archival analysis of business records. The timeframe of a survey would be contemporary whereas an archive analysis can have its focus be in the past or the present day.

Robson (2002, p87) sees the choice of research method or design as between fixed and flexible. Fixed methods include experiments and surveys. These are fixed because most of the study is pre-specified. Experiments and surveys have clear and professional standards for the way they are carried out with tried and tested procedures and steps. Qualitative designs are more flexible. They are flexible since there is much less preparation and the design evolves as the study proceeds. Robson prefers the term flexible to qualitative since the study can also use quantitative methods at certain stages. This flexibility is something that Robson sees as necessary to solve *real world* problems.

One of the criticisms of much of the output of traditional research is its low level of impact on real world problems. Cohen et al (2001, p226) quote Marx:

> **'The task is not merely to understand and interpret the world but to change it'**

Otrun and Perry (2002) are concerned by the 'irrelevance of traditional research' and cite a number of criticisms of university research with much management and organizational research written for an academic audience only. They cite a survey of 200 senior US executives who showed scant interest in university research findings.

**"....not a single executive who was interviewed cited the research of business schools as either their most important strength or their major weakness. The business world is generally speaking ignoring the research coming from business schools. The perceived impact is virtually nil..... ".**
**(Otrun and Perry, 2002).**

The problem is not limited to the US. The authors go on:

**"In Australia, much of the traditional research in graduate schools of management continues to be irrelevant to management practice.....In brief, the research usually done in universities that grant PhD and masters awards has little relevance to the managers...".**
**(Otrun and Perry, 2002).**

The authors suggest that Action Research is one way of conducting research within an organization that can benefit both the organization and the body of knowledge about which a thesis is written.

Action research is a qualitative method that may have more relevance to real work problems. Otrun and Perry (2002) suggest that Action Research has three key aspects:

1. A group of people are at work together.
2. They are involved in the cycle of planning, acting, observing and reflecting on their work more deliberately and systematically than usual.
3. They produce a public report of that experience (such as a thesis).

Otrun and Perry go on to suggest that the existing literature ignores the complexity of presenting action research in the format required for a PhD. Action Research is a type of research approach that combines academic research with intervention in real world problems. Cohen et al (2001, p226) list a range of definitions of action research that have an educational and development flavour in a book about education research methods. One definition cited is: 'The combination of action and research renders that action a form of disciplined enquiry, in which a personal attempt is made to understand, improve and reform practice'.

Action research differs from case study research in one important element according to Avison et al (2001). Whereas the case study researcher seeks to study organizational

phenomena but not to change them, the action researcher is concerned to create organizational change and simultaneously to study the process.

Cohen et al *(ibid)* see action research as working in an area that needs desirable change until an improvement is achieved. There will be cycles of action. Action research is also concerned with monitoring an action plan.

Coughlan and Coghlan (2002) have put this cyclical spiral into a diagram (Figure 3.2) and introduce the concept of the project real world problem *client system.*

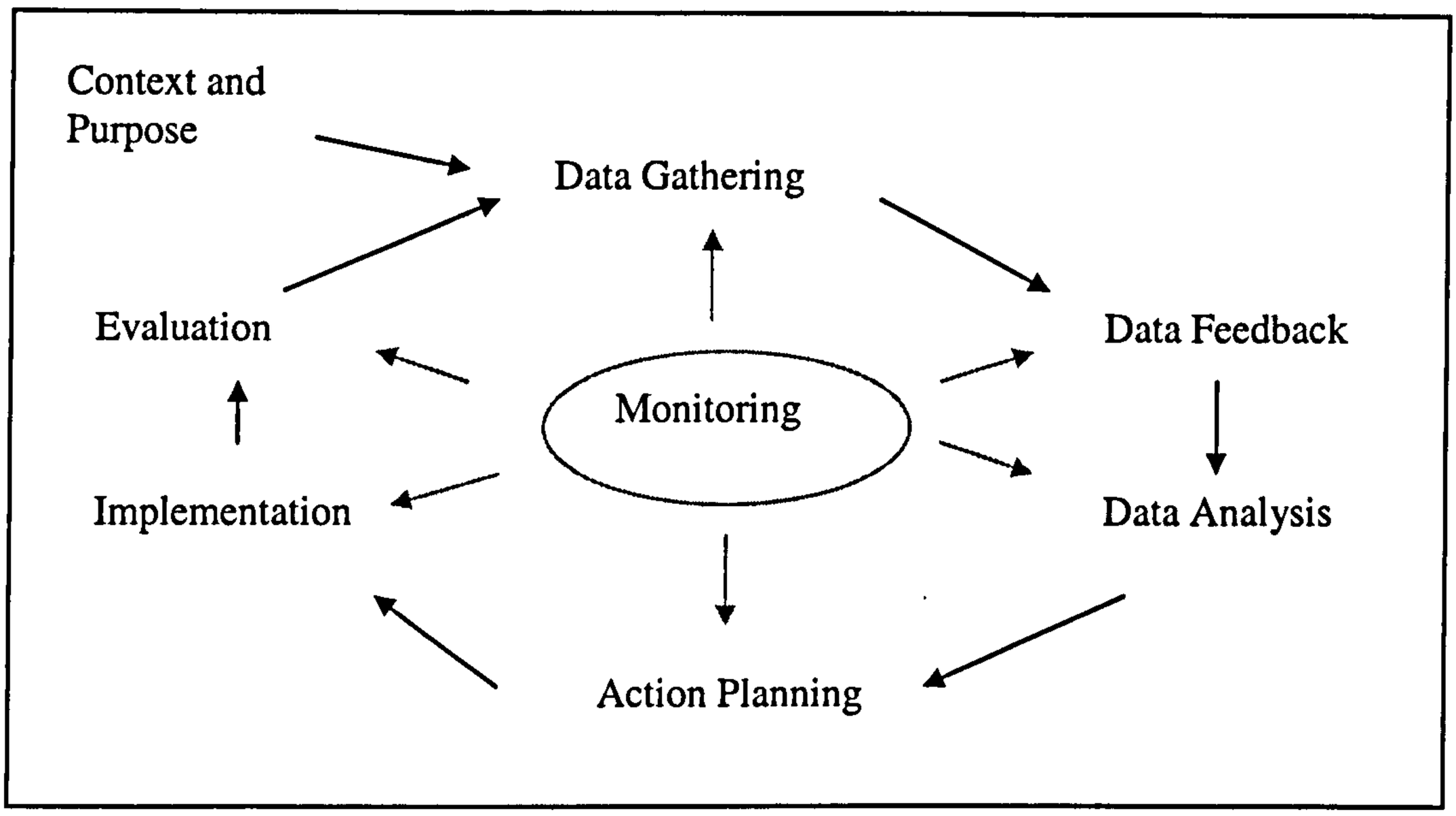



Figure 3.2: Action Research Spiral. Adapted from Coughlan and Coghlan, 2002.

However whereas the outer cycle describes the real world problem solving part of action research, the authors describe the academic side of the research as a *meta-step* of monitoring each step as the cycle progresses.

## 3.2 Selection of method

The thesis is about the methods and organization of NPD. The choice of qualitative or quantitative favoured the former approach since this was an enquiry process of 'understanding a human problem' – in particular how managers organized NPD. It was aimed at building a 'holistic picture, formed with words and reporting detailed views of

informants'. A quantitative approach was less appropriate since we had not for example attempted to try a new NPD method in an experiment and predicted a result from a developed theory.

The investigation needed to discover how NPD was organized in the case study firms and their supply chain partners. The methods used for this needed to use both observation and also interviews to discover the views of managers within the firms involved. The individual manager's views were also interpreted by the researcher and cross checked through interviews with other managers; observation; and examination of background documents, figures and archive material at the firms. It has previously been explained in chapter one (section 1.4) that the researcher was acting as a facilitator within the case study firms on real world problem solving and therefore he was involved in a type of action research approach of changing methods, after first understanding them.

In the researcher's view the study worked with the managers' views of how their world worked since in order to effect change it was the world that they believed in that was altered. As will be seen in the case study data findings this did not preclude the current researcher from presenting to managements a view of their firm that differed from their existing perceptions. In the example of RetailCo, for instance, senior managers considered that the bottleneck to development was the manufacturer. The data collected proved otherwise and managers at RetailCo were given evidence of this and then they helped to improve the timing of their buying decisions to speed up the cycle.

The Action Research process, starting with data gathering and leading to action planning, was therefore used in this research since the researcher was involved in solving real world problems and there was a separate associated research interest. There was a separation between the timing of the real world problem solving and the research cycle since the focus for the firms involved was the immediate individual situation of the firm whereas the researcher had a longer timescale.

It would have been possible to find out about the UK Textile and Clothing Supply Chain through a questionnaire survey method and indeed this is how much of the existing research studies on NPD have been carried out so far. There are weaknesses in this approach due to the possible informant bias and limited information that would be

gathered. The access to a small number of firms over an extended period in this research allowed a much more detailed understanding of the NPD processes to be gained than was possible in a survey.

The NPD methods and organization in a small sample of UK Textile and Clothing Supply Chain firms were investigated. The firms were part of a joint industry/government/university initiative aiming to improve supply chain performance. Access to the firms was, in the first instance, for the express purpose of jointly solving supply chain problems.

This thesis examines the data collected from the firms for the purpose of discovering details about their NPD methods and organization. The method therefore had some similarities with the Action Research process described above except that there was a separation in time between the real world problem and the research interest monitoring process. In this respect the method used was quite similar to the McKay & Marshall (2001) twin cycle action research method where there is a real world problem solving cycle and a separate but connected research problem cycle.

The research method examined the material collected from the real world problems and the same, now archived, information. Each supply chain firm was examined as a Case Study and since the firms had different real world problems the method of re-examining archive material and drawing inferences regarding NPD methods was flexible and varied from firm to firm, although evidence was sought to answer the same set of propositions discussed in the Literature Review.

The Case Study approach was acceptable since the questions that arose from the propositions were of the 'how' and 'why' type. For example the proposition "Supply Chain firms adopt 4$^{th}$ Generation faster, flexible NPD models" required that at least the following questions were investigated:

1. How are the functional departments involved in the NPD process?
2. How is the customer involved?
3. What NPD models are used?
4. Why does any particular NPD model appear to have been adopted?

The detailed method used to answer these types of questions was a new examination of the data and archived material arising from the Industry Forum intervention work within the firms. The method utilised the base data from project interventions involving a small number of firms, who were being assisted in solving supply chain problems. The base data was collected by the thesis researcher whilst employed as a research fellow and consultant on Department of Trade and Industry projects in the UK Textile and Clothing Supply Chain.

The data collected by the researcher during the case study interventions was used, for example, to answer the question above of how the functional departments were involved in the NPD process through consideration of the real world problem intervention project data and associated archives. In the KnitwearCo Case Study project, for instance, site visits were carried out and production staff interviewed as part of the KnitwearCo real world problem solving of discovering better methods to organise the product development and manufacturing processes. The information that was gathered also gave an insight into the way that the firm's business organized NPD across functions.

A Case Study approach was the preferred option to answering these types of questions rather than the use of a survey since we were interested in finding out in detail how NPD was organised and not simply to discover, for example, what percentage of firms use Stage Gate Models. The researcher had regular access to managers; and the firms involved all offered the opportunity to study the entire NPD process at first hand whilst helping to improve it. The case study approach revealed a rich picture of the firms and the supply chains.

This Case Study method nevertheless used information that was collected for the different purpose of solving a real world problem. There was therefore a need to ensure that an audit trail existed that linked the real world data to the research interests and propositions. An audit trail in Figure 3.3 shows how the original data for the real world problem solving was collected, who was involved and what the subjects were that respondents were asked about. In addition, the audit trail shows the types of data collection and the outputs of the process.

For example in KnitwearCo the firm wanted to consider how the NPD process could be made faster. This involved answering sub questions such as how fast was the existing

process, how did the process work and who was involved. The sub questions led to a set of data collection methods including site visits, interviews, examination of artefacts, such as products, and types of computer data. The area of the investigation was specified as the firm, the customers and the current NPD process. The base data collected from this qualitative case study investigation was the output of records made, of site visit reports and the NPD Process Map plus associated reports that were presented to the real world client at workshops. The output also included the summary reports and recommendations, proposal and pilot trials of new methods.

This base information was then analysed again with respect to the research interests and propositions, for example the proposition that part of the NPD process is carried out elsewhere in the supply chain. The plan for the real world research was contained in proposals to the firms for the project work. The lower part of the table in Figure 3.3 shows the connection between the real world data and the thesis research and how the data collected from the real world problem was examined in the light of the literature review findings and in particular the proposition that supply chain firms in this sector shared NPD activities.

| Context | Questions | Examination area | Unit of Analysis | Collection Method | Data Collected | Output |
|---|---|---|---|---|---|---|
| **Real World Problem** | How can the NPD process be made faster? | What is the speed of the existing process? How does the existing process work? What are the process stages? Who is involved? | The firm, the departments, the customers, the current NPD process and developments. | Interviews, Site visits, Products, Computer data. | Notes of interviews, documents, tapes, new products, photographs. | Description of the NPD Process, Timings, Process Map, Visit Reports, Workshop presentations, Summary Reports, Improvement proposals, pilot trials. |
| **Context** | **Question** | **Propositions** | **Unit of Analysis** | **Collection Method** | **Findings** | **Analysis relative to propositions** |
| **Research Interest** | What are the methods and organization of NPD | 2. Supply chain firms do not carry out all the NPD activities themselves… | Case Study firms | Examination of real world problem material(s) relative to the research propositions | How the firm carried out NPD | How the NPD process related to Literature findings about NPD activities. |

Flow of audit trail information

Figure 3.3: An audit trail

In this example there is a demonstration of the real world problem and its relationship to the research proposition regarding supply chain sharing of activities. The top part of the table illustrates how the real world problem for RetailCo looked at how to improve the speed of the NPD cycle and the table illustrates the collection of a specified set of data to understand the real world problem boundaries more clearly. The table also defines the sources within the firm which provided the data as the departments, customers and the new product projects. The data collection method required site visits and interviews. The records of interviews and documents helped to build an understanding of the NPD process and timing. The outcome of the real world problem solving was a set of further documents and reports to the firm concerned and records of the interventions to then change the NPD process.

The lower part of the table illustrates the connection between the real world data and the current research and how the data collected from the real world problem was examined in the light of the literature review findings. Understanding is further enhanced because all the data collection and analysis was undertaken by the same researcher.

The method was a qualitative Case Study approach. The researcher was involved during the study in various projects at twelve UK Textile and Clothing Supply Chain firms over a period of eighteen months acting as a facilitator. From these projects seven firms and four supply chains were then investigated in order to test the research propositions. The choice of the four supply chain units of analysis involving seven different firms is discussed below.

## 3.3 Units of Analysis

In considering the sample to include in this investigation, consideration was given to the potential data required to test the propositions within each of the firms - the units of analysis. The researcher was involved in and had access to material from a number of Industry Forum projects. However not all projects had sufficient focus on new product development to offer a reasonable amount of information to test many of the propositions. The section below gives background information on the Industry Forum, the firms involved and then a section discusses the real world problems and the

relationship with the research interests. The case studies used as the units of analysis for the thesis are then discussed.

### 3.3.1 Background to the Industry Forum

This research has been carried out with the assistance of the Industry Forum, a government backed organization dedicated to improving the performance of the UK Textile and Clothing Supply Chain. The Industry Forum employed the researcher who collected the data for the Case Studies.

The Industry Forum was set up in response to industry concerns about decline, and was jointly funded by the DTI, UK retailers and the supply chain firms who requested intervention in the form of Industry Forum projects.

> **'The UK textile and clothing industry's contribution to the UK economy is substantial, adding £7 billion of value annually. However the industry is currently facing the greatest challenges in its history. Low labour-cost suppliers are securing an increasingly large share of world markets, state aids in a number of overseas countries are distorting competition, sourcing patterns on the UK High Street are changing as are consumer spending patterns, and the general weakness of the euro and related European currencies is having a significant, negative impact upon UK exporters.'**

This excerpt, from the executive summary of the National Strategy for the UK Textile & Clothing Industry report published by the Department of Trade and Industry in 2001, expressed a view regarding the pressures facing the sector. The strategy report resulted from a joint exercise in 2000 involving representatives of trade associations, manufacturers, retailers, unions, academia and the DTI. The strategy report led to the creation of the Industry Forum (section 2.2).

The researcher was employed by the University of Salford, Department of Art & Design as a Research Fellow working for the Department of Trade and Industry - Industry Forum initiative that was jointly funded by the DTI and the Textile and Clothing Supply Chain. The researcher joined the programme when it had been running for six months and left after another eighteen months by which time the programme had fulfilled most of the original objectives. The Industry Forum founding partners included the following companies: Alders Department Stores Ltd, Allied Textiles, ARC Sports, Arcadia,

Acordis, Browns of Barnsley, Coats Viyella, Chilton of Scotland, Freemans ,Glenaden, Great Universal Stores, Hield Brothers, House of Fraser plc, Littlewoods, Marks & Spencer, Next plc, New Look, Oasis, Penn Nyla, Quantum Clothing Group Ltd and Textured Jersey.

The partners in the Industry Forum were major UK retailers and their suppliers. The UK variety chain and multiple retailers had a large market share (Jones, 2002, p243), holding, as they do, 50% to 60% of the market for clothing. The table in Figure 3.4 reproduced below (Jones, 2002, p244) shows the 1998 sales, for both clothing and non clothing, of the largest UK apparel variety chain and multiple retailers and which were involved in the Industry Forum. Most of the store chains have only own label products.

| Sales £000 | |
|---|---|
| | 1997/8 |
| **Marks & Spencer** | **8,243,300** |
| **Arcadia plc** | **2,086,600** |
| **Littlewoods** | **2,286,200** |
| Debenhams Retail plc | 1,678,100 |
| **Next Retail** | **1,072,123** |
| BHS PLC | 855,126 |
| Sears Clothing | 485,188 |
| Laura Ashley Holdings plc | 338,392 |
| River Island | 229,635 |
| Matalan plc | 229,635 |
| **New Look Retailers** | **279,493** |
| Peacock Stores | 123,069 |

Figure 3.4: UK Retailers. Adapted from Jones, 2002, p244.

The figures in bold are those retailers who were collaborators and partners of the Industry Forum. For reasons of anonymity the names of the actual firms and four supply chains involved in the research are not disclosed but they do include supply chains for two of the retail firms listed in bold above and are therefore important examples of the sector. More recent data from Mintel (2004) has sales figures for 2003 for Marks and Spencer for non food at around £3.4 Billion. M&S are still the largest UK clothing retailer. New Look sales in 2003 were £571m and are almost double the

1988 figure. The 2003 ranking of clothing sales in the Mintel report shows similar dominance of own label clothing brands including Marks & Spencer, Next, Arcadia, Matalan, BhS and New Look.

| Rank | Store | Sales £'000 |
|---|---|---|
| 1 | **Marks& Spencer (non-food)** | 3,402 |
| 2 | **Next Retail** | 1,809 |
| 3 | **Arcadia Group** | 1,702 |
| 4 | Matalan | 982 |
| 5 | BhS | 863 |
| 6 | TK Maxx | 601 |
| 7 | **New Look** | 571 |
| 8 | Primark Stores | 563 |
| 9 | Peacocks/Bonmarché | 490 |
| 10 | Gap (USA) | 405 |
| 11 | Mothercare | 381 |
| 12 | River Island Clothing Co | 378 |
| 13 | H&M Hennes | 373 |
| 14 | Alexon Group | 316 |
| 15 | Dunnes Stores (Republic of Ireland) | 241 |
| 16 | **Littlewoods Stores** | 240 |

Figure 3.5: Leading Clothing Retailers

Those shown in bold in figure 3.5 were Industry Forum partners.

The researcher was also involved, acting as a facilitator, in further retail supply chain projects outside of the two from the list above but these did not have sufficient New Product Development focus to be included in the research.

The Industry Forum had many partners as outlined above. The researcher was involved with a total of twelve firms in the partnership covering nine supply chains. Four of the supply chains are the subject of this study.

### 3.3.2 Industry Forum Intervention Projects and the Research Interests

The researcher worked on a number of Industry Forum intervention projects during the period of his employment by the University of Salford and the Industry Forum. The firms involved in these projects are listed below including some supply chain partnerships where the project involved management in two organisations. A selection of four of these supply chains in the list below were suitable cases for inclusion in the study. This section explains the choice of firms for the study.

Coats Viyella - Jaeger Manufacturing/Jaeger Retail
New Look - D&R Garments/New Look
Quantum Clothing - Stevensons Dyers/Marks & Spencer
Acordis - Tencel
Arc Sports
Quantum Clothing - Aspira Hosiery
Louis Vuitton Moet Chandon Group - Thomas Pink
Charnos Knitwear – Marks & Spencer/Charnos Knitwear
Browns of Barnsley

The four supply chains that were included in this research are **not** identified by name for reasons of maintaining anonymity. The selection of each supply chain for the study was partly a result of the underlying real world problem that the firm wished to address and partly a result of the degree of access to relevant data regarding NPD.

Each of the firms involved in the research invited the Industry Forum to assist them in improving some aspect of their supply chain performance. Whilst the focus of improving the firm's performance in a specific area varied from business to business, a common technique used by the Industry Forum consultants and project teams was process mapping of product development routes and manufacturing systems. This involved examining the methods; stages and organisation used by the firm though a series of site visits with interviews, observations, document collection and examination. In some cases the projects saw the definition of a problem, a process mapping, the highlighting of some areas for improvement and the trial of new working methods. Other projects were of a more exploratory nature, gathering data for use by local

managements. Two of the projects involved market research with a retail store garment inventory survey and market research gathering attitudes of consumers towards garment properties in a test sample.

Intervention projects generally followed a common workflow and organisation:

1. Exploratory discussions between the I.F. and partner company on a core problem area
2. A formal proposal of project work drawn up by the I.F.
3. Acceptance of the I.F. proposal by the partner company
4. Project team formed in the company
5. Project team work within the firm facilitated by the I.F. team leaders and researchers
6. Reporting by the I.F. team to the partner company senior management
7. Project report disseminated to I.F. partners and the Department of Trade and Industry.

The Industry Forum projects therefore gave the researcher an opportunity to combine the employment role with research into NPD methods in the clothing supply sector.

The local company management selected the intervention focus of each I.F. intervention project at each business. A project plan and timetable of investigation and action was then put forward by the Industry Forum with suggestions for the provision of staff time (and other resources) by both the firm and the Industry Forum. Each proposal had as a target the improvement or better understanding of some aspect of the supply chain performance.

The types of problem investigated by the researcher in I.F. project interventions included:

- The cost of a high volume new product development service for knitwear
- The perceptions of customers and suppliers regarding product development service performance in knitwear
- The speed of the new casualwear garment development cycle
- Improving the quality standard of new garment products for a retailer

- The development of a quick response cost model for a retail supply chain
- The development of a quick response garment processing service for a retail supply chain
- The market development of a new fibre product
- The speed of developing new sportswear products
- The development of a new anti Deep Vein Thrombosis flight sock product
- The mapping of new product development in high quality shirts

It can be seen from the above list that the many projects were focussed on improvement of new products and services. The intervention projects thus provided an opportunity to gather data that not only helped to solve the company problem but also to develop a perspective about the methods employed by the various companies that could help to answer the research question.

One way to consider this relationship between the IF project intervention in a real world problem and the research interests is to model the situation as a Venn diagram. (Figure 3.6).

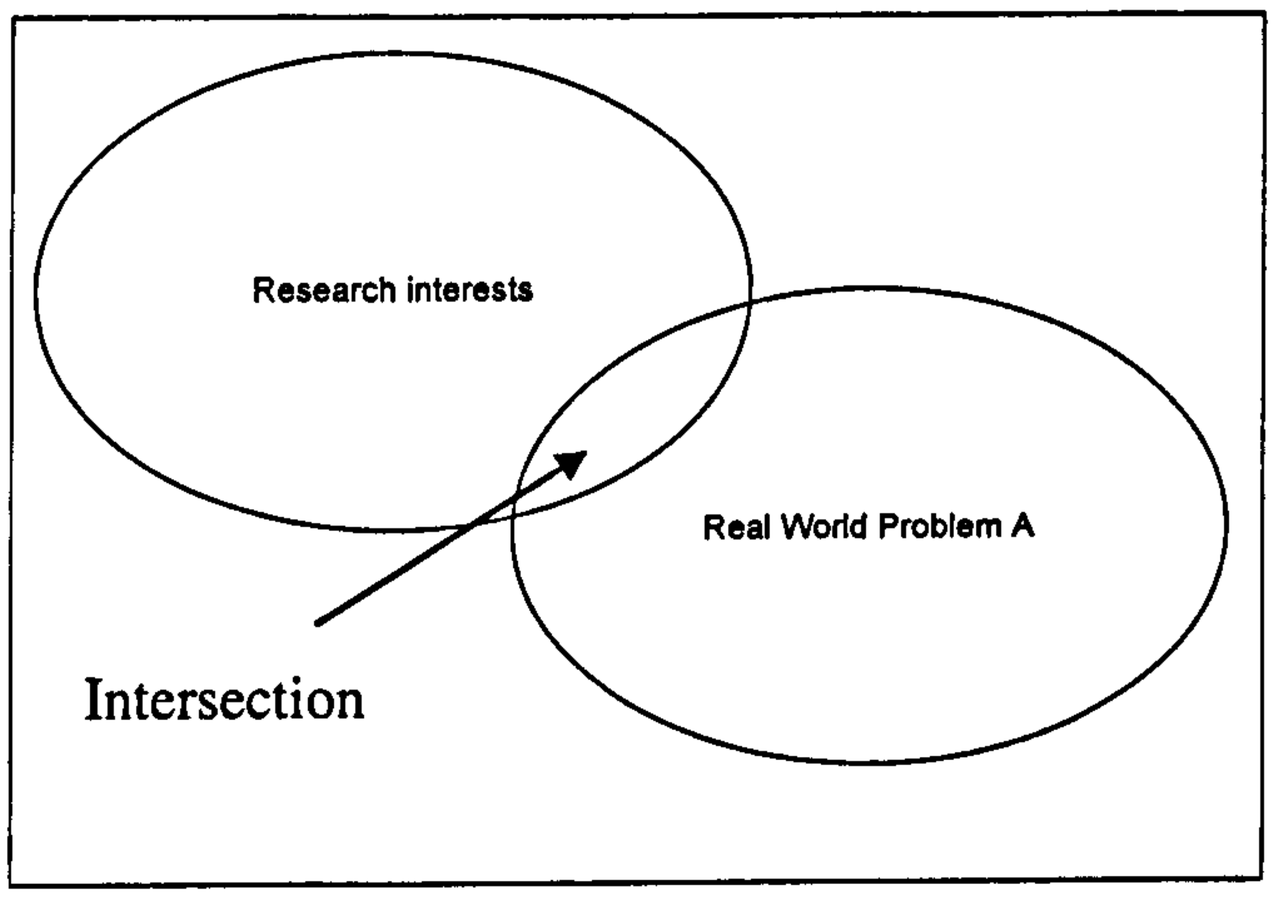



Figure 3.6: Venn diagram: Research Interests and Real World Problem.

In the Venn diagram we suppose that one Industry Forum intervention project involves a company that has a problem A that exists in the real world. The problem A has an accompanying set of information at a point in time about company methods, strategy, products, costs, manufacturing, organisation, customers and markets. The research interests in the Venn diagram therefore concern the methods and organization of firms

within the UK Textile and Clothing Supply Chain in New Product Development. As we have seen New Product Development literature covers:

- The type and generation of NPD Models
- NPD process development methods
- Organisation and activities
- So called 'NPD success factors' including strategy, top management involvement and market focus
- Definitions of NPD success
- Definitions of newness and where new product ideas come from.

For each Industry Forum project intervention there was a real world problem and data and evidence was collected. The data showed how a particular part of the UK Textile and Clothing Supply Chain behaved about New Product Development at the time of the intervention and this related to the research problem.

Having considered the research propositions and the degree of overlap in all the I.F. intervention projects the following supply chain case studies were the most appropriate with a high degree of overlap. The following (anonymous) supply chains were investigated through the use of an examination of the data and information relating to each Industry Forum intervention project.

1. KnitwearCo

KnitwearCo had real world problems concerning the cost of a high volume of seasonal new product development in a short timescale and the perceptions of retailers and manufacturers about new product development in a retail supply chain. The real world problem required a process map of the NPD system and a customer perception survey about the level of NPD service, and therefore, offered a high level of overlap with the research proposition subjects and the research interest area of methods and organization in the UK Textile and Clothing Supply Chain. Both a retailer and a garment manufacturer who converted yarn directly into garments were involved.

2. RetailCo

RetailCo had a real world problem of the speed of the new product development cycle in casualwear with an independent manufacturer. The real world problem required a process map of the NPD system, measuring the development cycle time and improving the quality of the new products developed. Again this case offered the opportunity to investigate NPD methods in a retail supply chain with a garment maker involved.

3. DyeCo

DyeCo was concerned about the need for a new range of added value services for the retail supply chain. Better marketing of the firm's offer was required and an understanding of the inventory risks of unpredictable demand in fashion retailing. As a processor of garments DyeCo offered a Quick Response product development model to the retailer. This project offered the possibility of understanding retail new product range planning and investigating the methods used by retailers to measure NPD success.

4. FibreCo

At the start of the supply chain, this business was concerned to improve the adoption of the latest new product development. The company hoped to pull the product through to the consumer by influencing retailers and as a result a consumer survey was carried out. The project gave the possibility of understanding the timing of suppliers' new product developments into the development timetable of downstream customers.

These four cases, whilst different, firstly did represent most parts of the UK Textile and Clothing Supply Chain including fibres, knitting, dyeing, garment manufacture and clothing retailing. Secondly the four cases all allowed the researcher to study the complete NPD process and the supply chain in operation during the development of new products. Interestingly the four case studies involved seven firms and the customer/supplier interfaces within these supply chains, therefore allowing, for instance a view of NPD within three private label clothing retailers.

## 3.4 Data Collection Procedures

As discussed above the data collection involved two stages. In the first stage base archive data was collected during the real world problem solving for each firm. This data was originally used to produce reports to the firm.

The second stage involved re-examining the base data and the reports that were relevant to the research propositions. As an example the section below shows the base data collection for the KnitwearCo case study. The appendix in chapter seven illustrates similar information regarding data collection for the other case studies.

### 3.4.1. An Example of Case Study Data Collection - KnitwearCo

This section deals with the data collection method used at KnitwearCo in order to illustrate the research data collection method. The following discussion concerns:

- The organizational situation encountered during the research
- The real world problem the organization client wished to improve
- The problem solving intervention
- An account of the data gathering for the problem solving intervention
- The issues of validity and reliability in this Case Study

The I.F. project intervention took place at a manufacturing division of a leading UK designer clothing retailer and was primarily concerned with finding better NPD methods and investigating the effects of a high volume of new product development work on the costs to the business. The firm was interested in discovering how the NPD process was affecting costing methods and cost trends. In addition the manufacturing division was losing its share of the retail division buying spend to more innovative Italian suppliers and the parent company wished to discover what was driving the relationship between retail and manufacturing divisions. The real world problem intervention allowed the researcher access to observe the New Product Development methods of the company

and hence an opportunity to answer the research question for a supply chain member who was close to a retailing customer. In addition a perception survey of the needs of the supply chain was undertaken and this allowed some insights into the management attitudes to innovation. The parent company also wanted to understand how the product/market portfolio affected the costs of the knitwear manufacturing business. In particular the facility at KnitwearCo was developing more business outside the overall organisation with third party retailers including Marks and Spencer, John Lewis Partnership and Burberry.

The real world problem solving required an NPD process model to be developed in order to find ways to improve it. The production and development costs were also investigated as part of the process of understanding the NPD process and activities. The management perceptions of the needs of the supply chain and how well the manufacturing arm performed against these needs were also investigated. The data collected for the problem solving, therefore, also included information that was relevant to answering the research questions about NPD methods and management attitudes and company practices in NPD.

Most of the I.F. intervention project work and researcher's access to management and systems involved the manufacturing part of the KnitwearCo and the external communications with the retail division.

KnitwearCo was a manufacturing division of a designer retailing brand. The parent brand company also owned a tailoring manufacturing supplying business. The KnitwearCo business operated from a site in Derbyshire and employed 360 people manufacturing fine gauge knitwear garments containing noble fibres such as cashmere. Output was 440,000 garments per annum. The manufacturing arm at KnitwearCo had a close relationship with the parent brand retailing division with almost two thirds of the volume of output purchased by the head office in London. The remaining third was sold to retailers including Marks & Spencer, John Lewis Partnership and Burberry. The parent brand had a number of product groups including Womenswear, Menswear, International, Outlet Centres and a Designer Brand. At the time of the project intervention in 2001/2 the parent company management was concerned about the cost trends of the business in the KnitwearCo division and needed an appraisal of the appropriate product mix for the business. In addition the KnitwearCo NPD process was

struggling to cope with a high level of demand for new products from the retail division garment designers and had concerns regarding the existing costing methods. At the same time some retail designers were buying more from non-house Italian suppliers who were perceived as offering a better service.

The intervention project was divided into two parts. First the KnitwearCo costing problem and second the designer perception problem. The I.F. project intervention problem solving projects and data collection described here were aimed at trying to:

1. Improve the understanding of the costs
2. Improve the NPD process
3. Gain an understanding of management perceptions of the needs of the supply chain
4. Discover what the best mix of new products would be in terms of cost and margins.

As discussed above, in section 3.3.2, an Industry Forum intervention project's initial step was normally an exploratory meeting to discuss the problem area. For KnitwearCo discussions were held with the senior group management in London in August 2001 involving the following staff from the Industry Forum and the KnitwearCo parent company:

| **KnitwearCo Parent Firm** | **Industry Forum** |
|---|---|
| Supply Chain Director<br>Operations Director -Knitwear | Director<br>Research Fellow (The researcher)<br>Logistics Consultant |

The discussion focussed on the key issues facing the relationship between the Knitwear manufacturing division and the retail brand categories. These issues were summarised as:

- Difficulty of apportioning the costs to the appropriate products produced
- Concern regarding the impact of recent cost trends on profit
- The possible benefits of a different mix of products and markets

- Why is KnitwearCo becoming uncompetitive?
- What are the needs of the supply chain?
- Why do the retail designers chose Italian suppliers?

There were therefore two main areas that needed to be investigated and potential for improvement established. These were the cost base/ costing system at the KnitwearCo business and also the perceptions that KnitwearCo and the retailer product group designers had of each other.

A number of objectives were developed and presented for the intervention project proposal:

1. Establish cost trends over the past two years
2. Obtain a detailed understanding of the costing and monthly management accounts and variances
3. Determine the apportionment of costs to product lines
4. Define the KnitwearCo sourcing policy and decision making process
5. Establish both the KnitwearCo Retail and KnitwearCo management beliefs and perceptions about supply chain needs

A formal proposal was presented to the parent company. This proposal included the process by which the project would be organised including data gathering, the agreed problems, objectives, methods and deliverable outputs from the project. It should be noted that the proposal was aimed at fact finding and answering the questions rather than on implementing solutions.

There were a number of key questions:

- At what rate will KnitwearCo lose competitiveness? What is the break-even point?
- Why is it losing competitiveness? What are the market drivers?
- Is the cost picture accurate? Can costs be better allocated within the (product) range?
- Is there and optimum product mix at which KnitwearCo would be more profitable, or protect its profitability?

- Why do the retail designers choose Italian suppliers? What facts or perceptions drive their decisions? What are the perceptions of the needs of the supply chain.

The proposal included details about the type of information that might help to answer these questions and the methods that would be employed to gather data that could answer these questions and this is set out in the box in Figure 3.7 below for example for the information about costing

**Proposal**

The initial activity should focus on answering the main questions before moving forward to put solutions in place.

**Objective** – define

- Cost driver trends over the past 2 years
- Detailed understanding of the costing and monthly management accounts and variances
- Apportionment of costs to product lines

**Method**

- Analysis of financial records and interviews with key people

**Output-**

- Clearer understanding/validation of the KnitwearCo costing system
- Estimation of the effects of a 'do nothing' scenario
- Proposal for scenarios and benefits of a different mix and apportionment approach

Detailed analysis of: -

- Problems in product design and development
- Waste in time and cost in the order to delivery cycle
- The impact of use of an activity based costing method

**Resources**

The University consulting input will require between 15 and 20 days with KnitwearCo and the parent brand company needing to plan 10 days of input to cover interviews, workshops and data collection.

Figure 3.7: Industry Forum Proposal

In order to understand the issues behind the costs, the current product markets and market portfolio a thorough investigation of the New Product Development Process was then carried out. This not only gave information for the real world problem solving

process about where improvements might be made but also provided data that was relevant to answering the research question and propositions.

Gathering data regarding the current costing, production and NPD practices and current performance in the KnitwearCo Company involved the following methods:

- Site Visits
- Interviews
- Observation
- Artefact examination
- Documentation collection
- Archival analysis

In building up a picture of the production process, NPD process and costing methods it was possible to use the information gleaned from the original interviews, conversations, observations and documents. A notional model of the NPD process was developed and presented to management. In addition an appraisal of the current costing system and a proposal for a new system were presented to the company.

The next part of this section discusses how various data collection aspects were addressed including site access, informants and respondents, detailed data collection types and methods and summaries of the data collected.

## Informants and Respondents

The researcher's work for investigating the costing, production and New Product Development system involved interviews with the following staff:

Operations Director

Commercial Executive

Finance Executive

Production Manager

Human Resources Manager

Costing and Product Line Manager

Sample Operations Manager

Knitting Technician

Fully Fashioned Knitting Manager

V Bed Knitting Manager

Senior Knitting Technician

Make Up Manager

Customer Liaison Manager

Yarn Development Assistant

Yarn Buyer

Yarn Allocator

The picture in Figure 3.8 below shows part of the manufacturing facility:

Figure 3.8: KnitwearCo Manufacturing.

### 3.4.2 Data Collection Types and Methods

Site visits to the KnitwearCo site were made over a period of six months. The data collection took place over this period using informal interviews and open-ended conversations, observations, document and archive collection plus artefact examination. The result was a gradual building up and cross checking of the ways that production and NPD was carried out and development of a NPD process model. The details of the conversations in KnitwearCo were recorded through note taking by the researcher. A

summary copy of these notes was submitted to the KnitwearCo Operations Director and Industry Forum research team for checking after each visit. The NPD process mapping model was also submitted to the project team in an NPD workshop.

The observations were recorded through note taking and digital photography. Data from documentation and archives was recorded through note taking, photocopying and through emailing and subsequent computer disk storage of the document files. The perception survey was carried out using a questionnaire that was completed by the respondents at KnitwearCo. A follow up interview with the KnitwearCo management then reviewed the individual responses to the questionnaire (and gained insights into the reasons behind the answers). These interviews were recorded through note taking and tape-recording at KnitwearCo. The NPD Process was mapped through collecting data from respondent sources along the new product development chain from the sample room to the finished garment manufacture.

Interviews were typically open ended and informal, and were guided conversations rather than structured interviews. The researcher was trying to build a picture from a variety of data sources about the way that production costing and NPD were carried out within the organisation. Some of the findings from the interviews with the staff covering a variety of topics are set out below in Figure 3.9. Whilst interviews were unstructured they were nevertheless not general conversations but aimed at finding out what each participant did in their part of the production, costing and NPD process. The interviews during site visits were recorded through the use of notes. These site visits were all written up and these visit reports sent back to the site for checking within two weeks of each visit.

A total of fifteen site visits were carried out between November 2001 and June 2002. Sixty-five respondent interviews and discussions took place in gathering data about the NPD process and costing methods. Respondents completed eighteen perception survey questionnaires. After each site visit a summary report was produced by the researcher and forwarded to the KnitwearCo Operations Director and university project team leader. An example visit report is shown in Figure 3.9.

Industry Forum

Improving the textile & clothing supply chain from concept to customer

**IF Partner Meeting**
**KnitwearCo**
**Prepared by RR 30/04/02**

| | |
|---|---|
| Meeting with | Karen [Customer Liaison]<br>Alison [Yarn Development]<br>David [Yarn Buyer]<br>Sue [Yarn Allocator] |
| Date: | 17th April 2002 |
| IF Team Members | Bob Redfern - Salford University |
| Location: | KnitwearCo, Derbyshire |
| Focus of Meeting | Changeover data collection on Customer Critical Path and Yarn Trials, Prototypes, Travellers samples and Production |

**Womenswear**

Karen explained the timetable of the critical path for Womenswear and the timetable in which development samples were produced for a seasonal range.

There was an 8-week lead-time assumed. (From the yarn being ordered for a Prototype to the samples being delivered to Head Office for the Business Management (BM) review).

Week 1 - Order yarn
Week 3 - Place sketches
Week 6 – Deliver first sample to Designer for review
Week 8 – Deliver all samples to BS for BM review

Karen pointed out that for Spring '03 (now being worked on) there has only been 3 ½ weeks from Yarn ordering to the BM review and this would inevitably lead to KnitwearCo having to remake because the samples will not be in specification. There would need to then be Pre-Traveller samples since it is not feasible to learn enough about the product in the short time. Karen agreed to collect some figures about the number of attempts before approval of prototypes and the time it took to get them through. There were often two attempts of a prototype before the sample was submitted to the BM review. If the 2nd prototype were approved for fit it would become a white seal. There was usually some feedback after the BM and sometimes more redevelopment. Karen thought that the hit rate in terms of getting approval of samples was better for Spring '03, compared to Autumn '02. It looked as if there would be business for 24 of the 28 garment styles sampled to export. [This is small volume]

Autumn '02 for domestic Womenswear had been too complicated and fragmented and the department had ended up with too much knitwear. KnitwearCo had made lots of samples and ended up with little business on many of them. KnitwearCo had made 12 Autumn 02 Transition garments and received no business on any of them. Autumn had also started late and it had been difficult to obtain sign off on sketches from the head of Design who had now left. There had been two changes in the design team at head office in London. The women's wear department looked as if they were now going to be more merchandise led and less creative. They had enquired about the knitting gauges at KnitwearCo and the capacity for the first time! The designer name (sub brand) prototypes tended to be developed gradually as they came through. This had the disadvantage of giving time to designers to change their minds. It looked as if 3 out of the 4 submitted will be taken up. Overall Karen thought that KnitwearCo would make as many development samples as they were asked for with no limit. When business is tough they try to do as much as possible. The new Spring '03 range of developments was going back to previous best sellers.

Karen later provided the following summary of Autumn '02 Womenswear:

**Transition**

On the majority of the transition styles we made 2 prototypes (internal decision) in order to achieve the designers original specifications. Complicated new shapes with integral trims

1 style remade after gold seal to achieve complicated shoulder fit with an integral stand neck (modification on one affected the other)

**Groups 3 – 9**

10 of these styles 2 prototypes were made because new yarns/ structures, when the first proto made it was too far from the designers original specifications (internal decision)
4 of the above were remade after white seals for further fit modifications
2 of the above were remade after gold seal 1 because we couldn't achieve the neck stretch on an integral trim (from alterations of the previous sample)
5 styles new garments after white seal to develop new yarns / improve fabric handle
1 of the new yarn trials was a 60 unit buy
2 of the 5 styles have been cancelled since

**Yarn/ Fabric Trials and Prototypes**

Alison dealt with the yarn ordering for fabric trials and prototypes. The development cycle stared with a visit to the Italian yarn show Pitti Filati in January. Alison went with the menswear and womenswear designers (who also cover export). Expofil in France in December is considered too early. The show is toured and usually the designers have booked appointments with selected Spinners (the reliable ones who deliver on time!) who show their latest ideas. The designers have normally got some specific looks in mind that interests them. Alison gets swatches, shade cards and takes notes about the yarns of interest and adds any details from the designer about which garment style the yarn is for.

A single sample 1kg cone of yarn is requested as required and these turn up 4 –6 weeks later at KnitwearCo and Alison then gets details of the yarn prices too if these were not available at the yarn show. Alison also gets yarn sent direct from Spinners outside of the yarn shows. Not all cones arrive this way. Some Designers prefer to get the cones delivered to head office in London and they will then be distributed to the knitters. The sample 1kg yarns are usually knitted on the appropriate gauge in a single jersey construction to be assessed. Some seasons when stripes are in vogue there may be a lot of fabric development before a garment sketch to enable the designer to assess the 'set out' of different stripe patterns. They could do this themselves with coloured sketches but KnitwearCo have obliged with up to 25 fabric attempts on some designs.

Whilst 1kg yarn cones from spinners at the yarn shows are usually free, if the shade is one the spinner already has the cost can mount if the shade has to be dyed specifically for the designer. Many of the fabric samples yield no further development work once the designer has seen the single jersey sample. Alison knitted 60 yarns samples for Spring 03 and of these only 10 going in to prototypes. If the ultimate structure is not going to be single jersey at all (e.g. cable) then the yarn will be knitted in the required structure with a simple knitting statement specification being produced. If the yarn is selected for a Prototype then Alison orders more yarn, usually 2 to 5 kgs depending on the gauge. Alison tries to use the stock colours.

As the sketches come in the 'Picture Plan' is updated in the sample office.
When the yarn arrives the sample office issues the individual Prototype sheets.

By the time that 'travellers' are wanted the yarn must be the exact shade wanted and this means buying larger quantities. David does this but Alison is involved in the colour matching. The shade that the designer wants to use also needs to be matched by the yarn spinner and dyer. KnitwearCo does not use spectral data although M&S of course use it. There is usually then a pattern to be matched for shade in the way of a bit of fabric or yarn from the designer. The spinner will submit lab dips in 2 to 3 weeks and these hanks get sent to head office in London for approval. Once agreed there are all the yarn colour details and numbers that Alison enters into the central computer SYSTEX database. Sometimes yarn is approved but the designer has not decided what to put it in to. Last month Alison used £15,000 of yarn in fabric trials and prototypes, according to David.

**Travellers Prototypes**

David orders the yarn for 'travellers' since these garments are treated as production. Usually this means buying 16 kgs of each yarn type and shade since this is the smallest dye lot available. Stock yarns from the stock shade card can be bought in one or two cones. Any yarn left over from making the travellers is charged back to head office designer departments. Autumn '02 had lots of yarn left and this led to charges of £60,000. Whilst there is a lot of sampling going on, the fact is that KnitwearCo use three main yarns types when it comes to production: - cashmere, cotton and merino wool.

**Bulk Production**

When the range has been approved head office in London will issue the plan and David orders all the yarn at once. A bill of materials is produced when the style and volumes are known including yarns. Yarn utilisation is adversely affected by the small batch sizes but David has no details to support this view. Most yarn suppliers take 4 –6 weeks to supply. Yarn is then delivered to a confirmed delivery date as the dye batches come through. With a larger order it helps if spinners can dye another batch to maintain continuity.

**Yarn Allocation Office**

Sue issues yarn, as the knitting department need it. The department also issue the movement bar codes tickets for batches of garments. Sue gets a pack of information in a plastic wallet for each style including sample specification, the processing comments sheets from the prototypes, a WIP (works order) number, works order sheet and bill of materials of yarns. Sue and Tom plan the needs of the knitting departments. Once the yarn arrives from the spinner it put in to the yarn warehouse in a numbered location. Sue checks that the yarn delivery note details match the yarn order details. The shades are checked against the standard pattern. Sue gets a yarn for knitting request sheet from Tom about a week before he needs the yarn and then she works out how much weight of yarn is needed for the garments from the BOM and production specification.

Movement batch tickets are produced for the style and the ones for knitting are sent to the knitting department along with the yarn. Sue then updates the warehouse yarn stock records on the computer system. Sue checks the 'travellers' sample progress sheet each week to see if any styles have been cancelled. Unused yarns are taken back into stock.

**DATA REQUIRED**

I briefly saw David (Operations Director) and Doug (Production Manager) to ask if I could have a copy of the latest yarn usage report from accounts and an updated copy of the number of samples (and how many went in to production) from Nick. I reminded Doug that he had said he would look at the correlation between the number of samples put through production and the efficiency. David commented that he thought that head office were now adopting a more market led approach with an emphasis on a price point structure and planned volumes rather than on a fragmented design led approach.

The next visit will be on 8th May when the work so far will be reviewed.

R. Redfern

Figure 3.9: Sample Visit Report.

**Documentation**

Documentation was also collected at the KnitwearCo site or sent by email or post from the staff at the site. Documents examined and details collected included:

Customer specification sheet
KnitwearCo specification sheet
Costing sheets
New Costing Proposal Spreadsheet
Works Order

Knitting programme

Bill of Materials

Bar Codes

Batch Cards

Garment Seals (Master Versions)

Measurement Charts

Designer Sample Sketches

Prototype sheet

Knitting statement

Knitting times data

Microknit dimension plans

Yarn Assessment sheet

New Developments Summary

Picture Plans

Critical Path summary

Booking Out to Dye details

Product Line Make Up Sheets

Travellers Samples Progress Sheets

Sample cycle time summary

Operating Profit and Loss Accounts

Capital Employed Statements

Overhead Analysis

Quarterly Forecasts

Sample Cost summary

Sales and Margins Summaries

Delivery On Time summary

Knitting machine List

Variance statements

Yarn Usage and Stock Lists

Work in Progress Tracking Sheets

Organisation charts

Sample Yarn Cost Summary

Forward Loading Charts summary

Expected Deliveries sheets

Travellers Samples summary

Dye Cost summary

Production Flow Chart

**Archive Material**

The main archive materials examined were financial records for prior years. Copies were provided of the past operating profit and loss accounts, capital employed statements and sales by customer records.

**Observations** also took place at the knitwear facility and notes made. Some of the observations were also recorded with digital photographs. The sample prototype production systems and production methods were observed.

**Artefact Examination**

The raw materials, concept products, new product prototypes and versions, patterns, garment, manufacturing machinery and equipment were all examined.

**Management Reports and Presentations**

In addition to the site visit reports, that provided feedback to KnitwearCo on data gathering activity, there were a number of management workshops where the researcher presented the conclusions of the data gathering and analysis of the data along with proposals for improvements for discussion and approval. All presentations were also distributed to management as a formal document.

## 3.5 Relevance of Real World Data to Research Propositions

In the example above it can be seen that the data collected for the real world problems solving had relevance to the research propositions in general. The next section shows an example of the relevance of the visit report in Figure 3.9 in relation to the eight research propositions:

1. **Textile and clothing supply chain firms adopt 4th Generation faster, flexible NPD models.**

From the interview with Karen who is the Customer Liaison Manager we learn that the customer buying departments are instrumental in providing the product concepts. The development is therefore not 1st Generation Innovation NPD Model (R&D based) but a more market led type. We also learn that there is some early concurrent collaboration on raw material concepts with the validation stage starting before the concept selection stage when the Buyer (Retail Customer) and Yarn Developer (Manufacturing Supplier) visit the Yarn Trade Trend Exhibition.

2. **Textile and clothing supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

We can see direct evidence that the manufacturer does not carry out the concept review decisions since the retailer carried these out.

3. **Textile and clothing supply chain firms select an NPD strategy that focuses resources on customer's short term new product needs.**

The organization of the development process has a dedicated sampling by the manufacturer that then only obtains a fraction of the samples as new business from the retailer. Hence the manufacturer is dedicating facilities to satisfy customer led needs.

4. **Textile and clothing supply chain firms use non sales based measures for new product success.**

This particular set of interviews covers success measures briefly to the extent that the manufacturer measures the success rate of prototypes acceptance by the retailer.

5. **Textile and clothing supply chain firms develop new products that are line extensions.**

Karen's discussion of the new Spring '03 range reverting to 'previous best sellers' and the overall discussion of changes in raw materials, new sketches and short timescale in the order of weeks suggest that there is little change in product technology and the products are similar to previous styles.

6. **Textile and clothing supply chain firms' senior managers are not involved in the individual project decisions.**

We understand from the interview discussion that the yarn developer has the authority to order raw materials for prototypes for the manufacturer although the yarn buyer maintains an overall monitoring of the costs each season. Additionally at the retailer there is a senior management review of the best prototypes selected by the buyer.

7. **Textile and clothing supply chain firms use structured communication methods with each other in the NPD process.**

The twice yearly yarn show meetings between the yarn developer and the retail buyer and the sketches issued by the buyer demonstrated some of the methods used to communicate. The role of the customer liaison manager was another communication mechanism.

8. **Textile and clothing supply chain firms use tools to monitor adherence to the product development schedule.**

The interview gives details of the 'womenswear critical path' used to control the supply of prototypes and orders to meet the launch date for the retailer.

These examples illustrate the link between the real world problem data collected and the research interests.

## 3.6 Reliability and Validity

Reliability and validity are often difficult issues in a qualitative methodology since whilst the data presented may seem neat, tidy and coherent this is no guarantee that it is valid and a true reflection of the situation (Holloway, 2002). Although Cohen et al (2000, p106) remind us that, as qualitative researchers, we do not need to work within the agenda of the positivists. We are not perhaps seeking validity but confidence and credibility of the results.

The methods used for the case studies in the current research may seem reasonable but we need to be certain that the findings are not fictional, that the data is representative of the whole, and not selective, and that the meanings that people had in their interviews and discussions have been interpreted correctly. The data therefore requires verification.

The findings have been verified in a number of ways:

- More than one person was interviewed about the NPD processes to provide triangulation. For example at KnitwearCo interviews took place with each department supervisor, the head of the sample development unit, the production manager, the sales manager, the customer liaison manager and the operations director.
- Respondents were asked to back up claims with documentary evidence. For example in the RetailCo example whilst the senior management were under the impression that the garment manufacturer was responsible for delays in the product development cycle, data collected over a three month period covering 67 new products showed that the delays lay in the buying departments.

The interpretation by the researcher of the site interviews were checked by circulation to the project teams of the site visit reports and summaries of the project in workshop

presentations. Drafts were sent to the firms concerned for checking and any errors could be noticed and corrected or new information added. For example in the RetailCo summary report the Operations Director asked that the latest financial estimates be added to the final report version. In another example the Chief Executive of the company gave a presentation of the study findings to the annual Industry Forum Conference attended by over 150 people from the industry including the government minister involved in the I.F. project.

The managers in the businesses concerned generally gave positive responses about the project changes and performance improvement work. These views were included in the documents subsequently placed in the public domain, as Industry Forum 'best practice' case studies. The validity of the original data that was collected and the reports to the firms themselves therefore had verification by the managers of the firms themselves. Managers from the firms also presented the findings of the interventions at regional management workshops that were open to industry managers as well as the national annual conference of the Industry Forum.

Most importantly, in some cases, the process mappings were used to highlight areas for change within firms. This was a strict test for the validity of the information since if the information and process mapping evidence was poor the new methods would have an unsound foundation.

The degree to which the data collected is representative of the whole has also been improved by the length and timing of the studies in each case study firm. As an example the number of site visits made to KnitwearCo was fifteen with 65 respondent interviews and 18 customer perception questionnaires completed by the senior managers at the firm and the retailer partner. These visits took place over eight months when the company were developing about 400 new products. The data collected regarding KnitwearCo was therefore a good representation of the firm's NPD situation.

The extent to which the opinions of managers interviewed represents their true feeling has been improved by feeding back information to managers as visit reports and workshops and summaries. Managers have been able to check the information. In some cases the views of managers have been tape recorded. For example the customer perception survey for KnitwearCo used a questionnaire that respondents filled in and

then the managers were also interviewed to provide further details with tape recordings made of the interviews. These recordings provide an opportunity to verify the information given.

In another example to improve the data relevance the FibreCo consumer questionnaire was circulated and tested within FibreCo and wording amended, to improve respondent understanding, before being administered. The results of the FibreCo findings have been published in a refereed journal article when the FibreCo management read and approved the draft.

It can be seen that various methods have been used to provide reliability and credibility of the data collected. In all cases the data has been reported back to the management of the firms, even when the data contradicts the previously held views of managers. The data has often been used to make changes to the way that the business has been organised. Data about company performance before the changes and afterwards have been collected to demonstrate the impact of the work.

The summary data from the cases has been put into the public domain with the permission of the firms themselves. This gives an indication of the trust that the firms themselves have with the data.

## 3.7 Summary

This third chapter has set out the argument for the choice of research methodology. A case study approach was preferred and provided an explanation of NPD methods and organization used in the UK Textile and Clothing Supply Chain that is rich in detail.

The researcher has been closely involved as a facilitator in a government funded supply chain performance improvement project that has then given a basis for testing the research propositions developed in chapter two.

As an example of the data collection procedure used in the research a detailed account of one of the units of analysis, KnitwearCo, has been included.

The following chapter analyses each of the four case studies with regard to the eight research propositions.

# Chapter Four – Analysis

## 4.0 Introduction

The previous chapter has explained and justified the method used for the case studies of four Textile and Clothing Supply Chains.

This chapter now analyses in turn these four case studies, testing them against each of the eight research propositions that were developed in chapter two. The first case of KnitwearCo is slightly different since the introduction part has already been included in chapter three. The remaining case studies of RetailCo, DyeCo and FibreCo then follow and each has their own introduction in this chapter at the start of the individual case analysis. All the case studies also have a conclusions section in this chapter.

Reports regarding each of the four case studies and details of data collection methods are contained in the appendix in chapter seven.

We are reminded that the eight research propositions are:

1. **Textile and Clothing Supply Chain firms adopt 4th Generation faster, flexible NPD models.**
2. **Textile and Clothing Supply Chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**
3. **Textile and Clothing Supply Chain firms select an NPD strategy that focuses resources on customer new product needs.**
4. **Textile and Clothing Supply Chain firms use non-sales based measures for new product success.**
5. **Textile and Clothing Supply Chain firms develop new products that are line extensions.**
6. **Textile and Clothing Supply Chain firms' senior managers are not involved in the individual project decisions.**

7. **Textile and Clothing Supply Chain firms use structured communication methods with each other in the NPD process.**
8. **Textile and Clothing Supply Chain firms use tools to monitor adherence to the product development schedule.**

## 4.1 KnitwearCo Case Study

> **"The aim of the brand is to represent innovation, luxury, elegance, style and wit which is design led and customer focused." KnitwearCo Customer Website**

This quotation is from a main retailer division of a leading UK designer brand. The retail division operates 206 stores and concessions in the UK and achieves a high level of innovation through the co-operative development of new product concept designs by another division in the company, the case study subject – KnitwearCo. The case study business develops six hundred and fifty new product concepts into commercial products each year for the retail division. Two thirds of the business is with the in-house retailer. This chapter addresses the research questions and examines the extent to which this high level of innovation at KnitwearCo compares with the lessons of new product development in the research literature.

### 4.1.1 KnitwearCo type of NPD Process

KnitwearCo has a well-defined new product development process, described in detail in the KnitwearCo case study findings (section 7.1.1), with these main stages:

- **The Yarn Trial**
- **Concept Garment Development**
    - **Sketch and swatch**
    - **Prototype Knitting**
    - **Make Up**
    - **Fit Approval**
- **Semi-Bulk Prototype Development**
- **The Buying Decision**
- **Production and Launch**

Whilst there was no formal description of the NPD process in existence at KnitwearCo, there were a series of documents used in each department to progress all developments. Examples of the documents include the customer specification sheet, the picture plan, the costing sheet, the bill of materials and batch cards. The Industry Forum case study

intervention had a process map of the KnitwearCo NPD as one of the outcomes. From the work on the map, and the detailed description that was developed for the company; we can ascertain that KnitwearCo did use a standard NPD process with the steps outlined above. The NPD steps took place for each development idea and therefore represented the NPD model used by KnitwearCo.

It could be argued that the stages in the KnitwearCo system are the following:

1. Materials testing - the yarn trial
2. Customer Concept/Design generation - sketch & swatch
3. Specification development - concept development
4. Prototypes development - prototype knitting
5. Customer approval and Product ordering – Fit approval, buying decision
6. Production - launch

These steps compare in some ways with the steps in a Phase Review- early NPD model that are:

1. Concept evaluation
2. Specification and planning
3. Design & Development
4. Testing & Evaluation
5. Product Release

We can see that the KnitwearCo steps do not include a market analysis. The early Phase Review NPD model is a similar 'technology push' 1st generation type of innovation model lacking in marketing focus. However the phase review model also had a complex system (Cooper, 1994b) of phase planning and subdivision of phases into tasks and activities with tracking of activities. Whilst KnitwearCo participates in the customer's 'critical path' timings the manufacturer does not then break down the tasks of development, attach timescales, allocate responsibilities and monitor progress. Whilst similar to an early NPD model the KnitwearCo system lacks the detailed planning of the early technology push types of NPD.

Another reason why it would also be difficult to consider the KnitwearCo approach as one of a fundamentally 'technology push' type is that the business has no projects that

are investigating knitting methods, fundamentally new materials or new garment shapes. The main retail division customer saw this as a weakness for KnitwearCo compared to other suppliers.

> **" they seem to have an inertia"**
> **" they are not seen as bringing anything to the table"**
> **" other suppliers who offer their own label collection comment on 'new machines, technical innovations, new ideas'.**
>
> (Customer's managers: comments in the perception survey).

The KnitwearCo NPD system also shares some similarities with the 2nd Generation Innovation Model idea of 'market led' customer needs type of product development, since the new products that KnitwearCo develop are exactly those explicitly demanded by the customer. The KnitwearCo system is not incremental although this is difficult to judge. For instance is this season's fashion in knitwear an incremental development? Certainly customers changing fashion needs were satisfied. Yet designs were however generally similar, in many respects, to previous garments in terms of technology, materials and product features. According to the responses in the perception survey, the market and customer wanted better value products but this was not an area being investigated by the KnitwearCo business. From the customer and 'market pull' point of view the customer's needs were satisfied almost completely, since everything that the retail division designer wanted was taken from a sketch to a commercial product by KnitwearCo.

KnitwearCo also did not have a 3rd Generation stage system with gates since there were no gates. The actual stage activities of the NPD system are examined in detail below. The classic stage gate system model in the literature has development activity steps in the process but these are always followed by a review gate where senior managers examine competing projects (for company resources) and eliminate the least well performing products, relative to the gate hurdle requirements, with go/kill decisions. KnitwearCo *did not have a review process* that reduced the number of projects. All projects were developed if they could be. If more resources were needed then overtime was used or main production equipment utilised to supplement sampling capacity. There was a type of external gate at the yarn trial test stage where the fabrics were produced and submitted to the retail division designer for approval. There was a gate

decision and funnelling here, but by the customer. The system gave the retail designers the opportunity to try out stitch designs with new yarns and having them knitted to see the results. The NPD process at KnitwearCo was under pressure with some lateness and so the lack of a gate process contributed to this since everything was a priority. Apart from the yarn trial the main external gate was when the customer buying department designer examined the first knitted garment prototypes and would then select some to be considered at the retail Business Review meeting. Finally the retail Business Review would approve some designs for inclusion in the retail range and approve the placement of orders. These gates all took place at the customer's business and the results communicated to KnitwearCo, therefore the supplier had no 3rd generation innovation model gates.

Nevertheless there were 3rd generation innovation model type of validation stages at KnitwearCo when the quality standards to be achieved and specifications on dimensions and stability were assessed. Products were developed that should meet the specifications and further samples would be produced if the specification was not met. The same was true of any colour shade standard. The yarn dyer was passed a shade specification (from the retail buyer) and yarn lab dip samples had to be approved for shade by the Sample Office staff and the retailer to ensure that it met the retailers shade standard. Once lab dips were approved, the bulk dyed yarn could be ordered if the retailer had given out an order.

These stages can be seen as validations and tests, although again there was no evidence of the appraisal of the tests acting as gates, since the results did not lead to a product being abandoned. A good example of this was when one viscose product went all the way to commercial quantities and then the product could not be knitted successfully. Examination of the records of the prototypes had adverse comments on the knitting performance record sheets for the prototype but no one had raised the issues in any kind of structured review meeting since these meetings did not take place.

KnitwearCo also did not appear to use a 4th Generation fast, flexible, fuzzy stage gate approach again due to the lack of gates. Fuzzy refers to flexible decisions where a product project can proceed on a conditional basis and can leave out some stages (provided there is a good reason) or carry out some stages concurrently and early if it makes sense. However, since KnitwearCo had no internal review, and there were no gate decisions, fuzzy or otherwise, there was no limiting of projects to those most likely to be successful.

5th Generation NPD models have a time focus and use information technology to help speed the development cycle. KnitwearCo certainly had a time element in the NPD process and did use I.T. methods. The time element was the external 'critical path' that came from the retail division customer and left fairly short periods to develop concepts into prototypes. The manufacturer used both CAD and computer based standard garment templates for garment dimensions to help speed the taking of the concept and translating it into a production specification and then into a garment. The use of CAD and templates did speed things up and allow the business to cope with the high demand for samples and prototypes. The business also had computer assisted tracking of prototypes through the production system through the use of batch cards. Also prototypes were treated as production orders that then gave access to production information on the computer system through the swiping of bar codes on batch progress cards. The tracking could help speed up the information about late items. KnitwearCo did not however use internal 4$^{th}$ or 5$^{th}$ generation concurrent engineering methods since prototypes were passed sequentially from one department to the next. There was also no use of a multi-functional team to meet and monitor project progress. This was anyway an impossible task with dozens of new products each month.

The conclusions then, on the type of NPD process used at KnitwearCo, are that it was a formal documented system that had in house quality checks, external validation tests and a time focus helped by the use of I.T. There was a high level of customer needs focus rather than a technology push and whilst the customer had broken down the NPD process into timed stages and responsibilities there was no further break down at KnitwearCo to aid on time development. There were no project teams or concurrent engineering methods. The system was almost a machine like production process with its ability to process new developments with little intervention or decision making.

The KnitwearCo case study therefore **does not support** the proposition Supply Chain firms adopt 4$^{th}$ Generation faster, flexible NPD models.

### 4.1.2 KnitwearCo NPD activities

In this analysis we take the NPD activities identified in chapter two and determine the extent of KnitwearCo's implementation of the activities. According to research there are a number of important stages in an NPD process and the tasks within the stages, if carried out efficiently, can contribute to NPD success. Few firms carry out all stages. The chart in Figure 4.1 below illustrates the level of activity use in one research study.

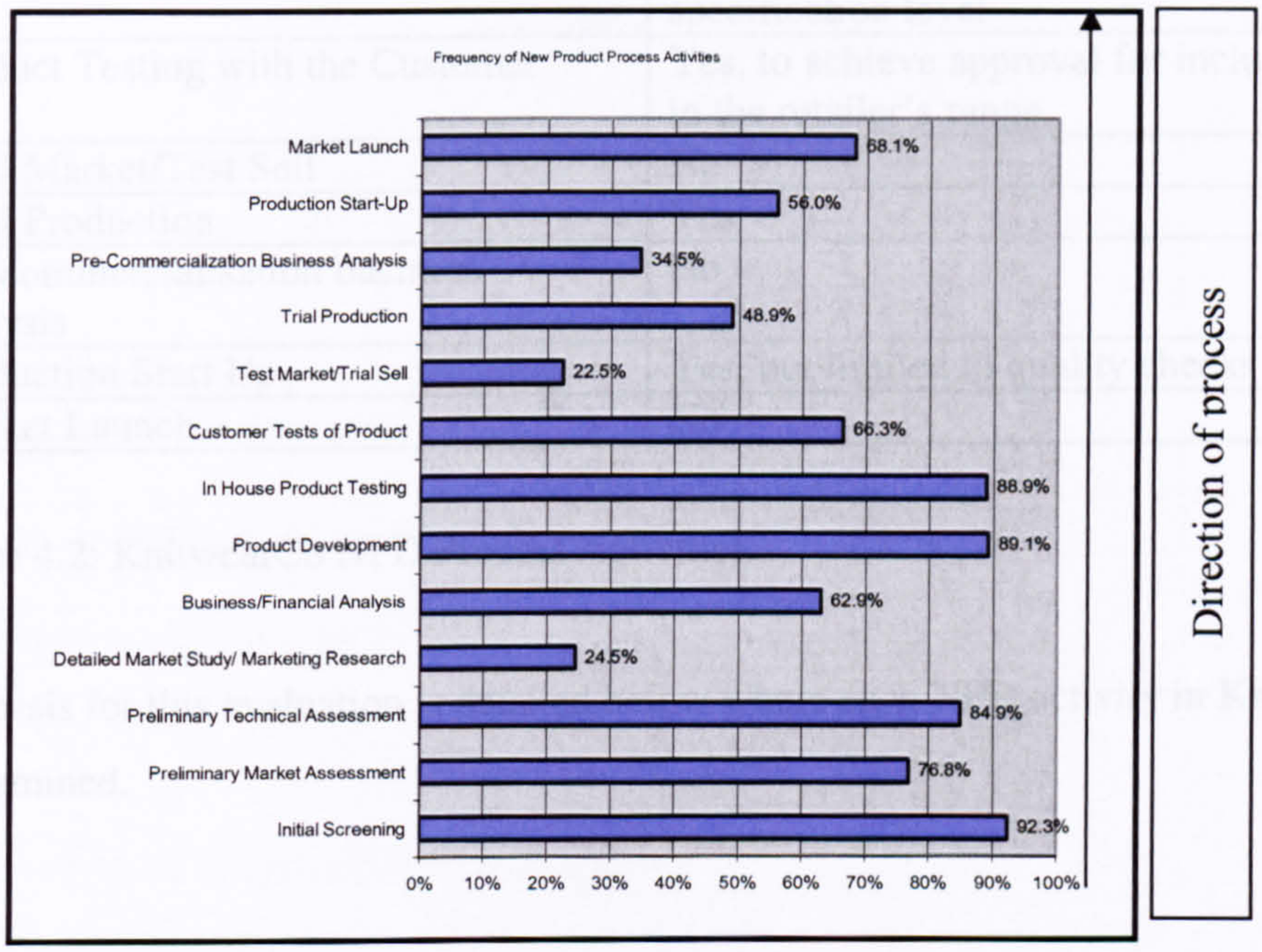



Figure 4.1: Frequency of New Product Process Activities. Adapted from Cooper & Kleinschmidt, 1986

The chart in Figure 4.1 shows for example that test market/test sell takes place in 22.5% of the firms studied. It can be also seen that there are some other activities that are carried out less often including detailed market study, and pre-commercialisation business analysis.

But what tasks happen in these stage activities. And what is a preliminary market assessment? What would represent more efficient and improved versions of these stages that the most successful NPD firms carry out? Here we consider the extent to which case study firms have efficient processes and examine the evidence that the detailed tasks are carried out during the new product development process. The table below in Figure 4.2 shows an assessment of the key NPD activities, identified in chapter two, against KnitwearCo activities.

| NPD Activity Stage | Carried out at KnitwearCo |
|---|---|
| Initial screening | No |
| Preliminary market assessment | No |
| Preliminary technical assessment | Yes, well executed |
| Detailed market study/market research | No, but customer needs were known |
| Business/financial analysis | Yes, limited to raw material and unit costs |
| Product development | Yes, well executed with speed and high volume of projects |
| Product testing In-House | Yes, well executed to achieve a specification level |
| Product Testing with the Customer | Yes, to achieve approval for inclusion in the retailer's range |
| Trial Market/Test Sell | No |
| Trial Production | Yes |
| Pre-commercialisation business analysis | No |
| Production Start Up | Yes, but limited to quality checks |
| Market Launch | No |

Figure 4.2: KnitwearCo NPD Process Activities.

The basis for this evaluation is detailed below where each NPD activity in Knitwear Co is examined.

## Initial Screening

The options at the start of the process are to consider how formal the screening is for new ideas. Is there an informal group or individual decision? Is there a formal decision by a group with a list of criteria that can weed out unsuitable projects and reduce the burden on the development resources of the firm? At KnitwearCo the new product ideas all came from the customer and the manufacturer always put every retail division development idea into the NPD process immediately. There was therefore no idea screening carried out by KnitwearCo to put a concept into the NPD system since all ideas were worked on. In discussion with the management of the manufacturing firm during the Industry Forum Case Study intervention it was suggested that the firm should spend more time on an NPD strategy of their own and then allocate more time on, for example, developing new products that fitted the needs of the business strategy. The

business needed to focus on cheaper versions of existing types of products since there was a drift to the retail arm buying low cost imports. The table below summarises the situation regarding initial screening as proposed by Cooper & Kleinschmidt (1986) and identified in the literature review in chapter two. At KnitwearCo and we conclude that this screening activity was not carried out at KnitwearCo although the retail buyer carried it out.

| Approach | Used in the Case Study firm |
|---|---|
| A group decision, based on an informal discussion – no formal techniques used at all, e.g. no checklists of criteria, no rating forms, etc. | No |
| A single individual made the decision, again on an informal basis (no formal techniques). | No |
| A group decision, based on a formal checklist of criteria. | No |
| Carried out by customer | Yes |

## Preliminary Market Assessment

At this stage the company might examine the market for products of the type being considered using secondary market research data, review competitors' products, ask the customer if they might be interested in this type of development, quiz the sales staff who have knowledge of the market or at least have an internal discussion about the suitability of the project idea for the proposed market.

At KnitwearCo whilst there was certainly regular discussion and contact with the customer by the customer liaison person from the knitwear manufacturer and joint visits to the yarn shows prior to any development. This did not, however, constitute a formal market assessment for the new products that was used as a screen to narrow down the number of developments to those that stood the best chance of meeting a market need. Neither were there any market surveys or examination of competitor products. KnitwearCo themselves did not see their role as being to understand the knitwear

market according to the perception survey (section 7.1.3). All the ideas from the customer were developed and KnitwearCo had no estimate of the level of sales for any product development wanted by the customer at this stage in the NPD process. The table below shows a lack of any type of market assessment.

| Approach | Used in the Case Study firm |
|---|---|
| Direct contact with customers to narrow options | No |
| Discussions with the sales force | No |
| Review of competitors' products | No |
| Access secondary/published data | No |
| Knew market already – internal assessment/discussion session only | No |
| Carried out by customer | Not known |

No data was collected, in this research, about the retailer's efforts in the area of market assessment other than the dates of the Business Review Meetings where projects and prototypes were considered and approved.

We conclude that KnitwearCo did not carry out a market assessment for each project.

## Preliminary Technical Assessment

The technical assessment of concepts is designed to remove those projects that are unsuitable since the firm may not have appropriate technology. This step also includes where a preliminary product development may be carried out, a specification developed or the idea's feasibility studied.

At the knitwear plant there was a feasibility analysis and engineering assessment before the product was developed into a prototype to the extent that there was a yarn trial where the raw material was knitted into a square of fabric and this gave a good idea about the feasibility of the product technically and the type of equipment that would be used. However the commercial decision to go/kill still mainly rested with the retail division designer. The piece of knitted fabric (swatch) helped the retail designer to assess the fabric look and handle. The fabric therefore helped in the design of the

concept 'sketch and swatch'. A sketch and swatch was a formal concept document that had a drawing of the knitwear garment idea and a small cutting of fabric that illustrated the type and size of stitch or colour that the designer wanted. In addition the knitwear manufacturer could then also use the amount of yarn in the fabric square to later establish the likely cost of raw materials. The yarn trial stage did act as a gate at the knitwear manufacturer although the go/kill decision was always with the retail division. This was illustrated when, in the period of the Industry Forum Case Study intervention for the Spring Summer 2003 retail selling season, there were 60 yarns sampled and knitted (not including different stripe set outs) by KnitwearCo and of these only 10 were selected by the retailer for commercial development. Generally, once the designer had approved the yarn trial stage and come up with a concept design, the manufacturer would then develop a prototype garment specification and go on to develop and submit a prototype. The table below provides a summary of this preliminary technical assessment stage tasks and comparison with the literature suggestions..

| Approach | Used in the Case Study firm |
|---|---|
| Capability/feasibility analysis | Yes |
| Engineering assessment | Yes |
| Product specification | Yes |
| Product design, model development | Yes |
| Carried out by customer | No |

We conclude that KnitwearCo carried out the preliminary technical assessment stage well.

## Market Studies

This stage is concerned with a brief estimation of the demand for this type of new product. The competitors and existing products are studied. At best a market research study - involving a reasonable sample of respondents, a formal design, and a consistent data collection procedure - is carried out to try and discover what customers need. Secondary market data, such as market share, may be examined closely to establish the likely market opportunity.

KnitwearCo did not carry out an analysis of competitor products and prices or buy market research studies. It would not in any case be sensible to carry out market research for hundreds of new knitwear styles in the six weeks between the concept and retail review. Market studies are designed to discover the likely sales interest in the idea and potential sales level. So for KnitwearCo this was unnecessary since the customer would decide this and the manufacturer did in any case develop exactly what the customer (the retailer division) wanted. But there was no elimination of developments on the basis of a poor likely level of sales. This was a weakness in the system at KnitwearCo since products were then developed, often with very small commercial potential. We conclude that market studies were not carried out at all at KnitwearCo. The retailer, nevertheless, did carry out an assessment with a market size breakdown as part of the critical path schedule.

| Approach | Used in the Case Study firm |
|---|---|
| A study of competitor products and prices | No |
| A study of what customers needed or wanted | No |
| A study to determine market size | No |
| Carried out by customer | Yes |

## Business/Financial Analysis

In the classic stage gate model there is a business analysis step before any serious commitment of resources to product development. This can vary in level between a discounted cash flow (DCF) to a 'quick and dirty' guess; with costing estimates perhaps in the middle. There were no DCF calculations at KnitwearCo and profit depended on the sales level, price and margin and this involved the retailer. For example once the sketch and swatch was received from the retail designer, the product would begin commercial development where the outcome was a fully commercial product although it was a prototype. Only when the designer received the prototype, along with the proposed selling price from the manufacturing division, would the product be put forward for review by the retail designer. If the prototype then survived the retail review an order would be forthcoming and sales levels would be known by

KnitwearCo. Selling price to the retailer depended on costs at KnitwearCo and the target profit margins of both KnitwearCo and the retailer. The price was gradually built up. The development of the first prototype was accompanied by a build up of the production and raw material costs as the development proceeded from yarn to knitted panels, through finishing and linking to final make up. This cost included an overhead for development costs. There was no DCF, ROI or break-even analysis at any stage although there was a cost and margin calculation carried out and a unit profit margin and selling price estimated. [In the researcher's view the DCF and ROI are only appropriate when there is a capital investment being undertaken and there is then expected cash outflow on the new equipment and an inflow when the sales of the new product take place.]

Break even can be calculated on a theoretical basis when the fixed and marginal cost is known in which case a calculation can be made of the level of sales will cover the fixed costs. At KnitwearCo there was no analysis of the break-even costs. The Industry Forum intervention resulted in a break-even calculation being provided by the researcher for the business as a whole and the new product developments were also the subject of a new costing proposal that calculated cost of development of a project and spread it over the commercial order quantity.

| **Approach** | **Used in the Case Study firm** |
|---|---|
| Costs and sales forecasts | Yes |
| Discounted cash flow analysis | No |
| Return on investment analysis | No |
| Payback period and/or break even analysis | No |
| Superficial analysis: informal; 'quick and dirty'; rough guesses and estimates | No |
| Carried out by customer | Yes |

The table above summarises the situation. There was a costing but sales were not known. The retail division did have a plan for sales in terms of the sales budgets, prices and units to be sold, but this was not communicated to the manufacturing division except through the mechanism of individual new orders.

## Product Development

Product development is the actual translation of the idea or concept into a viable product prototype or sample.

KnitwearCo carried out this stage for all the designs from the retailer. The process was carried out quickly and there was a good level of resources allocated to development with the use of a dedicated sample unit and both additional staffed development lines and production machinery used in knitting. The retailer was not directly involved in the product development process although the designer did make comments about prototypes and ask for changes to the product that then led to a second prototype.

## Product Testing – In-House

This stage involves testing the product in-house, in the lab or under controlled conditions (as opposed to in the field or with customers). With a garment there are usually a number of key tests and controls including size measurements, colour and washing durability.

At KnitwearCo once a prototype knitwear garment was developed there were checks for how well it met the specification in terms of the important dimensions of the garment that would be a useful predictor of how well it would fit – a proxy for functionality. Whilst neither washing nor dry cleaning of cashmere and wool garments was carried out the level of shrinkages in finishing were tested by the external finisher and results provided to KnitwearCo. Colour of the yarn raw material was also checked against a standard. The garments did not have wearer trials.

The table below summarises the in-house testing.

| Approach | Used in the Case Study firm |
|---|---|
| Prototype testing: to determine if the product functioned properly and reliably. | Yes |
| Operating tests: tests to check the functionality/reliability of the product under real-life working conditions. | Yes |
| Specifications check: tests and checks to determine if the product met specifications, outside (external) design standards, etc. | Yes |
| Field tests of the product. | No |
| Carried out by customer | N/A |

## Product Testing with the Customer

For most retail products this involves the consumer trying out the product.

For KnitwearCo there was not enough time before launch for prolonged tests. The clothing industry has a system where there is a degree of self-assessment by manufacturers on behalf of the consumer with small batches being produced and wearer trials carried out by staff at the manufacturer and the results passed to the retailer. The same situation applies to durability and washing tests. The manufacturer carries them out and supplies the results to the retailer. KnitwearCo did not carry however out wearer trials.

The KnitwearCo prototype was nevertheless always sent to the immediate supply chain customer - the retail designer - who would decide how well the prototype had been interpreted from the concept. The garment would be tried out, for example, on a female size 10 model at the retailer to check the fit. Minor design changes were then often requested by the retail designer and they required a complete new prototype to be produced from the specification step onwards by KnitwearCo. The customer was also sent the achievement of specification details and the product master standard 'seal' garment for approval. This stage at KnitwearCo is a product test therefore with a gate at the customer to the extent that if a product that met the designer concept interpretation and fit approval then it would go forward to the retailer management review. If the

review approved the product then an order would be placed. We conclude that customer testing was carried out.

## Trial Market/Trial sell

A test market or trial sell of the product involves trying to sell the product but to a limited set of customers or full scale sales but in limited geographic area.

KnitwearCo did not carry out this stage out at all. It would be unreasonable in the short timescale and in any event one had the impression that the retail division small orders meant this was happening in the retail stores.

| Approach | Used in the Case Study firm |
|---|---|
| Selling the product to a small sample of selected customers only. | No |
| Selling the product in a limited/specific geographic area only. | No |
| Carried out by customer | Yes |

## Trial Production

With large new product launches one could expect a tentative production run to test both the facilities and also the extent to which the prototype translates easily into commercial volume manufacture. This is a way, therefore, of testing both the product and the production line.

| Approach | Used in the Case Study firm |
|---|---|
| A test of the production system itself (e.g. the production equipment ran properly). | Yes |
| A test of the integrity of the product that the production system yielded (e.g. to see that the resulting specs were met). | Yes |
| Carried out by customer | N/A |

This stage was carried out early at KnitwearCo since the new products were generally made on the production equipment. There were notes made on the production development documents about any particular technical problems. One weakness of the system at KnitwearCo was that there was often no review of the archived documented record, so any difficulties that did take place were ignored. The trial production did not then protect the business from developing products that did not run well when they went in to full scale production and sales. This perhaps emphasises the need for a Gate after each stage to review the outcome of the stage since collecting data about performance is only of use if the data is examined.

## Pre-commercialisation Business Analysis

The idea of this stage is to have a final look at the sense of the project before committing the business to large scale resources and risk. It involves a financial or business analysis following product development - but prior to full-scale launch.

KnitwearCo did build up the detailed costing analysis mentioned earlier but then did not repeat the exercise at this stage. The original information about cost had been used with a sales margin to give the selling price to the retail customer. The retail buyer would then decide if he/she could put the product into the stores at a retail price that consumers would be attracted by. Unfortunately the knitwear manufacturer would not have any idea of the sales forecasts until the retail review had taken place and an order arrived. The main problem with this approach by KnitwearCo was that they had to commit a price and quote to the buyer and then may only receive a small commercial sales order.

However it may well have made good sense to carry out a cost analysis early for the retailer who can then plan the budget buy and the price architecture of the garments in the store to the consumer. The table below summarises this stage. The retail division did carry out business reviews and set targets for sales.

| Approach | Used in the Case Study firm |
|---|---|
| A detailed financial analysis, involving a return or profitability assessment. | No |
| A review/integration of marketing information only: sales forecasts and marketing cost projections. | No |
| A cost review: a review of distribution, production and marketing costs. | No |
| Carried out by customer | Yes |

## Production Start Up

There were no real changes to the production facilities for new products, although standard quality checks were carried out on new products as they were developed.

## Market launch

This stage involves the conscious launch of the product, on a full-scale and/or commercial basis with an identifiable set of marketing activities specific to the product.

At KnitwearCo there was no special market launch effort although the retailer did promote parts of the range. There was no real need for this promotional step at KnitwearCo since most new products were developed to a customer brief and, when developed, sent to the customer for approval. The retailer did produce promotional booklets with the new season's styles for distribution to the trade and have a press show day as part of the critical path.

| Approach | Used in the Case Study firm |
|---|---|
| Trade literature, trade shows and trade advertising but no special promotion or training for the sales force. | No |
| Trade literature, trade shows and trade advertising plus a strong sales force promotional effort; demonstrations, conferences, and seminars for customers. | No |
| Trade literature, trade shows and trade advertising plus special training for the sales force. | No |
| Carried out by customer | Yes |

## NPD Stages and Activities Conclusions

KnitwearCo carried out half of the stages in the 'ideal' NPD process. It has been shown that firms who carry out more stages are more successful. However KnitwearCo did achieve a high level of volume of new product developments with their process and many of the stages look inappropriate in the supply chain scenario when the customer selects the concepts and approves the prototypes.
Some stages whilst not carried out by the manufacturer in the case study were nevertheless carried out by the retailer including concept screening, business analysis and market launch. This increased the overall score of activities carried out to a good level.

The findings **support the proposition** that textile supply chain firms did not carry out all the activities of an efficient NPD process although the retailer customer carried out some activities.

## 4.1.3 KnitwearCo NPD Strategy

NPD strategy concerns senior management choices and decisions about the focus of NPD activities, market goals, targets for new products focus and a programme of activities to achieve the goals. Strategy also concerns the degree of product newness

and the synergy of the new product needs with the existing skills of the business. New Product Development should take place with some strategy or objectives in mind. The objectives might answer questions such as:

> Is the company weak in certain areas of its product range compared to competitors?
> Does the company have a strategy of steady growth in existing areas of the product and market that it is already competent?
> Does the firm plan to reach new markets or new customers?

The KnitwearCo NPD strategy was to a large extent in the hands of the main in house customer who used almost all the NPD resources and bought two thirds of the output. The retail in-house customer effectively selected the type of product that was developed and the raw materials used and the type of technology selected. A clear example of this was the impact of a decision by the in house womenswear buyers to abandon the fine gauge knitwear product and to buy weft knitted T-shirts instead. This had the effect of shutting down the fine gauge knitting fully-fashioned knitting section at KnitwearCo and this came as a shock to the firm. For KnitwearCo management there was naturally a concern about which markets to be involved in and in the past few years there had been growth in external business. For example the management at KnitwearCo was trying to develop more business with Marks & Spencer (M&S), but was unclear about the benefits since on the one hand margins were lower but on the other hand so were the NPD costs. This was an attempt to switch the direction of NPD to a simpler approach since M&S always selected the same product as purchased in previous seasons using the same raw material and the same technology process. Colours would be changed each season to match the latest fashion trends but this had minimal impact on development cost. This Marks and Spencer approach was in sharp contrast to the in-house retailer designers who would try new raw materials and new garment shapes and have hundreds of new ideas each season. The chart below (Figure 4.3) shows the recent sales by market and the growth in M&S business from £1.4 million to £2.7 million, although In-House business was also growing.

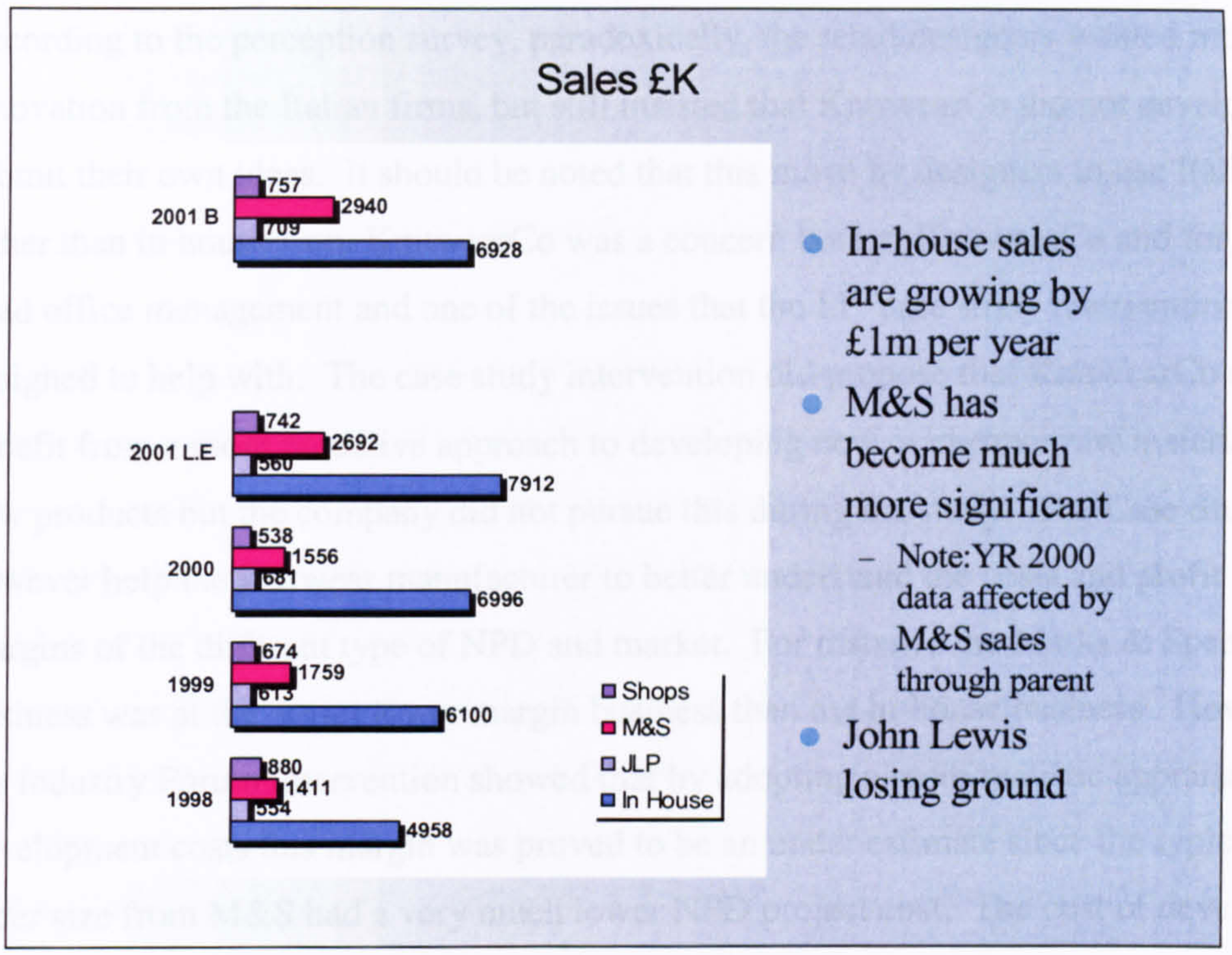



Figure 4.3: KnitwearCo Sales.

The KnitwearCo management therefore had concerns regarding the proportion of business with the in-house customer and the associated high cost of NPD. At the time of the study the manufacturing business allocated whatever resources were required to NPD for the in house retailer and gave the retailer preferential access to the knitting capacity and would not allow M&S fine gauge products.

The fact that top management at KnitwearCo largely went along with the in house designer led NPD meant that the retailer was effectively setting the direction of NPD strategy for the knitwear manufacturing business and this meant that the NPD process was dominated by an orientation to a high volume of product developments in a short time scale. The vast majority of developments were processed on time and submitted to the designers and retail divisions without development difficulties and on time and this gave the designers a large range of choices. However the effort that went into large volumes of new products for the in house retail departments was not necessarily paying off for KnitwearCo in the long term. This was due to the tendency of some of the in house retail designers to increasingly prefer to place orders for new products that were from Italian firms where the ideas for new products were developed by the supplying firms rather than ideas from the in house retail designer.

According to the perception survey, paradoxically, the retail designers wanted more innovation from the Italian firms, but still insisted that KnitwearCo did not develop and submit their own ideas. It should be noted that this move by designers to use Italian rather than in house from KnitwearCo was a concern both at KnitwearCo and for senior head office management and one of the issues that the I.F. case study intervention was designed to help with. The case study intervention did propose that KnitwearCo could benefit from a more proactive approach to developing new or cheaper raw materials for new products but the company did not pursue this during the study. The Case Study did however help the knitwear manufacturer to better understand the costs and profit margins of the different type of NPD and market. For instance the Marks & Spencer business was at the outset lower margin business than the in-house business. However the Industry Forum intervention showed that by adopting a more realistic appraisal of development costs this margin was proved to be an under estimate since the typical order size from M&S had a very much lower NPD project cost. The cost of developing a single new product was calculated as £258.34. This sum has been arrived at by taking the raw material, direct labour, expenses and manufacturing overhead costs for the year and dividing them by the number of commercial batch orders. The total cost of all NPD activity at KnitwearCo was then £461,835 for 2001. Whilst the volume of in-house retail division NPD requests was very high and this put up costs the retailer did not then give KnitwearCo sensible orders. This orders size has an impact on the development cost. For example, after a product has been developed and if the in house retail customer then orders only four-dozen fully fashioned pure cashmere knitwear garments for a new product style the cost of development is £5.38 per garment. This is in sharp contrast to an order from Marks & Spencer that is normally for one hundred dozen, when the development cost is then £0.21 per garment. The problem for KnitwearCo was that the existing costing system charged everyone a standard £1.22 per garment for development. The in-house retail division customer was therefore both a source of many new product ideas but this came at a high cost to the business that were not easy to pass on to small orders.

The conclusion is that there was no clear direction for new product strategy at KnitwearCo. The managers in the business, nevertheless, agreed that cost pressure was one of the main external pressures on the business and were concerned about low cost imports. In the perception survey, for example, the need for better value products was considered by the managers to be the most important trend factor facing the business.

**"Lower prices ( is the most important market trend) .... we will need to reduce costs."**

(Manager, KnitwearCo, Customer Perception Survey)

However when surveyed by the researcher with another questionnaire, at a project feedback management workshop, the KnitwearCo managers had no clear common view about product development priorities for the business. Surprisingly, in spite of the intense pressure on prices, there was no work being carried out in the business to develop better value products.
The retail division customer was also effectively taking strategic decisions about product ranges that had a direct impact on KnitwearCo. For example the decision by the retail division to switch from fine gauge fully fashioned knitwear to a weft knitted T-shirt led to the closure of a section of the knitting plant and redundancies.

KnitwearCo had a strategy of structuring the business activities and resources in order to satisfy first the needs of the in-house supply chain customer. There was no long-term strategy to work on cheaper production methods or to cost engineer cheaper new products even though the company was losing business to cheaper offshore suppliers. There was an emphasis on satisfying the short-term customer needs with hundreds of similar products developed each season.

The evidence **supports** the proposition that textile and clothing supply chain firms select an NPD strategy that focuses resources on existing customer short-term new product needs.

### 4.1.4 KnitwearCo NPD success measures

Is success of a new product when the product gains a good level of market share within a year? Is success that the new product concept has been successfully developed for production and is then produced in commercial quantities? How do firms and academics measure NPD success? What can managers use success measures for?

There have been studies that show that managers would like to use up to 45 measures of new product success that could then be used to set objectives in portfolio management. The most favoured measures of success by researchers and managers appear to fit in to three broad categories:

First customer acceptance measured by sales, market share or market impact.

Secondly most firms have some form of financial target or hurdle for new developments. This can include profitability, profit margins or return on investment.

Finally there is evidence that product level measures are used that include actually getting through the new product development process on time and on budget cost, with a good quality product that performs well. Success in the NPD process is also an achievement when one considers that typically only 1.3 out of 11 new product ideas reach the end of the development process.

Having success measures is all very well but what can a business do with them? The success measures can, for instance, be used to look back at a project after a couple of years to determine how well the new product has succeeded. Have sales targets been achieved or succeeded? Has market share increased? But these measures take some time to assess. The on cost and on time launch measures conversely can be judged more quickly. However it is clear that success measures are more than this looking back. Measures are an integral part of the NPD process of weeding out less promising projects so that firms can concentrate their limited NPD resources on the few more likely successful projects. For example a new project that appears to have a good profit margin or a positive discounted cash flow (having examined the likely costs of manufacture, capital equipment, overheads, and possible sales volumes and selling prices) may be preferred to one that has a lower potential profit margin. Equally a product that gains high acceptance in market research may be developed instead of a less well liked product concept. Firms can therefore set portfolio management hurdles (that stem from success measures) to review and eliminate projects that do not meet minimum standards. In addition a firm can use success measures to reinforce a new product development strategy. For example if a firm has a strategy of high quality then projects must meet set quality standards, as well as perhaps financial measures, to stand a chance of being developed.

At KnitwearCo management considered success in various ways starting with on time 'launch' that in this case was delivering the accepted prototype in time for the retail division management review. The prototype would usually be a second version that had been redeveloped for the retail designer to ensure that any changes in the style, dimensions or fit were correct. So, if a concept idea from a retail department designer was successfully developed into a prototype without major difficulties or delays and the prototype could be submitted on time to meet the 'critical path' management review date then the concept had been a success. Failure, which was rare, was usually associated with an unacceptable quality level or a new product development that could not be produced on the equipment available. These production problems would lead to lateness.

Quality was a second success hurdle at KnitwearCo and possible reason for failure where the firm had built-in quality specifications that were set for each prototype and each sample was tested for meeting the various physical measurements similar to those in the diagram in Figure 4.4 below:

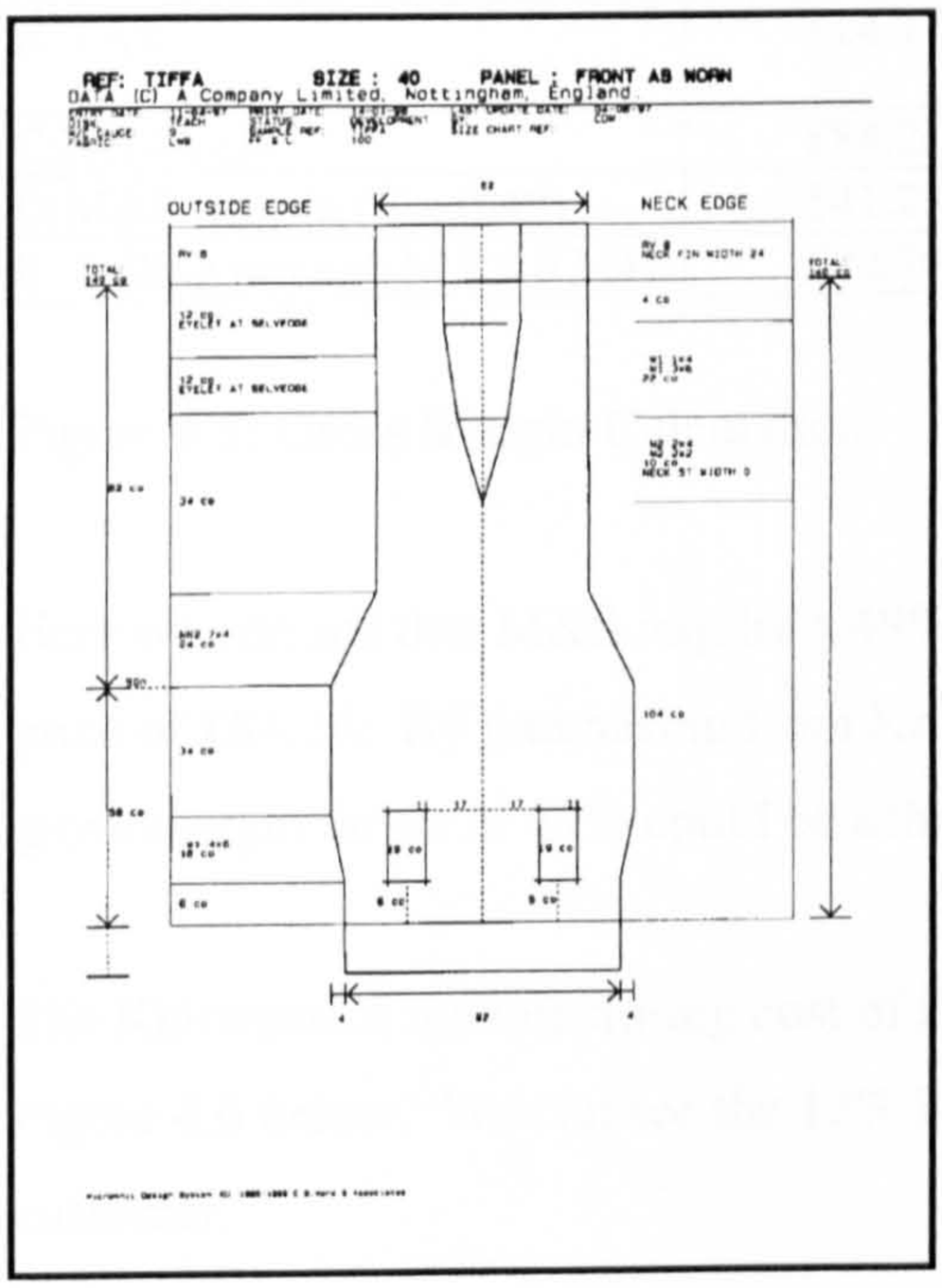



Figure 4.4: KnitwearCo Garment Measurements Specification. Adapted from Microknit, 2004.

Colour standards were also applied and checked at the semi-commercial prototype stage. These quality measures were therefore a type of success measure for KnitwearCo but what really mattered was the view of the retail designer about the prototypes since

even if the prototype had the correct measurements in the specification in, for example, the length of the garment in centimetres, the designer may well ask for a longer or shorter second prototype or abandon the concept even though it met the quality standards.

Financial success objectives at KnitwearCo were a third type of success measure but again the measure did not affect portfolio selection. Profit success was built in to the system largely through the close KnitwearCo understanding of the gross profit margins required by the retail division and the internal margins targets that KnitwearCo had for the various customer groups. In effect KnitwearCo would cost a new development, add on an overhead cost and then a standard sales margin to give the proposed selling price to the retailer. For example selling a cashmere garment to M&S had the following margins (Figure 4.5) and costs for a pure cashmere garment selling in the stores at £99.

| Costs per garment | Cashmere | Gross Margin for retailer |
|---|---|---|
| A:Retail | £99.00 | |
| B:VAT | £14.74 | |
| C:Net (A-B) | £84.26 | |
| D:M&S margin (C x 0.49) | £41.29 | 49% |
| E: Selling price to M&S (C-D) | £42.79 | |

Figure 4.5: Gross Margin Calculation.

Here we can see that M&S require a 49% gross margin of £41.29 on the pre-VAT store price of £84.26. By purchasing from KnitwearCo at £42.79 per garment the retailer's gross margin target of 49% could be achieved for M&S.

The KnitwearCo manufacturing cost of £42.79 to M&S was built up as in the table in Figure 4.6 below. We can see the 13% internal margin for KnitwearCo for this customer.

| | Cashmere | Margin for manufacturer |
|---|---|---|
| Selling Price to M&S | £42.79 | |
| KnitwearCo Margin @13% | £4.92 | 13% |
| Business Cost | £37.87 | |
| Raw Material | £20.00 | |
| After Raw Material Cost | £17.87 | |
| Standard Make Up Costs | £2.77 | |
| Knitting Costs | £0.79 | |
| Overheads and Indirect Labour | £14.31 | |

Figure 4.6: KnitwearCo Cost Structure.

Profit margin was therefore not so much a hurdle as part of the normal selling price calculation and this was very much affected by the raw material costs. Raw material costs can be seen in Figure 4.6 to be a significant proportion of total costs. KnitwearCo generally kept to the kind of raw materials that the retail division were familiar with so garment manufacturing selling prices were rarely an issue. Yet, the perception survey discovered a feeling from the retail division that more up front cost transparency on knitting costs would help, but it was often difficult to estimate knitting complexity by just looking at a garment.

Once a garment prototype had been accepted by the designer and put forward to the retail range planning review the next success came when it was put in the range and an order placed with KnitwearCo for a commercial quantity. For between a third and half of the time products were adopted commercially. This is summarised in the charts (Figure 4.7) below.

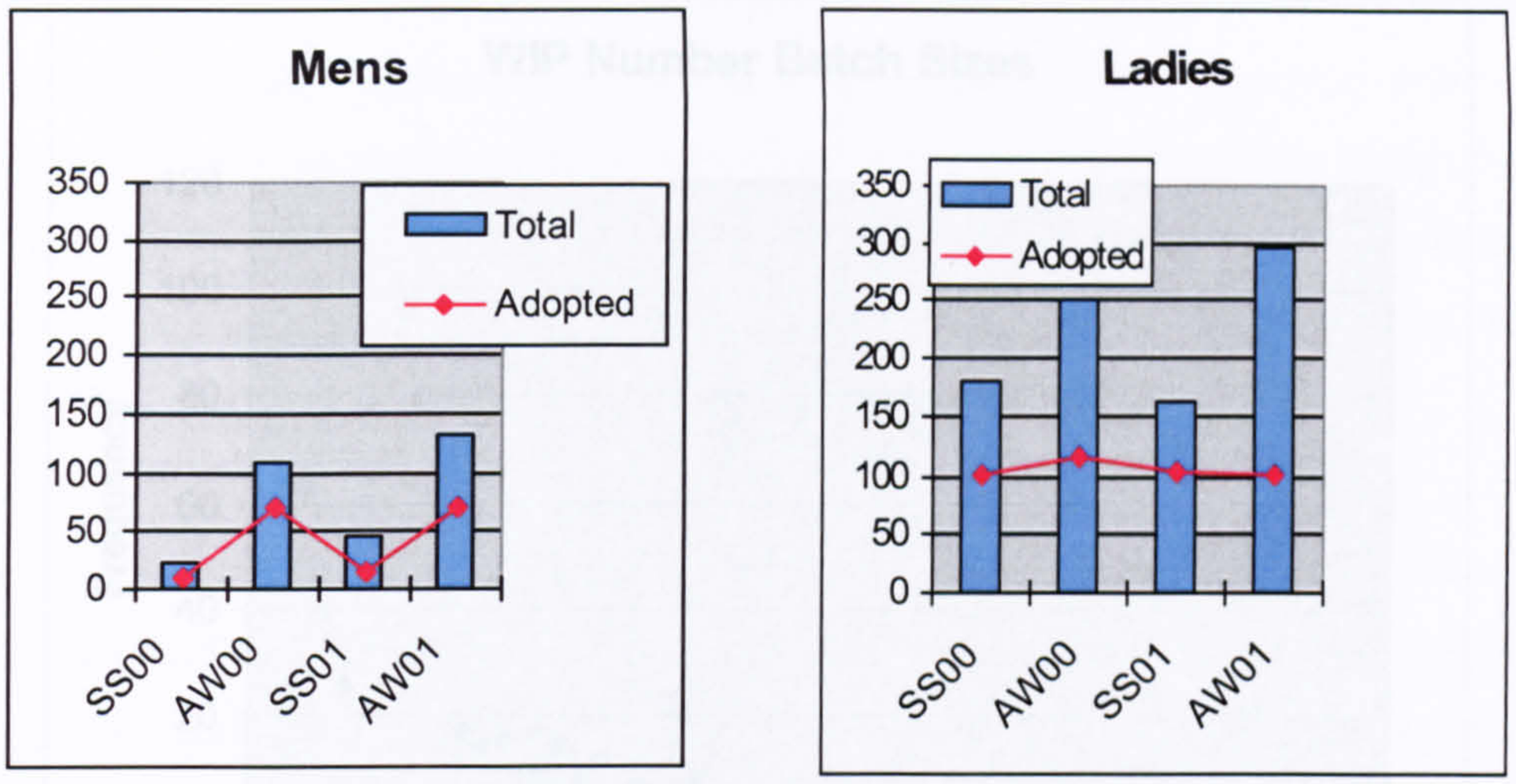



Figure 4.7: KnitwearCo New Product Adoption Rate.

It might be considered, from these figures that the KnitwearCo business was quite successful with such a high adoption rate. However although many products were adopted commercially some of the resulting orders were then quite small. For the knitwear business the costing system made no distinction between the costs of a large order and a small order on margins, prices, profits, operating efficiencies and raw material waste levels. Nevertheless the knitwear business managers themselves had some misgivings about the poor operating efficiencies that small orders achieved and in addition had concerns regarding the cost of the NPD effort that went in to what then became the small orders.

The chart below (Figure 4.8) shows the rather high level of small orders that KnitwearCo had.

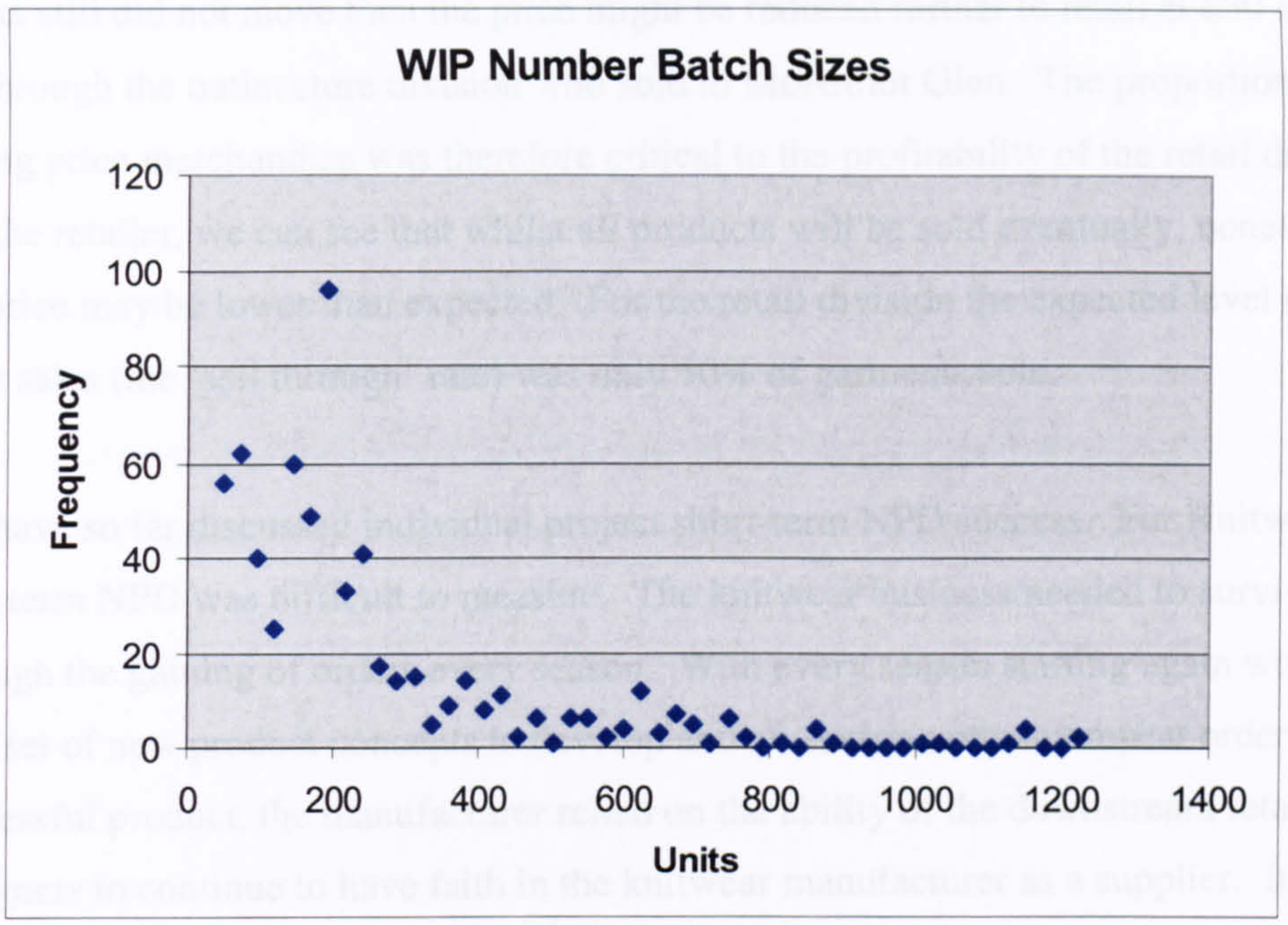



Figure 4.8: KnitwearCo Batch Sizes.

The chart shows that for example there were almost a hundred orders that had a batch size of only 200 garments. This batch would cover all the sizes required. E.g. 10, 12, 14, 16, etc. and each of the sizes had to be knitted separately.

It should be noted that as far as KnitwearCo was concerned once it had an order it then had to obtain the yarn raw materials and make the commercial quantities and deliver them to the retail division at the agreed price to see the level of sales and profit success. This usually took place within a few weeks of the order being placed.

The conclusion is that success then for KnitwearCo depended on the quantity of orders that it had, but to reach the order stage products had to be on time and meet the target financial and quality hurdles.

Success for KnitwearCo was not the same as success for the retail supply chain since the retail division could only measure success if the new products that had been ordered all sold at a good average price in the stores. Typically what happened was that the new product knitwear garments would go into store at the initial full retail selling price of for instance £125, but if the product did not sell well it would be marked down to £60. If

stocks still did not move then the price might be reduced further to retail at £30 and sold off through the outlet store division who sold to McArthur Glen. The proportion of full selling price merchandise was therefore critical to the profitability of the retail division. For the retailer, we can see that whilst all products will be sold eventually, nonetheless, the price may be lower than expected. For the retail division the expected level of full price sales (the 'sell through' rate) was only 50% of garments sold.

We have so far discussed individual project short-term NPD success. For KnitwearCo long term NPD was difficult to measure. The knitwear business needed to survive through the gaining of orders every season. With every season starting again with a new set of new product concepts to develop and no season with any repeat orders for a successful product, the manufacturer relied on the ability of the downstream retail designers to continue to have faith in the knitwear manufacturer as a supplier. It did appear however that this faith was waning and the use of more external suppliers by the retailer was a failure for the knitwear business. However it was difficult to explain exactly why this was happening and the Industry Forum intervention customer perception survey was designed to root out the possible causes.

Success measures are meant to be helpful in portfolio selection. However at KnitwearCo the business did not use any of the financial or customer acceptance success measures to weed out products internally during the new product development process. The retail division made all the go/kill decisions on the projects. KnitwearCo developed *all* the concept ideas, generated by the retail division, into prototypes.
Our overall conclusion about long term success is that the knitwear manufacturing business did measure success of individual new product developments initially in purely financial terms as a proposed margin obtained on that product and later became aware of market impact measure in terms of the size of order placed. Customer acceptance, whilst measured by the adoption of the product did not ensure financial success if the order that was then forthcoming was so small that the production was inefficient and wasteful of resources. In the long run it appears that acceptance by the consumer of the product in stores that then gave the retailer a fair level of profit and a good sell through might give the best possible chance that the retail designer would return to the in house knitwear manufacturer and develop further concepts that would lead to future orders, better efficiency and profits. However KnitwearCo was almost entirely in the hands of the designer who selected the products to develop and the ones to launch. The fact that

the downstream retailer was losing sales overall and had not made a profit for 5 years was a worrying situation for a supplier who was reliant on the retailer for the main part of the turnover.

The findings show that KnitwearCo did not track sales against a target of each of the hundreds of new products developed each season in order to gauge success of the individual projects. The reasons for this are clear. Each product had a set sales margin and therefore profit was assured. And since the product was the customer's idea acceptance by the customer was almost a given, even if the orders were then small.

The KnitwearCo firm had a cost-plus method for measuring potential profit and this was applied to all individual projects. This meant that new products had a target profit margin that was always achieved.

The main measure of success that might affect a product's progress was the achievement of the critical path prototype submission date - to the retailer for their business review. Lateness had wider implications for clothes ranges since a range would look unbalanced without the key items. Certainly the customer cited sample response as an important area.

> **"They understand (that) our business is getting samples out on time"**
> (Retail Manager, Customer Perception Survey).

The perception survey provided more evidence of the importance to the customer of on time sample delivery success. The matrix below in Figure 4.9 shows in the top left box the most important aspects of the KnitwearCo customer service from the perception survey and where the retail managers thought that the manufacturer should improve. Time is a key element to many of these parameters including working to the critical path timing, delivering on time, having shorter development lead times and communicating about delivery data.

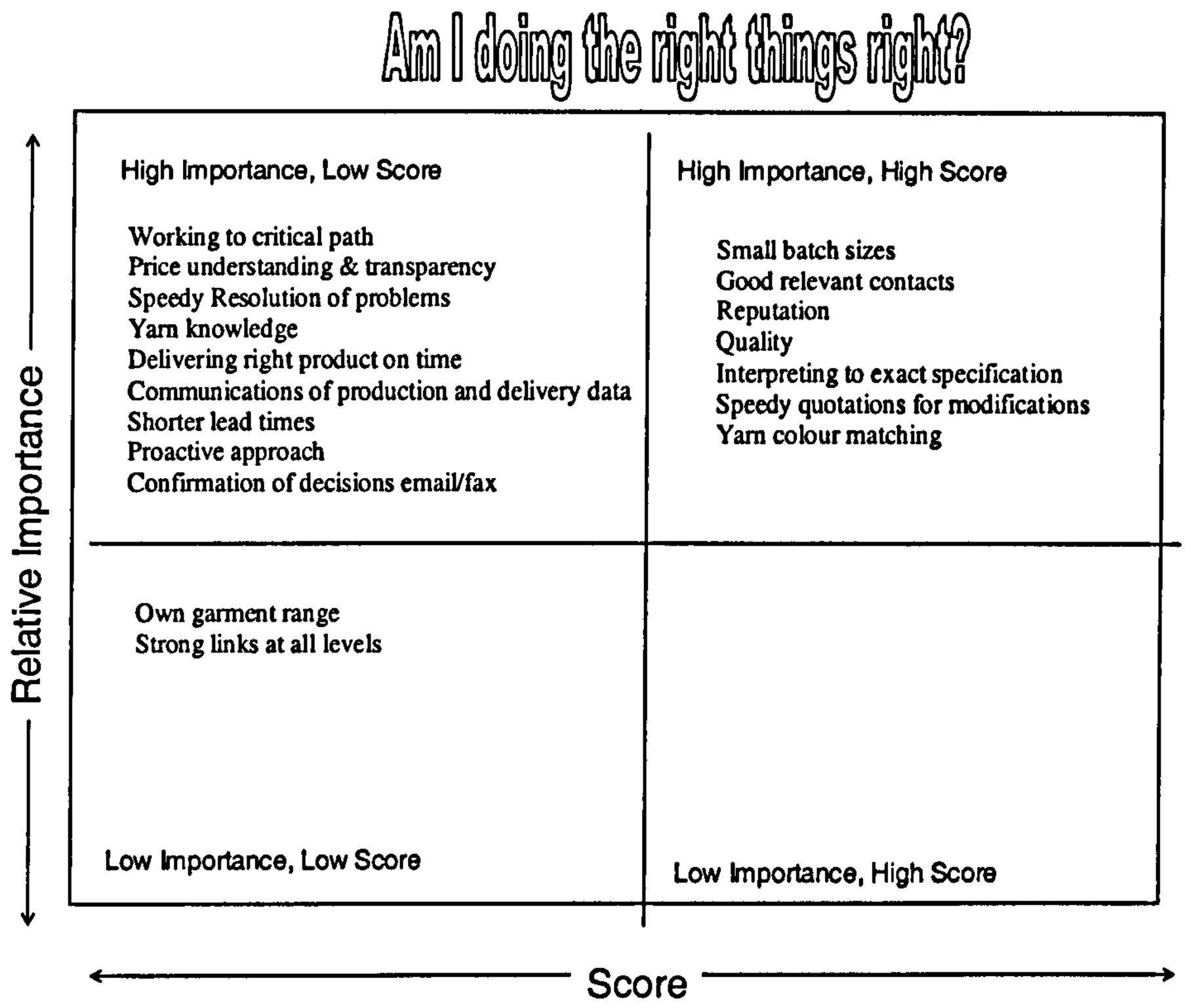



Figure 4.9: Customer Perception Survey Matrix.

Whilst we can see that adherence to the development timing and launch date are important, however it should be noted that sales success is missing from the list and therefore not an important success factor to the customer. This confirms the findings view that with a customer designing the product and giving orders for the best ideas at the target profit, KnitwearCo was assured of sales and good financial returns for a new product if it was selected. The business had no target sales for a new concept and therefore no target to miss. On time sampling was the main success factor.

The analysis **supports** the proposition that textile and clothing supply chain firms use non sales based measures for new product success.

### 4.1.5 KnitwearCo degree of product newness

> **"Business has been built on 30 gauge as a niche market but this season it has been wiped out (by jersey technology) and we did not see it coming."**
>
> (KnitwearCo Manager, Perception Survey).

Can a firm survive by building up a business slowly and staying 'close to home' on similar products or will some new competitor bring a new technology into your niche market and change the rules of the game as they did with KnitwearCo in the comment above? Should you wait and see how a new technology works out or is being first into the market best? Is a supply chain firm vulnerable if all new ideas come from the main supply chain customer? How new should new products be?

Not all new products are totally new to the world inventions and research shows that many new products are indeed line extensions where the product is similar to existing types with minor changes. However newness can take many forms and it has been argued that placing an existing product in a new market is also innovation. Newness can include new products, lower cost products, new distribution methods, new production technology used to manufacture the product, competing with new competitors or having new technology within the product features. However too much newness may not be a good thing if it takes the firm into uncharted territory and into areas in which it has little expertise. New products should therefore match the capability of the firm to develop them. But some research suggests that line extensions are perhaps insufficient or even dangerous when a major technological leap occurs. However research has also shown that firms with new product developments that stay close to their existing type of product, in the same markets, selling to the same customers, using the existing competencies and resources of the business do better than those who move away from these parameters. Whilst 'sticking to the knitting' may be safe and help NPD success rates there is some evidence that moving to more highly innovative products also improves the success rate and therefore firms should avoid a middle of the road approach. It has been suggested that highly innovative new products can lead to high impacts in the market.

This section investigates the extent to which the case study new products, production technologies or customers are new or if the company is extending its products into areas where it has little experience or capability.

The photograph below (Figure 4.10) shows the typical product developed by KnitwearCo.

Figure 4.10: KnitwearCo Garment.

Many of the new products at the Knitwear business were similar to those that had been produced before in some respects. They were made on the same equipment, used similar production processes, made use of similar types of raw materials and were sold to the same customers.

However the garments produced had generally not been made before and started with a sketch from retail Ladieswear or Menswear designer and a piece of yarn culled from a yarn trade show where the latest yarns were on display. Each new product at the knitwear manufacturer was then developed, with the exact shape of the garment built up

in a specification of row by row knitting stitches. The raw materials would be obtained from the yarn spinners latest range collections. Most new garments would be subject to a new prototype being produced for the retail customer and this would then almost always require one or more rounds of detailed modifications to the product to achieve the required look and style of the original design concept that the designer had been looking for in the initial sketch and swatch. To some extent then the products were new creations from a designer who had been inspired by the newest yarns on offer and other fashion trend influences.

However KnitwearCo was literally 'sticking to the knitting' and making similar products to those produced before most of the time. The development effort remained high though due to the sheer volume of new designs because every new design submitted from the main customer used a new yarn that was at least a different colour to those previously knitted. Each yarn had to be tried out in a prototype before the garment could be guaranteed to meet the specification in terms of fit. There was some evidence of trying new yarns and these not working very well so trying out in knitting was necessary.

> **"But we are having some problems currently. We lost it a bit about three months ago. We have had yarn quality problems, perhaps because the yarn may not have been right for the end use. We are looking now more closely at the development control."**
>
> (KnitwearCo Manager, Perception Survey).

The company did develop most products on the same existing knitting and make up technology. Capital investment in new equipment had been non existent recently and the fixed capital employed in the business had steadily fallen as a result, according to the company accounts.

**"Funds are not available to us. Quite poor really. We have to get capital expenditure approval from the parent company but the way the business has gone, there is not a lot of money to throw around so we have to make the best of what we've got."**

(KnitwearCo Manager, Perception Survey).

The potential for individual new products to have a major and long-term impact on the market share of KnitwearCo was quite limited for three reasons. First, all the products were bought in quite small quantities by the main customer and so there was no major impact. Secondly all the new products that were developed each season were 'one shot' products with no repeats, even if they sold well, since the timetable for development essentially left no time between one seasonal range being developed and the next season's range being planned. Thirdly the customer had been growing the amount of product from more innovative Italian knitwear manufacturers who were also cheaper so price seemed to be having an impact rather than product newness. Nevertheless there had been steady growth in sales to the in house retail division in the past few years although the latest news for sales was poor following the switch away from 30 gauge garments and redundancies had been announced as a consequence.

Newness seems low. The company was generally making new products each season for the same main customers. The chart below shows the sales over the past few years. Whilst sales to the in-house retail division has grown the reasons for this may have less to do with high innovation and had more to do with the general fashion trend favouring knitwear rather than casual wear tops.

The Marks and Spencer business, certainly, was low innovation where high quality pure cashmere knitwear with the same garment style and same yarn was being made in new fashion colours each season and this needed low levels of NPD effort. Sales to M&S had grown in the past few years (Figure 4.11).

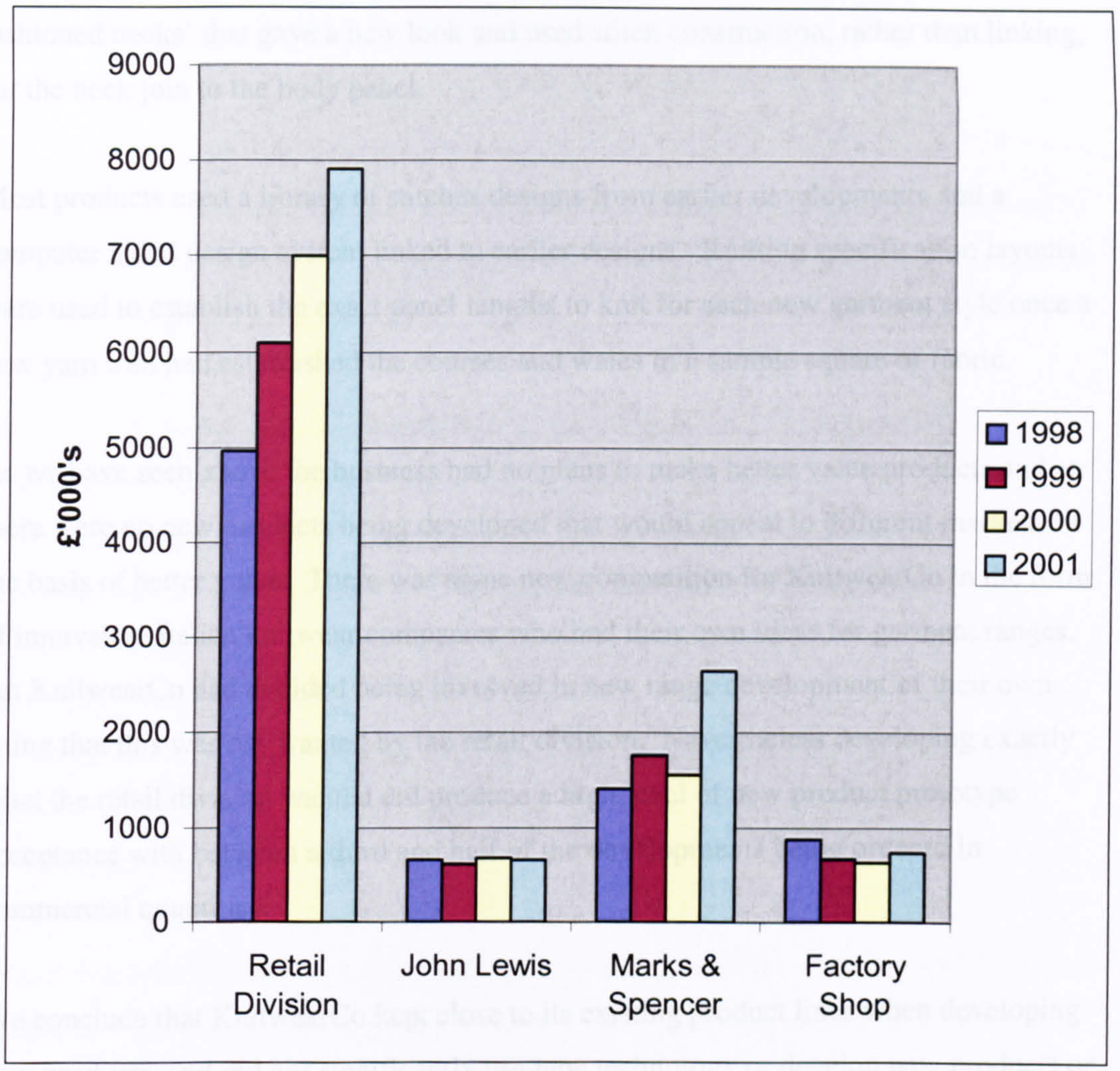



Figure 4.11: KnitwearCo Sales Trends.

Part of the growth with a number of customers may have had more to do with a shift in fashion to knitwear. This view about the changing popularity of knitwear was echoed by a KnitwearCo manager:

**"There are years when we make profits and years when we don't. It depends on the extent to which knitwear is in or out of fashion."**

The low level of newness included not only similar styles but also raw materials. For example the KnitwearCo business was developing new products using the same types of raw materials as used in the past that were mainly Cashmere, cashmere mixes and Merino Wool. The business also used the same knitting technology since all the samples were knitted on standard production machinery, which was unchanged, due to financial restrictions on capital expenditure mentioned above. There was some innovation during the study in the use of knitting techniques to make 'integral fully-

fashioned necks' that gave a new look and used stitch construction, rather than linking, for the neck join to the body panel.

Most products used a library of stitches designs from earlier developments and a computer aided design system linked to earlier designs. Knitting specification layouts were used to establish the exact panel lengths to knit for each new garment style once a new yarn trail had established the courses and wales in a sample square of fabric.

As we have seen above the business had no plans to make better value products and so there were no new products being developed that would appeal to different markets on the basis of better value. There was some new competition for KnitwearCo in the form of innovative Italian knitwear companies who had their own ideas for garment ranges, but KnitwearCo had avoided being involved in new range development of their own citing that this was not wanted by the retail division. Nevertheless developing exactly what the retail division wanted did produce a high level of new product prototype acceptance with between a third and half of the developments being ordered in commercial quantities.

We conclude that KnitwearCo kept close to its existing product lines when developing new products, and did not significantly use new technology or develop new products or try to sell to completely new customers. KnitwearCo did not try to develop better value products. The drive to innovate is designed in theory to attract customers, but there was nevertheless a high degree of acceptance by the customer of KnitwearCo's new product developments and staying close to existing competencies did enable KnitwearCo to produce a very high volume of new developments on time for the retail critical path range reviews.

The analysis **supports** the proposition that textile and clothing supply chain firms develop new products that are line extensions.

### 4.1.6 KnitwearCo Senior Management

Senior company managers should support the NPD strategy through an involvement in allocating resources to innovation activities and being part of the gate review process in the classic Stage Gate NPD model.

The senior management at KnitwearCo was not involved in deciding which specific application development project should be supported with resources. As discussed above every request for a development from a retailer designer was automatically processed into a sample prototype. Therefore the KnitwearCo Sample Unit and production supervisors always allocated the necessary resources to meet the demands of the retail customer's designers. This meant that raw materials were purchased, knitting machines allocated by the knitting manager and make up staff employed. Whatever hours were required, to meet the 'critical path' demands of the retail division, were always made available.

Senior management were not involved on a day to day basis for deciding which projects would be supported by more resources although they were responsible ultimately for approving the costs of the business and in this respect managed overall resources for projects. However there was no detailed management of resources for specific projects and so there was no decision that some projects would be funded and others chosen not to be funded. So even though managers were not involved they clearly gave tacit permission since there is little doubt that any attempt by senior management to restrict raw materials or cut overtime of knitters would have had a direct impact on the timely output of new product developments. However meeting all demands of customers without making a business case for any of the projects is an inefficient use of resources that exposes the supplier to waste resources on what eventually are low opportunity developments. The Industry Forum intervention was designed to discover the best product portfolio and this required a better understanding by senior management of the costing systems and true cost of developing new products.

As discussed above top managers at KnitwearCo did not make go/kill decisions on individual NPD since all concepts were developed. The situation could be described as automatic permanent go decisions with the consequence that development costs were

dependent on the number of requests from designers rather than the potential business thought to be available. However the KnitwearCo management did have concerns that the level of NPD activity and cost was not leading to enough business from the retailer and KnitwearCo wondered if more of the simple and easy to develop Marks & Spencer business would be preferable even if the margins appeared to be worse from the current costing.

The Industry Forum intervention project led to a better understanding of NPD costing and a new costing system was designed by the researcher that proposed a charge to the retail departments according to the amount of developments that were requested and the subsequent business that was placed for a new development. The Industry Forum intervention also attempted to discover the perceptions of each part of the business towards the needs of the knitwear market with the aim of developing a manufacturer/customer supply agreement.

The lack of management involvement may have been a consequence of the high volume and short time to launch. The KnitwearCo business tried to develop hundreds of new products for the retail arm in a short season. The system needed a fast response and as a consequence gate decisions at the manufacturer were missing and therefore the local senior management were not involved in go/kill decisions. The retail customer carried out the selection of potential new products. This left the manufacturer vulnerable to the retailer choosing a product from an independent source. For instance the head office retail division management did make far reaching decisions about using Italian suppliers and switching to T-shirts rather than use in house KnitwearCo capacity in both NPD and production. The decision to develop a T-shirt alternative effectively shut out KnitwearCo from that business since it did not have the technology or experience to make cut and sew jersey T-shirts. The T-Shirt product had replaced the fine gauge knitwear from KnitwearCo with a cheaper product perhaps aimed at a younger market and customer.

This example shows that at a senior overall company level of the KnitwearCo and the partner retail business the resource allocation to NPD projects was poorly integrated.

The conclusion is that for the many hundreds of new developments, senior managers were largely not concerned with regard to manning a decision gate to select products.

The analysis **supports** the proposition that textile and clothing supply chain firm's senior managers are not involved in the individual NPD project decisions.

### 4.1.7 KnitwearCo NPD Organization

**"The commercial director is not given timely information internally, but as soon as he knows it is fed into the retail customer."**

**"Things recently have been changing internally so I promise things and they do not happen."**

**"One of the problems is that there are a lot of new people at the retailer and it is difficult to get them to understand".**

(KnitwearCo managers' views in perception survey).

**"One of the best things about KnitwearCo is the regular contact with their Customer Liaison manager, Karen."**

**"We need better team management communications."**

**"We need consistent deliveries, pre-production seals, dates, facts not ad hoc."**

(Retail Division managers' views in perception survey)

There is no consensus in the research literature about the best or most successful organisation structure within firms for managing new product development. In fact companies often have more than one NPD organisation in place. Firms are generally composed of functions internally including marketing, engineering, R&D, production, sales and finance. There may also be separate departments within some functions. Externally there may be corporate management involved in decisions about strategy and resources. In a supply chain customers and suppliers may also be influential in NPD. New product development projects can involve all these functions and external stakeholders at different stages. The propensity for conflict between the internal functions in NPD is great and managers need to find methods to engender more co-operation. It has been suggested that better integration and multi functional team working on new product development improves success rates, although team members

need to be able to devote adequate time to a project. Some researchers suggest a link between senior management support and NPD success. Other studies suggest leadership on new product projects has a key influence and that project 'champions' can help improve success. It has also been proposed that rather than have a 'pass the parcel' sequential approach; project activities could take place concurrently and save time.
How then is NPD co-ordinated within the firm or with suppliers?

In practical terms those most involved in NPD normally spend their time in a functional area, but there needs to be some overarching responsibility to ensure the smooth progress of a development project as it passes from department to department and function to function. For instance, if there is a meeting to discuss project progress, who is in charge overall if the managers have equal status? If a junior manager represents the departmental function at the meeting does he/she have then the authority to commit the department to any promises of resource use or achievement, without recourse to a senior department manager?
Information can also play an important integrating role in NPD that helps to keep various stakeholders informed about progress.

This section considers a number of aspects of the nature of NPD organisation in the case study including structure, the use of multi-functional teams, the responsibility for project progress, evidence of formal co-ordinating mechanisms and the role of the customer.

Various organisational structures have been suggested for NPD. However there are still many firms who simply pass the development from one department to the next as the project progresses. The alternative multi disciplinary team (MDT) approach has been gaining popularity as a more common structure although some firms also have an NPD department and others even have both an MDT and an NPD department. Even though when there is an MDT there is usually also someone with an over riding responsibility for progressing projects in the form of a product manager, new product manager or a new products committee.
At KnitwearCo there was a Sample Office where most of the individuals worked who had direct contact with the retail division. This included the customer liaison manager who spent 3 days a week at the retailer in London, the yarn assistant who organised the yarn trials, and the sample operations manager who ran the department and was

responsible for the initial translation of each concept idea into an initial garment sketch and dimensions specification. The sample office was also where the knitting technicians worked on new product concepts, with Computer Aided Design, to produce a detailed knitting specification. In addition the business had a sample product line where samples could be pushed through the make-up side of manufacture on dedicated sample machines staffed with experienced operators. This meant that production make up capacity was not interrupted for samples. The product line was run by the Costing and Product Line Manager who also collected the costing information for each development. On the other hand the knitting of samples and prototypes had to be put through the main knitting production lines since there were no sample knitting machines available. The knitting department manager organised the planning of each prototype into gaps in the main production plan for the knitting department. In addition when there was a high volume of prototypes required the main making up departments would get involved in samples. Conversely the Sample Product Line would become involved in commercial production during quieter sampling times. The product line was relieved of some prototype pressure since second prototypes were put through as small production lots, although this then made the operations side less settled.

We can conclude that there was a kind of New Product Department within KnitwearCo. There was however no multi disciplinary team at KnitwearCo that was responsible for organising the progress of projects or reporting results to a senior management panel. Responsibility for progressing projects through the prototype system was not in the hands of one individual. There was no product manager or 'new product' manager or a new product committee. This lack of a progression responsibility meant that projects would sometimes get stuck for long periods. The chart below (Figure 4.12) shows the variation in time that second prototype projects took to get to final make up (FMU). Samples could take between one day and fifty days.

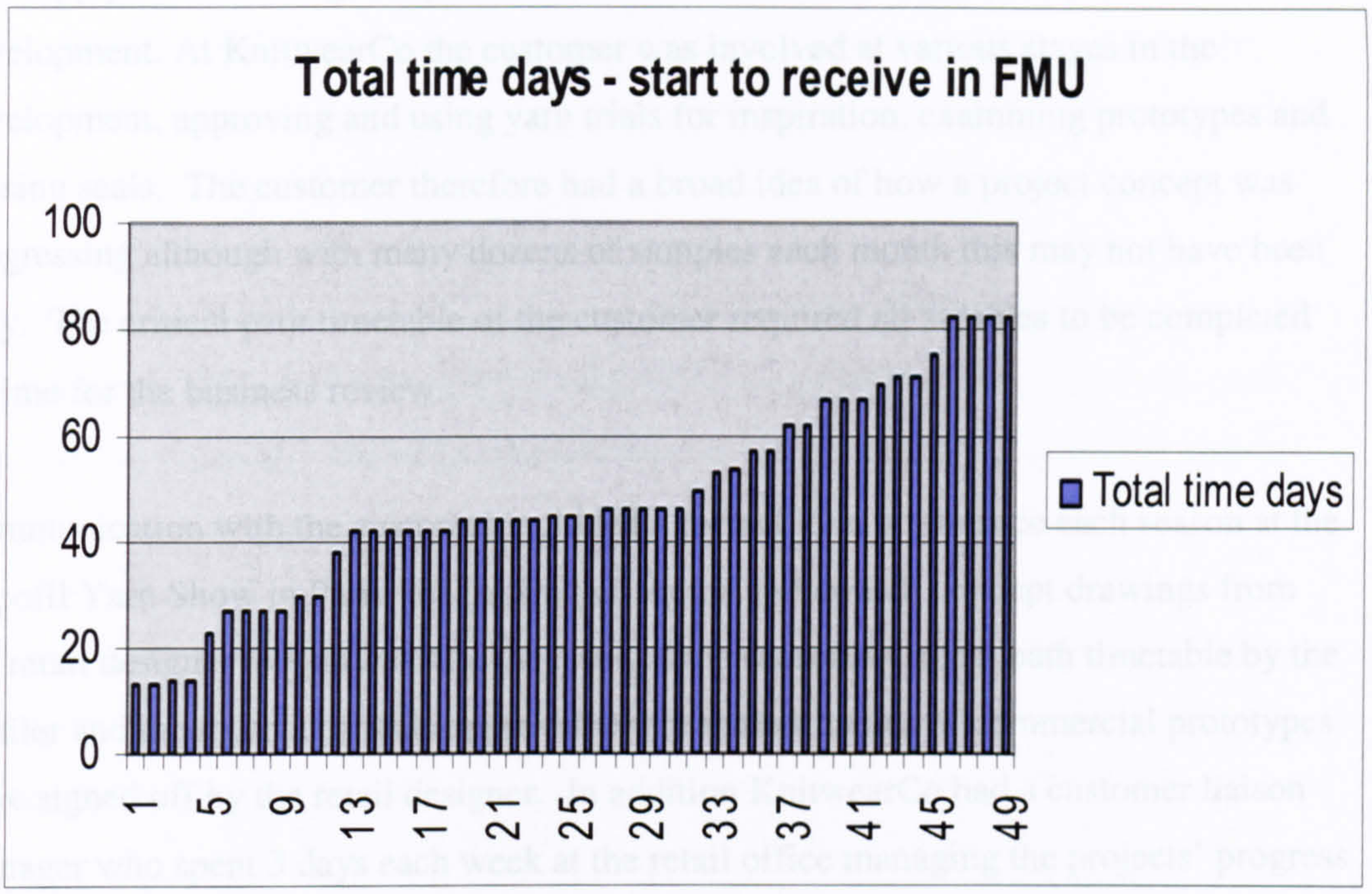



Figure 4.12: KnitwearCo Development Time.

It may have been difficult to use a multi-disciplinary team due to the complexity, speed and high volume of new developments. For example KnitwearCo had a mixture of routes through the NPD product development process and there were dozens of projects going through each month. This high volume of projects all at different stages and in different departments meant that co-ordination across departments was difficult for one person. There were, however, a number of internal co-ordinating mechanisms. Each project had a physical and uniquely numbered specification pack that accompanied it along the product development route in which all the information about the project was collated. Prototypes started in the Sample Office and returned there when complete, for checking against the size dimensions and general quality. Costing information was built up along the route for later quotation to the customer. For second prototypes the product route was small scale production with a bill of materials and bar codes issued that were torn off as the project passed through the production stages. There were a number of computer printouts each week that gave managers in all departments a view on the progress of samples. The problems arose when projects became stuck in the system and the production staff then found it difficult to predict when a prototype would be available for the customer.

In a supply chain we might expect the customer to be involved in new product development. At KnitwearCo the customer was involved at various stages in the development, approving and using yarn trials for inspiration, examining prototypes and passing seals. The customer therefore had a broad idea of how a project concept was progressing although with many dozens of samples each month this may not have been easy. The critical path timetable of the customer required all samples to be completed in time for the business review.

Communication with the customer included a formal joint attendance each season at the Expofil Yarn Show in Paris, the passing of sketch and swatch concept drawings from the retail designer to KnitwearCo, the issue of the seasonal critical path timetable by the retailer and the routine of seals approval where master copies of commercial prototypes were signed off by the retail designer. In addition KnitwearCo had a customer liaison manager who spent 3 days each week at the retail office managing the projects' progress through the approval system and feeding back and explaining any design changes to the factory.

The conclusions from this analysis are that KnitwearCo managed the organisation of a high volume of NPD projects with a combination of a dedicated new product department and 'over the wall' physical product development through each department. The system was well established, had some integrating mechanisms and coped well with the volume. The customer was therefore a key part of the idea generation, overall scheduling and approval process. Tensions did however still arise between departments and the customer. It would have been better if projects at KnitwearCo were given specific dates to complete each stage in a similar way to the customer's critical path. Equally KnitwearCo had no internal monitoring of the date needed for a development to be completed. The customer perception survey showed that the retailer wanted hard facts about delivery and not guesses that proved to be incorrect.

**"The response is poor because their scheduling/ forecasting is so weak"**

**"We need facts not ad hoc dates"**

(Retail managers, Customer Perception Survey).

One other problem was the short time allocated between the designer's last date for issuing sketch and swatch information to the manufacturer and the deadline for the range review when the prototypes were needed. In effect this could leave only 25 days to develop 45 new products.

The high volume of projects was organized with the customer through formal methods and in particular the use of the critical path form, a standard sketch and swatch where concepts are presented, the seals approval sign offs and the use of a customer liaison manager.

We conclude that KnitwearCo supply chain had good communications with a liaison manager, the use of the critical path and standard forms for concepts and approvals. The system was trying to cope with a high volume in short time and this led to strains.

The analysis **supports** the proposition that textile and clothing supply chain firms use structured communication methods with each other in the NPD process.

### 4.1.8 KnitwearCo NPD Tools and Methods

Research indicates that firms use a variety of NPD methods in an attempt to improve success. These include idea generation methods including Brainstorming, listening to the customer through 'Voice of the Customer' methods such as Quality Function Deployment (QFD) and portfolio management methods such as scoring systems and strategic buckets. Firms also measure development cycle time and on time achievement as well as using CAD to speed development.

KnitwearCo did not brainstorming methods to develop new product ideas. All the ideas came from the retail customer. There was also no use of QFD or portfolio methods for scoring potential projects since all of the customer ideas were developed. There was no allocation of resources, as in a strategic bucket, to any particular customer or new product group. CAD was however used in product development and computer stitch templates from previous products to speed development.

KnitwearCo was also driven by the main 'critical path date' for the review by the retailer. The 'critical path' plan was a list of every main decision point between product concept and the launch into stores. The rationale behind the critical path is that a fixed launch date needs fixed dates then for the stages and gates behind the development process. The critical path process had the following main stages (with dates) for Autumn/Winter 2002 retail clothing ranges:

1. Sketches issued by designer
2. Sample garments to design from manufacturer
3. Group review Sign Off
4. Lab dip approval
5. White seal approval of pre-production samples
6. Press samples delivery
7. Press show day
8. Purchase orders sent to suppliers
9. Gold seal
10. Black seal
11. Delivery to Central Warehouse
12. Delivery into stores

Most of these steps involved the supplier in meeting dates with samples. The early Group review sign off retail management approval stage assumes that products will then be able to later meet the seal criteria and the checking and approval of these seals are delegated to lower levels of management.

The overall conclusion is that there was a low level management use of the suggested NPD tools at KnitwearCo. The main methods used in practice were those to validate and approve products such as submitting lab dips, prototype and later quality and pre-production 'seals' and following the critical path timings for submissions. These methods are all timed.

The proposition is **supported** that textile and clothing supply chain firms use tools to monitor adherence to the product development schedule.

### 4.1.9 KnitwearCo Summary

The organization of product development in KnitwearCo has been presented and analysed relative to the research propositions. This section summarises the main findings.

*NPD Models*

The company does not appear to use a 4th generation NPD model since there is no real use of gates in a stage gate process. There is nevertheless a fast, high volume NPD system that closely satisfies customer needs and meets a deadline for the launch of hundreds of new products. KnitwearCo has no gate mechanisms to thin out the projects. This responsibility belongs to the customer. The NPD model has much in common with the early models of customer-led incremental innovation. However the KnitwearCo system gains speed from the application of lower retail management level (customer) approval mechanisms that divide up the validation steps into levels as the launch date approaches. For example there is a colour approval stage and a later first production approval stage. Buying decisions are made early and marketing activities planned in even though the final product range is not known. Cycling of prototype attempts goes on until the designer is satisfied with the interpretation of his or her design up until the review date. There is a use of templates to speed development of designs and the use of CAD and computer archived earlier designs and specifications. There are however no multifunctional teams in KnitwearCo, but the sheer volume and speed of new products, many of which are treated as small production lots may require a fast production response rather than committees.

Being a supplier to a supply chain retailer customer had an impact on the NPD process with virtually all new product ideas coming direct from the customer, the customer making the decisions on prototypes, on validation sign offs, on the timing and number of new developments and on the ultimate commercial size of the commercial orders placed. Everything is driven by the seasonal deadline for product launch into store. Whilst the NPD model used does not have the gates or multi functional teams of a 4th generation innovation process it is fast, copes with high volumes and meets a fixed short term launch date.

*NPD Stage Activities*

The NPD stages are a key area where repeated previous research confirms the need for a good quality of execution of activities. Of the thirteen stages recommended in research literature, only six were carried out quite well at KnitwearCo and a further six carried out by the customer. Almost all of the recommended stage activities are thus carried out by one or other supply chain partner. For a supply chain company it also appears that many NPD activities are customer led. In the KnitwearCo case this customer involvement restricted innovation to the range of products that the customer was interested in. The speed of the customer NPD needs left little time for long term developments of for example cost reduction and meant little change in the technology used and instead the developments used the safety of the tried and tested equipment. There were obvious dangers with so much responsibility for key NPD activity decisions in the hands of the major customer and this was highlighted when the T-shirt replaced fine gauge knitwear (an alternative technology) - the result was a closing down of KnitwearCo production capacity and laying-off of staff. Letting the customer drive ideas also left the supplier with a weak level of knowledge of the market or competitor products since everything that KnitwearCo knew was the information passed on indirectly by the retailer in the selection of concepts. The knitting company was however strong in other areas. There was use of production facilities for prototypes that then quickly went into launch. The firm also used detailed product specifications and did formally assess the difficulty of knitting new yarns.

Product testing was carried out within KnitwearCo and also the customer did check that the concept had been interpreted well and that the garment fit was correct. Any changes were accommodated through a redevelopment of the prototype. Market testing was not really feasible in the short timescale although the retailer did appear to develop many new products and then only order a small quantity and this may have been to test the consumer response to a new idea with little commitment by the retailer, but a high development cost to the knitter. But financial analysis was limited to margins at KnitwearCo and there were, as a result, very small commercial volumes accepted, since the margin was acceptable. Potential sales levels were not assessed. The knowledge about the market size was known to the retailer but not to KnitwearCo. Market launch activities were carried out only by the customer. There was therefore then no decision stage by KnitwearCo to assess the likely level of business prior to full production. On the other hand product development had a good level of resources committed to it at

KnitwearCo in order to meet the product review deadline of the retailer. The customer did carry out key NPD decisions and this was risky and costly for KnitwearCo since the customer was able to then order very small quantities that may not have justified the development expense.

*NPD Strategy*

KnitwearCo NPD strategy was very customer focussed. The in-house retail partner bought two thirds of the output but required virtually all the firm's NPD capabilities for small and, sometimes, uneconomic new product projects. The strategic direction of the new products was also determined by the retailer who was, unfortunately, consistently unsuccessful and unprofitable over the past five years. This posed obvious risks for KnitwearCo of possible poor levels of sales and pressure on prices and margins as the retailer looked to cheaper offshore supply to lower costs. There was also a risk to long term survival. The strategy direction for KnitwearCo tended then to carry on with a high volume, short cycle kind of products that the retail customer was used to having developed at KnitwearCo. This meant that the knitter did not spend time in developing some long term lower cost products and this was what the market wanted.

*Success measures*

KnitwearCo was naturally concerned with achieving the prototype submission date required by the retailer in order to achieve NPD success. Financial and sales measures were less important. New prototypes were costed on a unit margin basis but this ignored the likely sales volume of new business. Profit margins were calculated on a cost plus basis and the levels of cost were generally accepted by the customer since this measure rarely led to a product prototype being killed. Success in having a product adopted by the customer was no guarantee of sales though.

For the retailer in the supply chain the success of new products related to the extent to which sales were achieved within the season and the stocks sold with an average selling price level that was near to the original retail selling price. New products are normally developed and put into stores solely based on the experience and approval of the retail designer and the buying team rather than on any portfolio selection system using success factors such as sales potential. There were no financial hurdles either at

KnitwearCo that projects had to pass. Individual profit expectations, for example, were not used to judge between competing prototypes at KnitwearCo since profit margins were generally the same for all products to the same customer.

The customer perception survey also concluded that timeliness and meeting the sampling review and launch dates for the retailer's critical path were the most important measures for the customer.

*Newness*

The degree of newness was low with many new KnitwearCo products being similar in raw materials, knitting technology and customer to previous products. This similarity did however help to achieve the deadline for launch of dozens of new products since there was then little to learn about production needs and technical failure was rare. The level of newness for the in-house retailer was nevertheless higher than for the Marks & Spencer buyers who wanted the same garment as last season but in new shades. The evidence from this case study is that the supply chain situation does influence innovators to stay close to existing products.

*Senior Management*

KnitwearCo senior managers did not get involved in go/kill decisions on every one of the six hundred prototypes each year but did agree to ongoing funding of the overall development effort. The retail company needed a fast response and it was the retailer who narrowed down the prototypes to a range collection rather than the KnitwearCo managers meeting to make go/kill decisions.

*NPD Organization and performance monitoring*

KnitwearCo did not use multi-disciplinary teams, but there was a dedicated product development department. The production side of KnitwearCo did not liaise very well with the sales side and customer liaison staff and this led to promises on delivery of prototypes that were not achieved in practice. The customer used a clear critical path to set deadlines for a number of KnitwearCo development stages including concept, validation sign off (seals), prototype submission and store launch. KnitwearCo was

well aware of the dates and generally met them in spite of the short time scales and high development volumes.

The KnitwearCo customer liaison manager spent three days each week at the retailer helping to progress prototypes and feedback decisions.

*Propositions*

The research propositions concern the impact of being a supplier in a textile and clothing supply chain. Of the eight propositions the following are supported by the analysis:

- **Textile and Clothing Supply Chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**
- **Textile and Clothing Supply Chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**
- **Textile and Clothing Supply chain firms use non sales based measures for new product success.**
- **Textile and Clothing Supply Chain firms develop new products that are line extensions.**
- **Textile and Clothing Supply Chain firms' senior managers are not involved in the individual project decisions.**
- **Textile and Clothing Supply Chain firms use structured communication methods with each other in the NPD process.**
- **Textile and Clothing Supply chain firms use tools to monitor adherence to the product development schedule.**

The following proposition was not supported:

- **Textile and Clothing Supply Chain firms adopt 4$^{th}$ Generation faster, flexible NPD models.**

## 4.2 RetailCo Case Study

### 4.2.0 Introduction

> **"The fourth issue we are working on is about making improvements to our product both in the ranges and how we deliver them to the customer."**
>
> (RetailCo Interim Company Report, 2001).

This chapter continues to investigate the research area of methods and organization of NPD in the UK Textile and Clothing Supply Chain with an examination of a leading high street retailer's supply chain in order to answer the research propositions. The photograph below (Figure 4.13) shows one of the RetailCo stores.

Figure 4.13: RetailCo Store.

RetailCo is a fast growing clothing retailer with a chain of 480 stores in the UK. The company has built up the business quickly with a young customer base (Mintel, 2001) and a fashionable product range. Part of the casualwear range is developed through the use of a UK manufacturer who cuts, manufactures and trims (CMT) fabrics purchased by RetailCo thereby manufacturing garments according to designs and specifications set out by RetailCo.

The design work and raw materials planning is carried out by a RetailCo planning office situated near the CMT manufacturer in the East Midlands of the UK. Finished garment are shipped to the RetailCo distribution centre (located at the RetailCo head office) and

then distributed to the stores. The CMT manufacturing facility is shown in the photograph (Figure 4.14) below:

Figure 4.14: RetailCo CMT Manufacturing Factory.

The Industry Forum intervention project was concerned with improving the speed of the product development cycle through the RetailCo supply chain and involved the head office buying departments, distribution centre, the RetailCo planning office and the CMT manufacturer. This project activity necessitated the mapping of the NPD Process, measuring the NPD cycle time and then implementing and testing some changes to speed up the time taken. In addition the I.F. project team examined the quality systems in place and implemented some improvements.

The Industry Forum project at RetailCo therefore offered good levels of data collection relative to testing the research propositions since the work involved examining the NPD process at the retailer and the supplier.

### 4.2.1 RetailCo type of NPD Process

This section examines the situation at RetailCo with the aim of discovering if the firm uses a formal NPD process for all new products and if the system is a modern version

4th Generation model of the various NPD processes that has been identified in the literature.

The Industry Forum project and mapping of the supply chain NPD process identified clear systems that were used by the RetailCo head office buying and technology functions, the staff at the remote RetailCo planning office and the CMT manufacturer. These systems enable a model of the NPD process to be developed.

There were a number of clear stages and gates in the RetailCo NPD process. These are:

- **Trend Analysis**
- **Concept Garment Development**
- **The Buying Decision**
- **Product Development**
    - **Materials Call Off**
    - **Fit Approval**
    - **Technical Approval**
- **Production and Launch**

The process mapping identified two formal development streams that ran in parallel. The first stream was the fit approval part where there were a series of iterations where versions of the prototype would be developed. The initial prototype that the planning office designer sent to head office (with a specifications sheet of garment measurements) would first be examined by the buyer involved e.g. Womens casualwear. The buyer would then use a size 12 model fitting session to make a decision about the garment suitability and then send any comments about any measurement and styling changes back to the planning office. Further samples would be made incorporating the changes and these iterations would take place until finally the sample prototype was accepted and a seal garment approved.

The second stream is the materials and production flow. Once a buyer reaches a decision to buy, an order is then sent to the planning office which then calls off the fabrics and also orders trims.

These two streams are shown on the process flow timeline chart (Figure 4.15) below. The chart shows the stages in the process and the involvement of the various players.

The fit side of the timeline begins when the designer sends a first prototype (submit 1) to the RetailCo buyer. The buyer then makes a tentative decision to buy and requests a costing from the planning office. If the cost is approved the RetailCo buyer then has a fitting session for the prototype with the technical staff and this usually is followed by a feedback to the planning office for some adjustments to the prototype. The buyer also sends an order for commercial quantities to the planning office. The planning office first calculates the amount of fabric needed for the order and then buys in or calls off fabric dyed to the required shade. The fit and new prototypes have several attempts and finally are sealed (approved). Once approved the planning office can then make the gradings where the panels of each garment size are designed using the CAD system. The fabric and trims will normally have arrived at the CMT factory by this stage and then preliminary work on the first production samples can begin.

What is important is that the two streams operate independently until one of the streams is completed when one stream then awaits the completion of the other stream. For instance if the fabric and trims arrive before the prototype iterations are completed then the production has to wait until the approval is given.

The full CMT manufacture of the commercial order of 3000 to 10,000 garments takes about 11 days on average. The whole process from the first prototype takes 52 days on average.

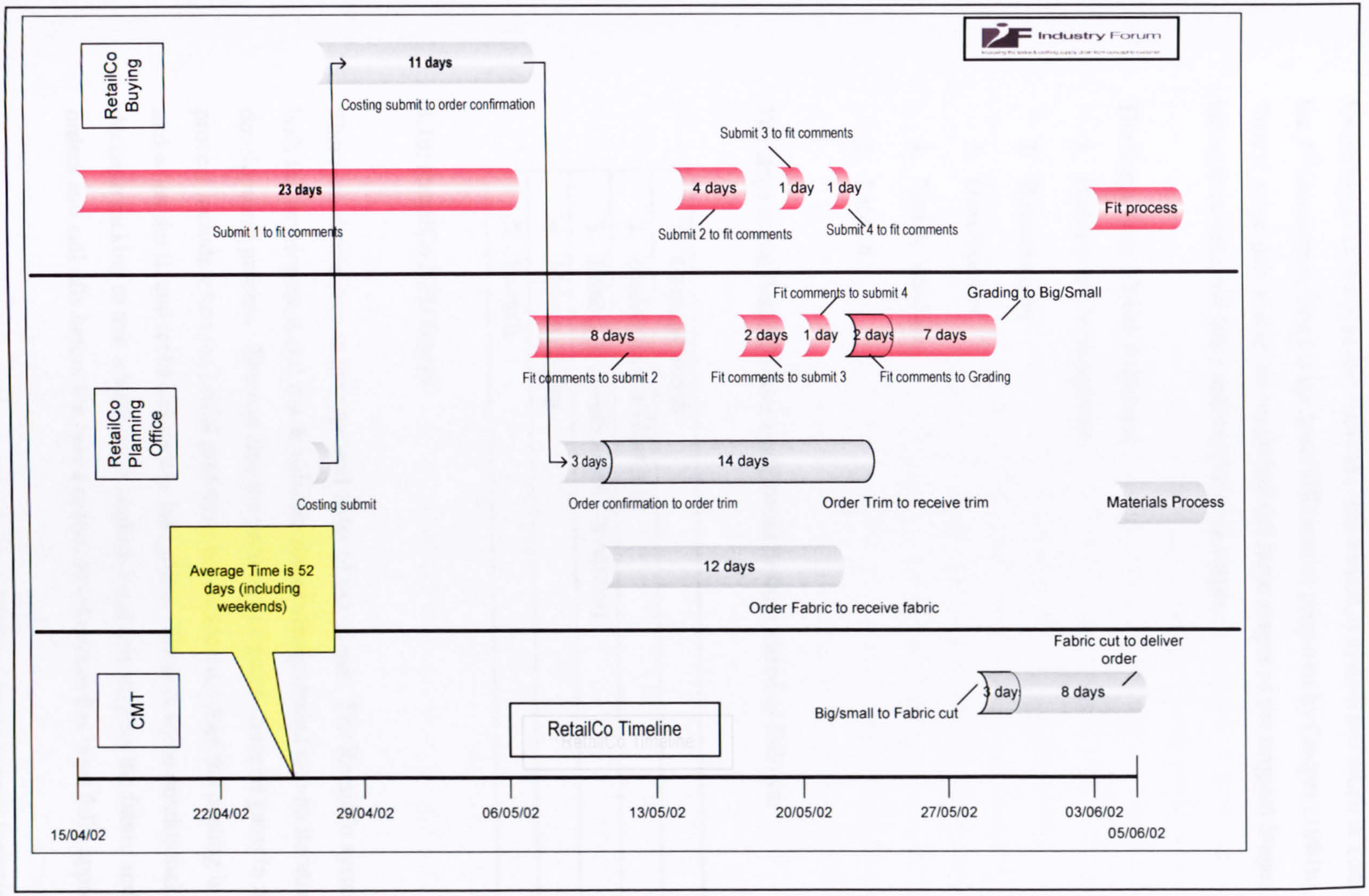



Figure 4.15: RetailCo NPD Timeline

Examination of the process shows that the RetailCo system has much in common with the 4th Generation fuzzy stage gate NPD model proposed by Cooper (1994b). The 'fuzzy' stage gate model we recall had the same stages as the original Stage Gate Model but with conditional gates and overlapping stages.

The Stage Gate Model stages are:

1. Preliminary Investigation
2. Business case
3. Development
4. Test & Validate
5. Launch

The steps in the RetailCo case study could be considered as follows:

| |
|---|
| 1. Concept search |
| 2. Business Case (Costing) |
| 3. Prototype development (Iterations) |
| 4. Manufacturing |
| 5. Launch |

4.16: RetailCo NPD Stages

There are similarities in the type and order of the stages. The RetailCo system has the both the development and test & validate stages amalgamated into an iterative prototype development process. There is also the presence of gates. Several gates in the RetailCo process include when the initial prototype is considered, when the costing is submitted and when the fit and technical checks take place. There is some conditional (fuzzy) decision making in that a bulk order is placed and this triggers the fabric and trims orders and call offs *before* the new product development has been fully approved.

In addition the test and validation stages are capable of being moved forward or backwards in time depending on the number of iterations of prototypes.

Where the RetailCo differs from a classic stage gate model is that the gates are not manned by senior managers. The system does not have a senior management review team who make go/kill decisions on all individual prototypes since the buyer may abandon two thirds of them and order those selected without recourse to an approval committee. In spite of the similarities of having concurrent stages this lack of a senior management review gate method with criteria effectively rules out consideration of the RetailCo system as a Stage Gate Model. The buyers are instead given the authority and the budget and then have an 'Open to Buy' amount that they can commit. Buyers also buy fabric in advance of the seasonal development process to a specification. This is a similar to predetermined gate for when the fabric is then delivered it should conform to the specification. The RetailCo system also has some other aspects of concurrent engineering with ordering the raw materials and booking manufacturing capacity although the CMT plant do not get to see the prototype until it has been approved and can only then plan the production route. The buying decision is in effect a go decision that is conditional on all the tests and verifications being approved later. There is some of the market focus of the basic Stage Gate model in terms of the regular seven weekly reviews of sales performance and stock levels. The RetailCo system has a very fast cycle time and little time therefore for a proper evaluation of the production technology needs of the new products. The effective early purchase of raw materials does cut down the long fabric development time identified by Forza & Vinelli (1996) but has an effect of limiting the degree of innovative scope of any new product development and the same comments apply to the use of product templates and margin targets since these also place limits on development.

The RetailCo supply chain also does not appear to use a 1st generation or Phase Review Model for the NPD process. The main reason for this conclusion is that there is no overall control of projects and no breaking down of tasks with monitoring and control by a reviewing panel of the adherence to the timetable plan as there was in the Phase Review type. The high volume of 30 to 40 small-scale new developments per week at RetailCo probably makes this type of organisation difficult. There is no management committee so the buyer is under no pressure to reach a decision about the first prototypes in a particular timescale. A Phase Review type of process would have a co-ordinating committee, a breaking down of tasks and timings and the dominant function is engineering. At RetailCo the dominant function is buying and tasks are not planned by a committee beyond a seven week performance and product range review.

The RetailCo NPD system does indeed appear to 'push' products at the consumer in a similar way to the R&D led First Generation Innovation Process ( Rothwell,1994), although the RetailCo system does not use new inventions and then seek applications for them. Rather RetailCo put together fashion trend inspired collections and puts them into stores every seven weeks. If the ranges do not sell well the price is discounted until the stocks are eliminated and the process starts again with another range.

There are some similarities between the RetailCo NPD system and the 2nd generation innovation 'market pull' model (ibid) since the changes in products at RetailCo are incremental and they follow a scanning of the market in the trend review. The products are incremental to the extent that they use the previous templates for sizing and fit. However it could be argued that the ranges at RetailCo do also respond to market needs in that if a product sells well it may have an extended life or be repeated in new colours. But the use of the base fabrics and trims for a variety of prototypes can be seen as a first generation NPD type of technology push.
There are additionally some aspects of the NPD process at RetailCo that mirror the 4th generation NPD model where there is concurrent phasing of the steps. Materials are ordered, for instance, in the appropriate colour whilst the fit and technical steps are also carried out at the same time. This parallel processing reduces the cycle time. The supplier is however not as involved as we might expect from a true 4th generation model for there is no real integration of functions. For example the CMT plant did not have prior knowledge of the products until they had to manufacture them with delivery of bulk due in ten days. The joint meetings that were held between the RetailCo Planning office and the CMT manufacturer were about delivery dates rather than any planning of the new product development needs of each party. The Industry Forum project was aiming to involve the CMT manufacturer earlier in the development process.

The RetailCo process has some aspects of the 5th Generation Innovation Process features. These include a focus on time, a use of CAD and an interest in quality with an almost continual incremental development. There were no I.T. Links between RetailCo and the CMT supplier. The links between the RetailCo planning office and the head office were generally an exchange of development documents. There was no 'Design for Manufacture' suggested for the 5G model by Rothwell since the manufacturer was not involved in the development process until the production ramp up stage. Quality was to some extent built in at the design and development stage through the use of

selected fabrics that had been pre-specified by the head office fabric manager. There was some cross functional co-ordination and teamwork since the RetailCo buyers and garment technologists were organised into buying teams where for example formalwear had a different team to girls wear. Another example of the formal co-ordination was that the planning office designer attended the review meetings held every seven weeks to examine sales performance and range development.

## NPD Model Conclusions

The analysis conclusions regarding the type of NPD Model in use in the RetailCo supply chain are that there is no use of a proper 3rd or 4th generation stage gate model with a senior management team reviewing development projects and making go/kill decisions. Buyers are given a budget and they make the commercial decisions regarding raw materials and new products based on their own understanding of the customer needs.

The stages in the RetailCo NPD process are however characterised by the following features:

- Concept development through market scanning of fashion trends
- Design by Retailer
- Manufacture by CMT supplier
- Fixed Launch Date window
- Use of standard product templates as a starting point for development
- Pre-determined standards and specifications
- Pre-ordered base raw materials that are dyed to shade later
- A buying budget – 'open to buy' for the buyer
- An early single go/kill decision by the buyer
- Products considered as part of a coherent range offering
- Concurrent processes

- Fast response to sales
- Cycling through Validation stages until specification standard is reached
- Validation sign off through use of master copies of product – 'seals'
- 'Seals' used as manufacturing standard
- Limitations/focus on development through
    - Target margins
    - Target selling price architecture
    - Pre-purchased materials
    - Standard product templates
- Fast development
- High volume of short life and low sales products developed
- Review cycle for range planning every 7 weeks

We conclude that the RetailCo supply chain, whilst having only some of the best practice of the later NPD model outlined in the literature, nevertheless does manage to produce a fast response to the latest fashion trends with a high volume of new developments based on a single decision of the buyer who has an allocated spend for (new) products.

The findings **do not support the proposition** that Textile and Clothing Supply Chain firms adopt 4th Generation faster, flexible NPD models.

### 4.2.2 RetailCo NPD activities

As we have seen, in the earlier analysis of KnitwearCo supply chain, firms may not carry out all the stages of an efficient NPD process although the missing stages may be competed by others in the supply chain.

The RetailCo early commitment to raw materials, use of product templates and validation through meeting specifications and manufacture to a master copy (seal) with some CAD has produced what seems to be a fast and efficient NPD process. Efficiency has however been defined by Cooper & Kleinschmidt (1986) as the degree to which firms carry out the detailed activities in his 13 step Stage-Gate process. This section considers these detailed activities in the RetailCo case study.

## Initial Screening

Cooper (1986) shows the initial screening options with a group decision and a formal list of criteria considered the best approach. Cooper later (2001, p133) suggests that this stage is where a list of 'must meet' and 'should meet' criteria are applied dealing with the new products strategic alignment, feasibility, magnitude of opportunity, market attractiveness, product advantage and ability to leverage the firm's resources. At RetailCo there was an individual buyer's decision with no particular list of criteria. The buyer did use a benchmark of the product's ability to fit in with the overall range being developed for the next mini-season of seven weeks. The new designs at RetailCo had a product advantage in their reflection of the latest fashion trends.

| Approach | Used in the Case Study firm |
|---|---|
| A group decision, based on an informal discussion – no formal techniques uses at all, e.g. no checklists of criteria, no rating forms, etc. | No |
| A single individual made the decision, again on an informal basis (no formal techniques). | Yes |
| A group decision, based on a formal checklist of criteria. | No |
| Carried out by supplier | No |

The magnitude of the opportunity may be reflected in the amount of the 'open to buy' budget that the buyer proposes to commit to the product. The feasibility of the product in the RetailCo case involves the buyer asking the garment technologist's advice. The

decision to carry on with the product development eventually lies with the department buyer who rejects 20 to 30 prototypes per week in favour of the 10 products that are given a go decision by requesting a costing from the planning office.

## Preliminary Market Assessment

At this stage the company might examine the market for products of the type being considered using secondary market research data, review competitors' products, ask the customer if they might be interested in this type of development, quiz the sales staff who have knowledge of the market or at least have an internal discussion about the suitability of the project idea for the proposed market. At RetailCo there was no direct contact with the consumer but there is a market assessment process that involves assessment of secondary research data and the production of the guidance Trend Booklet that reflects the catwalk fashion looks and the plan to roll out certain looks at certain times and for certain customers. The designer also reviewed competitor products. There were team discussions at the seven week reviews when the performance of previous designs is assessed.

| Approach | Used in the Case Study firm |
|---|---|
| Direct contact with customers | No |
| Discussions with the sales force | Yes |
| Review of competitors' products | Yes |
| Access secondary/published data | Yes |
| Knew market already – internal assessment/discussion session only | No |
| Carried out by supplier | No |

## Preliminary Technical Assessment

The technical assessment of concepts is designed to discover those projects that are unsuitable since the firm may not have appropriate technology. This step also includes where a preliminary product development may be carried out, a specification developed or the idea's feasibility studied.

At RetailCo this technical assessment stage is approached through the use of templates for the garment size measurements and the pre-ordering, and specification setting, of fabrics. The assumption is that if the same type of fabric and product has been made before then the technical capability already exists. There is no engineering assessment but there was the use of a previous product template, known manufacturing technology and a specification for fabric performance and garment dimensions. However as we have seen the CMT manufacturer was not involved at this stage and so we must conclude that no real engineering assessment has been made. A prototype garment is produced, by the designer in the studio, as an input to the buyer's initial screening process but this did not have a formal technical assessment.

| Approach | Used in the Case Study firm |
|---|---|
| Capability/feasibility analysis | Yes |
| Engineering assessment | No |
| Product specification | Yes |
| Product design, model development | Yes |
| Carried out by supplier | No |

We conclude that RetailCo carried out the preliminary technical assessment stage fairly well but could have improved it by involving the supplier and this was one of the recommendations of the I.F. project intervention. The CMT manufacturer was not yet involved so the RetailCo planning office estimated the capability of the CMT plant to make the product.

## Market Studies

This stage is concerned with a brief estimation of the demand for the new product. Competitors and earlier product performance may be studied. At best a market research study (involving a reasonable sample of respondents, a formal design, and a consistent data collection procedure) is carried out to try and discover what customers need. Secondary data may be examined closely to establish the likely market opportunity.

At RetailCo there is a market scan to consider the fashion trends at the start of the season. Later there is an informal market watching by the designer and buyer. However the sheer volume of small-scale new developments, for the supply chain in this case study, and the short timescale, would probably make any formal market research on individual products difficult, costly and too slow. The CMT manufacturer is not yet involved at this stage and does not carry out an independent market study.

| Approach | Used in the Case Study firm |
|---|---|
| A study of competitor products and prices | Yes |
| A study of what customers needed or wanted | No |
| A study to determine market size | No |
| Carried out by supplier | No |

## Business/Financial Analysis

In the classic Stage Gate model there is a business analysis step before any serious commitment of resources to product development. This can vary in level between a Discounted Cash Flow (DCF) to a 'quick and dirty' guess with costing estimates perhaps in the middle. At RetailCo there was no DCF, ROI or Break-even analysis at any stage although there was a cost and margin calculation carried out and a retail selling price estimated.

| Approach | Used in the Case Study firm |
|---|---|
| Costs and sales forecasts | Yes |
| Discounted cash flow analysis | No |
| Return on investment analysis | No |
| Payback period and/or break even analysis | No |
| Superficial analysis: informal; 'quick and dirty'; rough guesses and estimates | No |
| Carried out by supplier | Yes |

The table above summarises the situation. There was a costing step at RetailCo and the buyer had an 'open to buy' budget that could be allocated. The sales that a new product could generate were limited by this budget allocation. The CMT manufacturer would also have first sight of the concept garment at this stage and make a 'quick and dirty' guess at the cost and agree this with the Planning Office.

## Product Development

Product development is the actual translation of the idea or concept into a viable product prototype or sample. The product concept at RetailCo has already been developed into a first prototype by the designer using the garment block templates and purchased fabric, although there are still many versions to be made and the final colour to be used. The planning office used the designer and sample machinists to make any changes to the prototypes and resubmit them without involving the supplier in the development.

## Product Testing – In-House

This stage involves testing the product in-house, in the lab or under controlled conditions (as opposed to in the field or with customers). At RetailCo this included the

fitting on a size 12 model for example for womenswear. Garment measurements and specifications were also set and tested. The first prototype would use a standard block with existing specified measurements. However the buyer may decide, for instance, to alter the specification to make the garment looser fitting to match a trend for less fitted clothes. The next prototype would then try to match the new specified dimensions. Fabric used for the prototypes has also normally been purchased to a sample and specification. There were no internal wearer trials at RetailCo however and no wash tests of garments. At this stage the CMT supplying manufacturer is still not yet aware of the details of the product and does not carry out testing.

The table below summarises the in-house testing.

| **Approach** | **Used in the Case Study firm** |
|---|---|
| Prototype testing: to determine if the product functioned properly and reliably. | No |
| Operating tests: tests to check the functionality/reliability of the product under real-life working conditions. | No |
| Specifications check: tests and checks to determine if the product met specifications, outside (external) design standards, etc. | Yes |
| Field tests of the product. | No |
| Carried out by supplier | No |

As we can see the degree of testing is minimal although the system of templates and previously purchased and tested raw materials should make this less necessary. There is also little time to carry out extensive individual product tests due to the high volume of products and short time scale with 10 new products per week and a seven week cycle of development.

## Product Testing with the Customer

For most products this should involve the consumer trying out the product. At RetailCo there was no time to carry out this testing with consumers on the many new products before the product went on sale in the stores.

## Trial Market/Trial Sell

A test market or trial sell of the product involves trying to sell the product but to a limited set of customers or full scale sales but in limited geographic area.

| Approach | Used in the Case Study firm |
|---|---|
| Selling the product to a small sample of selected customers only. | No |
| Selling the product in a limited/specific geographic area only. | Yes |
| Carried out by supplier | No |

RetailCo did experiment with new products and only make a limited quantity for a few stores and then react quickly to sales. The chart below (Figure 4.17) shows that this was happening towards the end of the Industry Forum intervention project with many small orders.

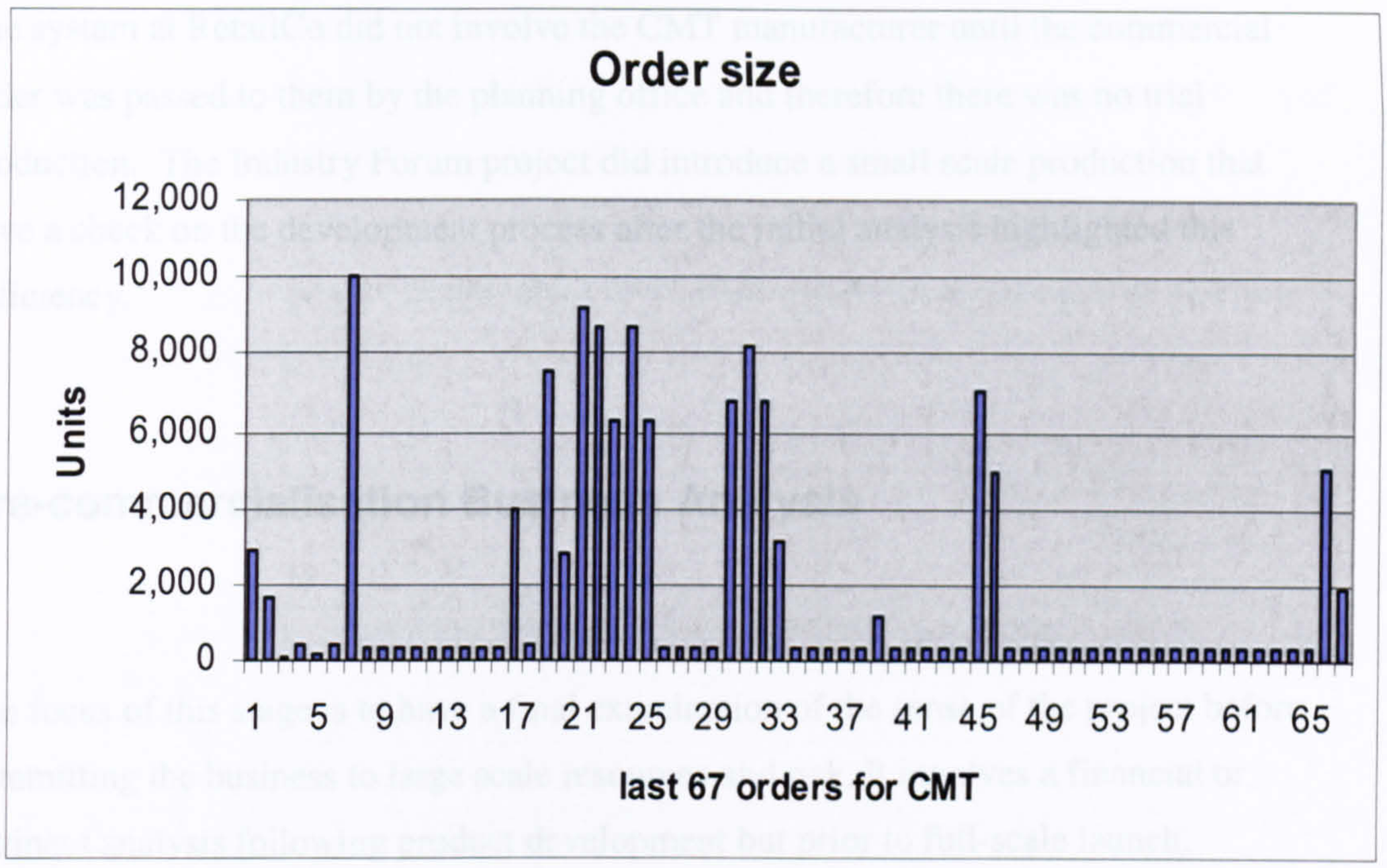



Figure 4.17: RetailCo Order Size.

## Trial Production

With large new product launches one should expect a tentative production run to test the production facilities and how well the prototype translates into commercial volume manufacture. This is a way of testing both the product and the production line.

| Approach | Used in the Case Study firm |
|---|---|
| A test of the production system itself (e.g. the production equipment ran properly). | No |
| A test of the integrity of the product that the production system yielded (e.g. to see that the resulting specs were met). | No |
| Carried out by supplier | No |

The system at RetailCo did not involve the CMT manufacturer until the commercial order was passed to them by the planning office and therefore there was no trial production. The Industry Forum project did introduce a small scale production that gave a check on the development process after the initial analysis highlighted this deficiency.

## Pre-commercialisation Business Analysis

The focus of this stage is to have a final examination of the sense of the project before committing the business to large scale resources and risk. It involves a financial or business analysis following product development but prior to full-scale launch.

| Approach | Used in the Case Study firm |
|---|---|
| A detailed financial analysis, involving a return or profitability assessment. | No |
| A review/integration of marketing information only: sales forecasts and marketing cost projections. | No |
| A cost review: a review of distribution, production and marketing costs. | No |
| Carried out by supplier | No |

The decision to commit resources at RetailCo had been made by the buyer after the first prototype has had a costing and so this pre-commercialisation step did not take place. At this stage the CMT manufacturer has also already agreed the manufacturing cost and with the absence of a trial production no new cost calculations were made.

## Production Start Up

Almost half the firms in the Cooper & Kleinschmidt 1986 study did not recognize this step in the NPD process. The 56% that did were mostly those who identified a need for changes to the production facilities. At RetailCo the production did not involve a

separate production start up step since the factory started the order in bulk and completed it. There were nevertheless occasional changes to the production routes used and some limited extra equipment used if the garment required it.

The Industry Forum project introduced a new small scale start up production and new quality checks prior to the bulk.

| Approach | Used in the Case Study firm |
|---|---|
| A few changes to the production facilities needed for the new product. | Yes |
| Acquisition and commissioning of significant new equipment and production facilities, sometimes a new factory. | No |
| Quality control checks at product start up. | Yes |
| A recognized step but no changes to the production facilities. | No |
| Carried out by supplier | Yes |

## Market launch

This stage involves the conscious launch of the product, on a full-scale and/or commercial basis; an identifiable set of marketing activities specific to this product. With dozens of new products each week in the RetailCo stores there was a focus of promotional activity on only a few selected lines. One example was the Best Buy campaign that had promotional Point of Sale material. These campaigns would last for a few weeks and often involve a larger quantity than normal being purchased and a keen price.

## NPD Stage Activities Conclusions

The table in Figure 4.18 below summarises the activities situation at RetailCo.

| NPD Activity Stage | Use at RetailCo |
|---|---|
| Initial screening | Yes but by a single 'empowered' individual buyer |
| Preliminary market assessment | Yes an examination of fashion trends |
| Preliminary technical assessment | Yes, through product specification |
| Detailed market study/market research | Not beyond some study of competitor products |
| Business/financial analysis | Not beyond a costing and an 'open to buy' consideration |
| Product development | Yes, high volume, fast development |
| Product testing In-House | No |
| Product Testing with the Customer | No |
| Trial Market/Test Sell | Yes |
| Trial Production | No |
| Pre-commercialisation business analysis | No |
| Production start up | Yes |
| Market Launch | Not for most products |

Figure 4.18: RetailCo NPD Activities

RetailCo scores only 6 clear yes results out of 13 for the activities above and must therefore be considered weak in terms of the NPD Process efficiency. However the system does produce a high volume of new products to a very short timescale that are at the forefront of innovation as far as consumers are concerned as well as being good value. At a number of stages the supplier was involved. The supplier firm were involved in the garment manufacture, providing a cost for the CMT activity and carrying out the quality checks.

The findings **support the proposition** that Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.

### 4.2.3 RetailCo NPD Strategy

> **"The company intend to extend the scope of our ranges, by introducing coats. tailoring and knitwear. RetailCo Company Report. 2003**

New product lines are clearly a part of top management strategy for the *future* according to this recent RetailCo company annual report statement. During the Industry Forum project intervention in 2002 there was also further evidence that RetailCo had an organised NPD strategy although it tended to be focussed on short term needs. This is discussed in the section below.

At the start of a good quality NPD process is the need for a clear and focussed NPD strategy and a formal method for both collecting and evaluating new product ideas. At RetailCo the brand had been built up on values that included the latest fashions at good value prices and the firm is considered the leading women's value retailer (Mintel, 2001). The business also had a strategy of fast product change and had a formal set of systems in place for achieving this.

Strategy concerns setting direction for the business and allocating resources and staff to achieve the strategic goals. RetailCo was reacting or perhaps as the market leader even setting a new trend for fast fashion in the value sector.

> **"What has been surprising in the discount sector is how well innovation sells. Our customers are late adopters but even they have been pleasantly surprised by innovations. This would not normally be expected from customers in the discount sector."**
>
> **- Buying controller, value chain, Mintel, 2001**

The strategy for fast product development at RetailCo revolved around a number of enabling systems:

First there was a timetable in the Head Office Trend Pack of seasonal new product range changes and introductions that were scheduled to be introduced every three months based on fashion trend themes. The autumn 2001 saw the theme of 'Military

Girl' for womenswear and the winter 2001 theme was 'Mafia Widow' (Figure 4.19). The designer at the planning office would then produce new idea concepts that fitted in with the next fashion theme at the rate of 30 to 40 per week.

Figure 4.19: Example of Catwalk inspiration. Dolce & Gabanna, Fall 2001, Source: Firstview, 2004.

Secondly the head office buyers for each product group would commit to bulk undyed fabric with suppliers in good time so that seasonal and fashion shades could be applied through local fabric dyeing in a few weeks once a new garment prototype had been approved. The fabric suppliers would then be able to respond quickly to new call off instructions from stock.

Thirdly the business scheduled cross product-group buying range review meetings every seven weeks and before these meetings buyers would utilise their remaining budget spend (the 'open to buy' amount) and approve orders for new products for the range.

Speed was also assisted through the use of standard product templates called blocks. These blocks were the library of previous standard basic garment shapes that had fixed dimensions such as the distance from the shoulder to the waist hem on a casual top for a size 12 garment. Blocks helped reduce development time and enabled the correct fit of prototype garments to be achieved with less prototype attempts. Designers could develop a design concept and then apply it quickly to a standard block. Each product group had developed their own set of blocks so that for example girls had different blocks than the womenswear for a T shirt. Blocks also helped the development of the other sizes than the size 12 used for womenswear. For instance, there were standard increases from the size 12 bock in dimensions for garments size 14 and 16 and reductions in the size 10 and 8.

There was no long term product development in the RetailCo supply chain involving the UK CMT manufacturer during the six months of the Industry Forum case study project. In examining this particular supply chain it is clear that RetailCo has kept close to its CMT manufacturers existing competencies and used these systems described above to support the strategy of fast fashion in the value sector. The new products that were developed were all aimed at the existing markets of younger females.

The development cycle of seven weeks ensured that the development effort was short term. Designers and buyers were reacting to short term sales, market and fashion trends. The fabrics and templates were already set and minor changes in design could be quickly accommodated.

The conclusion from this analysis **supports the proposition** that textile and clothing supply chain firms select an NPD strategy that focuses resources on existing customer short term new product needs.

### 4.2.4 RetailCo NPD success measures

NPD success measures relate to the focus of a company's New Product Development strategy and to the need for a portfolio management system that harnesses the scarce resources of the firm towards achieving the strategic objectives. Thus a firm that had a strategy of being first to market may then measure new product development cycle time as a measure of NPD success rather than Return On Investment. On the other hand a company with a focus on being first to market might concentrate on a portfolio selection that emphasised short term rather than long term projects and have success measures that matched the objectives such as on time delivery.

This section examines how RetailCo measured NPD success and the extent to which the company used the three common measures suggested in the literature including market acceptance, financial performance and product level measures such as quality or meeting launch date. This section also examines if and how RetailCo use these measures in portfolio management in support of the new product development strategy.

NPD success for the RetailCo supply chain (that included the CMT manufacturer and RetailCo planning office) was the achievement of enough prototypes that would reach the commercial launch stage to fill the store shelves as the previous product stocks ran out. This meant that for the 30 to 40 new garment designs produced each week there was a selection of about 10 prototypes that reached the commercial launch stage. The process stages are discussed later in this chapter. For an individual development idea to successfully reach the launch stage there were various considerations for the buyer:

- The buyer likes the product and it is a good interpretation of the fashion 'Look' and fits in with the rest of the proposed range
- The product could be delivered on time in commercial volume
- The product gross margin is on target and fits within the retail price point architecture
- The buyer has enough 'Open To Buy' to place a commercial order
- The current stocks at RetailCo are not too high to cause delays
- The product may use the existing commitment to bought fabric
- The prototype has been approved technically and seals signed off for fit

Whilst this was the ideal list, the case study project showed that there were some measures that were more important in practice than others.

We now examine evidence of the literature success measures of market acceptance, financial performance and product level.

Market acceptance, according to the literature, would normally be where sales of a new product met the target or where a market share goal was achieved. In the RetailCo supply chain situation once a new product was accepted by the buyer, and an order placed, then the product would normally then be produced in commercial volumes to satisfy the order and the garments would be delivered to the distribution centre and then sent on to the retail stores. Consumers would then buy the stock, either at the initial retail selling price, or if the product proved difficult to move, at a discount in the end of season sales. For the RetailCo supply chain under review the typical product order size per colour was between 3,000 and 10,000 garments. There were 480 stores in the UK

and each store needed the size range of 8 to 14. Therefore each store had between 8 and 20 garments to sell (in seven weeks) per style across the size range. If the style was restricted to the top 100 stores then this figure would increase to 30 to 100 garments per style. Garment full selling prices at retail were between £12.99 and £19.99. Gross margins at full selling price were typically 60%.

Since the buyer orders a commercial quantity early in the NPD development process it can be seen then that a style is expected to sell once it has reached the stores. Only the proportion selling at the full price (the 'sell through' rate) has to be determined. The researcher did not have access to RetailCo financial information on sell through rates and marking down was never mentioned by the respondents, except in relation to discounting customer returns for quality reasons. On the other hand the margin was frequently mentioned by respondents in the study.

Nevertheless, for completeness, the effect of sell through and discounts can be explained in a typical example:

If there is a 90% sell through on a product there is then 10% of the stock left to sell at a discount. If a £12.99 product had to be put into the sales at a price reduction of say 40% then the selling price would then be say £7.80. The average selling price is therefore a combination of the sell through and discount rate and in this example would be £12.47. This reduces the actual margin.

Margins were more important at RetailCo and the expected new product financial performance in terms of gross margin was calculated for a new prototype to establish if the product could be sold at one of the price points in the price structure. This assumed a known fabric cost per garment, a fabric waste level and CMT cost. The margin measure was then used directly as a portfolio selection hurdle in the NPD decision process by the planner and the buyer since a product that failed to offer the target margin was rejected.

There were also a number of product level measures in place at RetailCo that were measured through maintenance of Key Performance Indicators (KPI) for each supplier including the case study CMT manufacturer. These included delivery on time, number of rejects for quality at the Distribution Centre (DC) that were 'allowed' and the level of

returns to the manufacturer. A monthly report was used at RetailCo to compare suppliers' performance but this was circulated internally at RetailCo but not to the owner of the CMT factory.

In practice the level of delivery on time tended to be the main driving measure rather than quality since if a product arrived in the DC it was not always checked for quality and even if it was found to be outside tolerance for example on measurements there was a good chance that the product would be 'allowed' and sent to the stores anyway. Returns would also generally be reprocessed at the CMT plant and returned to the DC. The only issues then were then number of garments that could be rescued and the lateness of delivery into stores caused by the time taken to reprocess a new product. In theory there was a system of fines on CMT suppliers but this was not applied. . In practice if a product used part of the fabric commitment and could be reworked to make the quality standard then it would pass through but perhaps be late.

Success in terms of progressing through the NPD process was measured by a new garment having a good margin and meeting the quality and fitting requirements. If a product could not meet the margin standard then it would not be developed.

Margins also did have a longer term impact on NPD programmes at the UK based CMT manufacturer since better margins were available to RetailCo from cheaper offshore suppliers. For example the planning office designer had been sending some designs to offshore manufacturers. As the Industry Forum project progressed it became clear that a higher proportion of designs were being taken to offshore suppliers and there was a reduction in requests and orders for the UK CMT manufacturer.

Delivery on time and not being rejected for quality were quite important and the company had a set of fines in the quality handbook that set out in theory what a supplying CMT company would be charged for lateness or quality rejection. The monthly KPI reports for quality rejection had to be responded to by the planning office which had to indicate how the problem arose and what measures would be instituted to avoid a repetition. The retailer also had period when it held back incoming deliveries and would not commit to new products through a limit on the 'open to buy' position when it had too much stock in the company.

The conclusion of the examination is that the overriding success measure for this supply chain was meeting the delivery date for launch. This measure did support the company strategy of fast fashion. Customer acceptance was assumed since this supply chain committed itself early in the NPD process to a sales level through the ordering of new products and materials and therefore was bound to sell the products, but not always at the best price.

The findings **support the proposition** that textile and clothing supply chain firms use non sales based measures for new product success.

### 4.2.5 RetailCo degree of product newness

It is important that firms match the level of newness to the capabilities of the firm. It has been suggested that sticking close to existing markets, product types and production technology leads to a higher level of NPD success. On the other hand taking more risks and being more innovative may create a market lead that gives better profits. Firms need a clear idea of where they are on the continuum of newness and what the goals are in relation to newness. They also should have systems for keeping up to date information on advances in technology, markets and competitors. The degree of newness however exists in the eye of the customer.
This section examines the RetailCo supply chain degree of newness in a variety of ways including product, production process, technology, markets and customers, cost, competitors and speed to market. The section also considers the degree to which the degree of newness matched the capabilities of the firm.

New products at the RetailCo Supply Chain were generally interpretations of the latest fashion trends and therefore new to the consumer. There are few new to the world garment *types* or shapes developed since, for example, casual top shapes such as Polo Shirts and T Shirts have been in existence for many years. However twice each year (www.firstview.com) the international fashion couture houses develop new versions of tops, skirts, trousers, jackets, etc. that have new combinations of colour, styling details, fabrics, patterns, silhouettes and trims for the coming seasons fashions. These expensive new fashion looks were then interpreted into more affordable high street

versions by the RetailCo designer. As far as the RetailCo consumer customer was concerned the change of designs every seven weeks meant that the clothes for sale in the RetailCo stores were very new and replicated the very latest catwalk fashions.

For the planning office and CMT Manufacturer the product developments were slightly new with changes in styling details, shapes and trims but often using existing fabric types in new fashion colours. These new designs required new CAD designs to be produced and new production routes to be organised in the CMT factory. Whilst the designer produced 30 to 40 new designs each week about 10 of these became commercial products.

Newness was limited however since the designer was able to use the established blocks (garment shape standards) from earlier products and this improved the development cycle time. And the production process at the CMT plant for the new products was generally similar to that used for earlier products in terms of normally using the same stages of cutting, sewing and pressing. However some the new products did have added complexity and although this did not change the basic production steps they did sometimes involve additional passes through the manufacturing route stages, for example when a garment needed a lining.

New technology was used to some extent in the RetailCo supply chain. The planning office used Gerber CAD Grading technology to produce the pattern gradings on a computer for the different sizes of garments. The computer technology could also produce automatic lay plans for optimising the yield from fabric but this mostly was not used due to time pressure and the CMT business made the lay marker by hand, unless the fabric pattern needed the garment panels to be cut on a bias and then it was far safer to use the CAD system. The clothing sector has embraced automation but there was no use at RetailCo of sewing jigs that could speed production. This technology is used where there are long runs of similar sewing panels in the industry in jeans manufacture but the product changes at the CMT manufacturer were far too rapid to contemplate changing jigs so often.

Technology in clothing includes coping with new fabrics. There were new sewing techniques that had to be learned at the CMT manufacturer during the Industry Forum intervention project. New suede fabrics, for instance, proved to be difficult to cut

cleanly and sewing also caused problems. This caused a high level of garment rejection for quality when the resulting garment appearance was poor. The photograph in figure 4.20 below shows some of the panel cutting problems with the neck of this garment ragged.

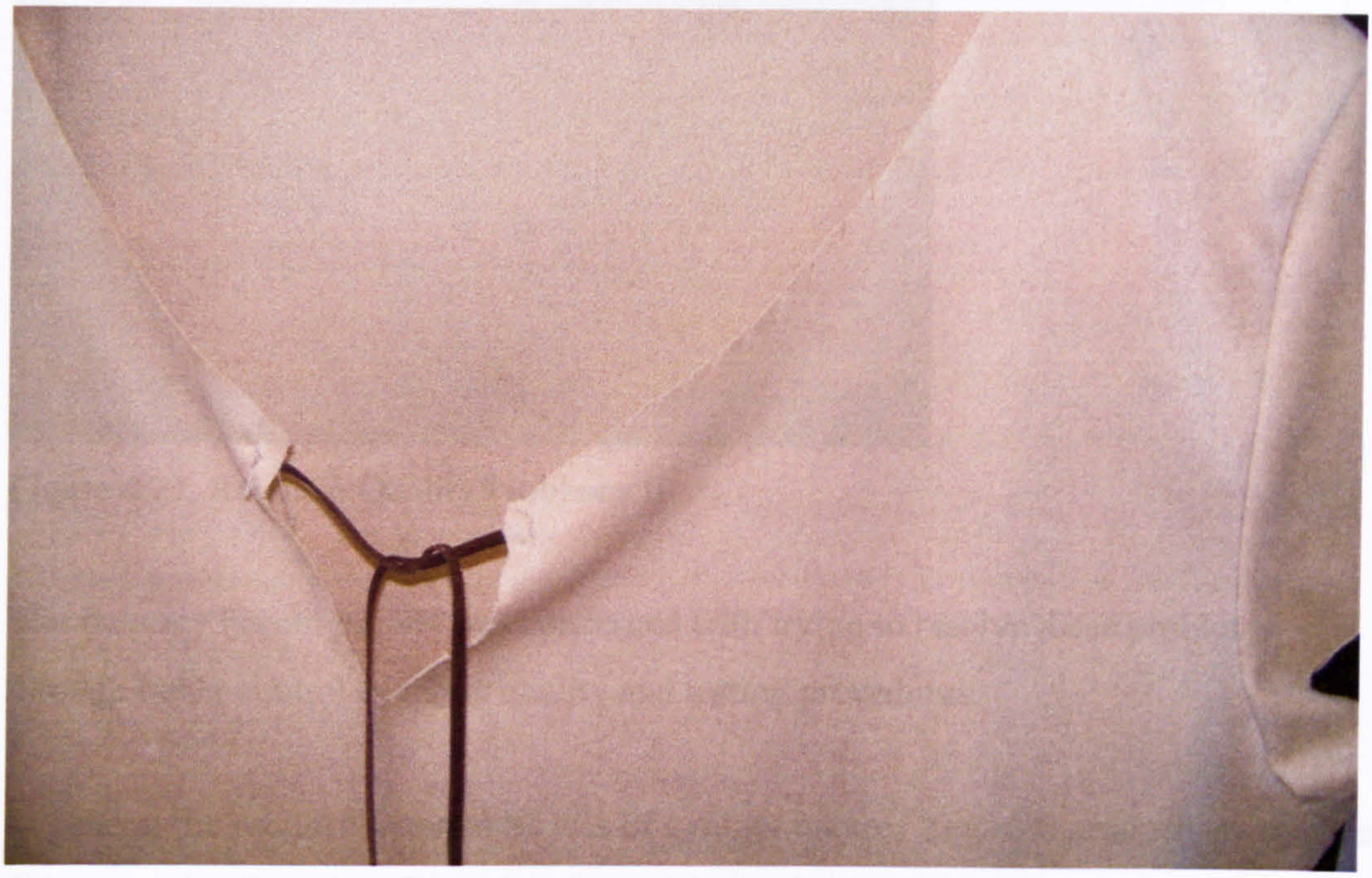


Figure 4.20. RetailCo Quality Problems I

The RetailCo head office distribution centre quality control department rejected the batch and this had to be returned to the CMT factory for reprocessing and the batch then missed the delivery date target. Similar difficulties also occurred, for example, with some new narrow fabric crochet trims and the sewing staff who were inexperienced then needed more training and sewing machinery had to be adjusted. Some thin fabrics were also difficult to control in cutting and others had shrinkage problems in steam pressing. The photograph in Figure 4.21 below shows some garments that had shrunk. The business needed to ensure that fabric was tested for shrinkage prior to making the markers so that panels were cut with the right allowance for later shrinkage at the pressing stage.

Figure 4.21. RetailCo Quality Problems II

The Industry Forum project was concerned with trying to resolve these problems through better control of fabric quality and testing procedures.

In general the production newness was of a minor nature. Ten new products every week did not really allow time for major changes in production technology from one product to the next. In overall garment technology terms the CMT manufacturer did not have sophisticated cutting equipment but CAD was used at the RetailCo planning office to The markets were also not new. RetailCo products were destined for the company UK stores. RetailCo was planning to expand the product range into new garment categories including knitwear, tailoring and coats. There was little newness with the types of products that were developed through the CMT supply chain. The main types made were casual tops, skirts and trousers for women and girls at the lower price end of the market.

There was also little effort to change to more cost effective products. Although RetailCo was seeking cost reductions from the manufacturer to improve profitability, there was no conscious development of new products that were re-engineered or used cost saving designs or techniques at the CMT manufacturer.

New products were not aimed at different competitors. RetailCo was competing at the lower value end of the market and the new products being developed did not appear to take the business into new areas of competition. There were, however, new supply

routes in the form of cheaper imports from low cost offshore producers who gave RetailCo better gross margins than those obtained at the UK CMT manufacturer. These cheap clothes put pressure on the CMT business to offer cheaper conversion prices and then to manufacture as fast as possible with high levels of operator output. This led to RetailCo sewing operatives being pushed to sew more quickly with less regard for the quality of the products produced. This drift to cheaper offshore supply is not new and the share of UK clothing manufacture is steadily falling (Jones, 2002).

By slowly moving to some more complex products the CMT manufacturer was competing in new areas but the change of product mix may well have been fashion led rather than a strategy with a fashion trend move to more structured garments. The RetailCo supply chain manager was still keen to improve the capability of the CMT manufacturer to process more complex garments provided the costs were competitive with the cheaper margins available from offshore suppliers.

Being 'first to market' with new fashion products was typical of the approach of RetailCo rather than waiting to see how well a product sold before being ' second but best'. The company had a fast response to sales of new products and could therefore start with a small quantity and then produce more if the sales were good. The speed of the cycle and high turnover of new styles did inhibit any learning by the CMT manufacturer and so quality standards were occasionally hard to control. The head office buyers were apprehensive about the move to more complex garments and the abilities of the CMT manufacturer to maintain good quality standards. The Industry Forum project for the retailer was also then aimed at improving quality systems and operator training. In addition, as discussed in the NPD process, the new product development process had a weakness in not giving the production unit enough time to plan the best production route before the commercial orders arrived. Small scale production verification trials were introduced in an Industry Forum pilot project so that quality issues could be solved earlier.

Staying close to existing capabilities has been recommended in the literature and in terms of capabilities the degree of newness demanded by RetailCo did closely match the abilities of the CMT manufacturer in that garments styles were generally simple casualwear products using existing production methods and technologies. There had nevertheless been a gradual shift over the past year to more complex products that took

longer to make and had more process steps. New raw materials did cause some problems in quality and delivery on time. The newness was confined to more product complexity and the CMT manufacturer was only making garments for RetailCo and did not have to cope with new customers and markets.

The conclusion is that RetailCo was quite innovative in terms of product features and always developed the most up to date fashions. This was part of the company strategy. At the CMT manufacturer innovation in the new products did not include new technologies to process them, but new raw materials had a steep learning curve and the manufacturer needed help in managing the validation of new products. This step was difficult when the CMT manufacturer only had 10 days from seeing the prototype for the first time to delivering in bulk to the distribution centre.

We have seen that in this case study newness exists on a number of levels including raw materials, design and production methods and having newness in products may have helped achieve sales. However the new raw materials and short cycle time in new product development have lead to strains in other areas such as quality and meeting the short fixed launch date. However new raw materials were not used significantly and existing technology was generally used to make new products which were based on an earlier template. Developments were generally for the same markets and consumers.

We therefore can conclude that the evidence **supports the proposition** that textile and clothing supply chain firms develop new products that are line extensions

### 4.2.6 RetailCo Senior Management

The literature on NPD success factors suggests that top managers should support the NPD process but not 'micro manage' it (Cooper, 1999). Top managers in particular should ensure the decision gates work and that the rules are adhered to so that pet projects are not favoured.
The proposition stems from the notion that, in a fast moving supply chain, senior managers may not be involved every project go/kill decision at all stages since this bureaucracy may slow the NPD process.

At RetailCo there was little involvement of top management in individual projects to develop new products. Yet at the CMT supplier, the owner exercised his authority in terms of agreeing with the RetailCo planning office production manager that a new product would be accepted at the price agreed for the processing of the materials. This was an area of concern for the owner when he and his wife (who organised the production) considered that more complex products slowed down the level of production. The owner also considered that the new more complex products were not as cost effective in that RetailCo did not compensate them for the slower production. Over time the owner of the CMT plant had established the kind of prices he wanted to charge but since RetailCo was the only customer it was hard to turn business away.

On the other hand at RetailCo the main go/kill decisions belonged to the product category buyers, so that for example Casual Jersey is a category and Formal Jersey is another. Buyers had a concern first for their own product category and then how well their range integrates with other departments, with this latter aspect being one reason for the management review meetings every seven weeks. The company was also however committed to a cost reduction exercise according to the company accounts and this will inevitably impinge on the New Product Development arena and may lead to products with better margins rather than products that perhaps meet customer needs or lead the trade in fashion.

We conclude that top management does have an influence at RetailCo but it is at a strategic directional level about categories of product, portfolio decisions, rather than decisions about individual product developments. It can then be at least said that top management did not interfere and use scarce resources for its own pet projects.

In RetailCo the NPD process had been developed to allow the buyers alone to decide on the suitability of each new product.

At the CMT plant the situation was quite different. The owner and his wife did have strong views about each new product and the way that it affected the smooth running of the operation. Complex products were not welcome. Their attitudes were made clear to everyone and they set the climate in the firm amongst the quality supervisors who would also complain about the complex products. The owner made it clear to the

RetailCo planning office that he would rather have simple products that could be made in large volumes without having to retrain operators. The hostility towards more complex products may well have put a limit on the creativity of the designer in the planning office and there was evidence from the production manager that he would limit the extent of design complexity and this seemed to also have got through to head office buyers who thought that the supplier had struggled with more complex products.

Voss (1985) recommends a balanced approach to the management of both technical and marketing activities for NPD. Many firms seem to have a preoccupation with technical and financial issues rather than the concerns of satisfying market needs with new products. We can see that the CMT manufacture was very much in the mould of the finance and production/technical focus and the owner and his wife were less concerned about the market desire for more complex products. As we have discussed above, this had a braking effect on NPD innovation.

RetailCo on the other hand apparently had a more balanced approach, with the buyers taking notice of market response to earlier designs. The trend packs, for instance, also ensured both a co-ordinated and a coherent approach to satisfying market needs as the season unfolded with central direction on market trends. Also at RetailCo the technical side was not ignored since there were detailed systems in place, in theory, to ensure conformance to specifications. However RetailCo would generally let a product be launched even if it had failed the quality criteria and so market needs came first almost every time. The RetailCo method was to have on the surface a strict technical requirement but due to the short timescales and the danger of not having merchandise in the stores that there was often a decision to ignore the technical rules if it meant that new products could be launched on time.

There is a need for NPD project managers to have senior manager clearly communicate objectives and responsibilities for their project work. In the RetailCo Case Study there were a very clear demarcation of departmental responsibilities for most of the NPD process stages and decisions. There were also clear rules as we have seen that allowed departments to carry out their part of the process using trend directions, agreed garment shape templates, pre booked materials and pre determined size measurements. So we can see that the responsibilities were clear if not implicit in the way that the systems worked between RetailCo head office, the planning office and the CMT supplier. That

is not to say that for instance the longer term quality objectives were necessarily made clear to everyone or reinforced regularly by senior management actions. RetailCo had set up the systems but that did not mean that they were adhered to and in this respect the communications about responsibilities and objectives broke down through a lack of senior management monitoring and control. So for example it was clear that the quality manual was designed to install a culture of good quality standards throughout the supply base. There was a system of fines to punish suppliers who did not conform. And yet on numerous occasions the faulty new products were allowed to be launched and the Distribution Centre QA system generally only gave a cursory inspection of goods and concentrated on getting products through. This had an impact on New Product success in terms of launch on time but perhaps this was at the expense of the success in the eyes of the consumer who might be unhappy with a new product that had some quality problems.

In terms of responsibilities there was also some management confusion at the CMT firm and the planning office about who was responsible carrying out the prototype developments at the 'Big & Small' stage. This had an impact on the NPD success chances with new products often getting into difficulty at the production ramp up stage due to inadequate validation of the manufacturing process. The Industry Forum problem solving intervention dealt with this issue and introduced a trial production.

The analysis shows that for the most part the senior managers in RetailCo did not have day to day involvement in new product decisions. As explained above, the buyers were given a budget figure and had an 'open to buy' position that effectively allowed them the authority to go ahead with developments and orders. The CMT owner did have an interest in individual projects but only to the extent of agreement about the price.

The results **support the proposition** that textile and clothing supply chain firms' senior managers are not involved in the individual project decisions.

### 4.2.7 RetailCo NPD Organization

The literature is divided on the best way to organize for NPD although certain factors seem to affect success including the firm's organizational structure, the use of multi-functional teams, the responsibility for project progress, evidence of co-ordinating mechanisms. This section considers these factors in turn and the role of the retailer in the supply chain.

At RetailCo the structure of NPD was geographically separated. The functions involved in NPD included head office buying and garment technology, planning office staff - including the planning manager and designer - and the staff at the CMT manufacturer. The planning office and CMT factory were in the same street but the RetailCo head office was 200 miles away.

The NPD process had some 'over the wall' passing of the projects. For example the head office first issued the trend booklet. Then the planning office designer produced the first prototype and cut out the garment panels using a RetailCo standard block pattern. The first prototype was then sewn together by the sample machinists who were employed by the CMT manufacturer but in a sample room in the planning office. The head office buyers and garment technologists would then manage the fabric buying and prototype model fitting session. The comments about the first prototype were sent to the planning office and the changes to the fit carried out by the sample machinists. The costing was produced by the planning manager who would consult the owner of the CMT plant about the price for processing. Once the final prototype was approved (sealed) by the buyer and garment technologist the planning office would produce the gradings that were the templates for the CMT factory to use for cutting fabric. The CMT factory would be sent fabric quantities that were called off and specified for colour by the planning manager. The quality would be checked for measurements and grade by the CMT factory to a specification supplied by the head office.

It is clear that RetailCo had a kind of NPD process with no separate new product department or new product team. The NPD organization at RetailCo was functional and mainly involved the supplier, the planning office and the retailer buying function. There appears to be a 'pass the parcel' approach although the planning manager

managed the process of development at the CMT plant. This was not a total project leadership role since the head office buyer had the responsibility of deciding if a new product first prototype was adopted and if the cost was acceptable and the size of the commitment to buy in commercial quantities. However the planning manager did progress chase the 10 new products each week and work to ensure that the launch dates were met and issues resolved if there appeared to be any slippage taking place or problems with quality. If there were no problems then most of the process was largely automatic with prototypes being changed until they met the needs of the buyer's amended block specification. Fabric was called off and dyed once the quantities required for launch were known. Manufacture would commence once the fabric and trims were available provided the prototype had been sealed.

There is no routine multi-functional team meeting suggested by Cooper (1999) and it is doubtful if this system would keep up with the sheer volume and speed of the new developments at RetailCo. There were co-ordinating mechanisms largely used by the planning manager to maintain track on project progress. A meeting would be held each week with the planning manager and the CMT quality control supervisors who were responsible for introducing new qualities into the production process. This meeting would agree the timetable for the week. On a daily basis the planning manager would chase fabric, track cutting volumes, production start up and send in the costings to head office.

The role of the retailer in the supply chain was very influential since the buyer would make the go/kill decisions and pre-purchase fabric. The buyer would also approve fit and amend specifications. The buyer would also decide on the scope of the new product in the market in terms of choices over the use of the 'open to buy'. Most importantly the buyer would decide if a CMT manufacturer was competitive and would provide the gross margins required. For the case study CMT manufacturer there was a drift of business for the retailer to off shore suppliers with better margins. This left the CMT manufacturer vulnerable to a loss of business even though the UK location and speed of manufacture offered fast response to changing consumer demand.

The RetailCo supply chain had some mechanisms to achieve integration along the chain. This began with the trend booklet every season, continued through the use of the seals that were master versions of the prototypes and included a short term weekly

delivery plan agreed between the planning office and the CMT plant. The planning office would send the prototypes with a specification sheet to the buyer. Any changes required as a result of the buyer's views and any fit changes where for example a change to a sleeve length was needed would be put on the form and sent back to the planning office. As the prototypes progressed all changes were recorded in this way.

The level of quality achieved, relative to the head office standard, by the first CMT production was recorded on a pro-forma by the CMT quality staff and this was sent to the head office technologist. There were regular reports on the level of returns and the results of the distribution centre quality checks were sent to the planning office. The planning office sent costings to the head office buyer and in turn the head office buyer would generate commercial orders (before the product was finally approved technically) and these were signed off by the administration staff at head office and sent on a standard form to the planning office. The head office technologist would also formally approve care label submissions from the planning office. Once a garment was approved technically it was signed off by the head office and 'sealed' (approved). The approved seal garment was given to the CMT supplier as a standard for the production along with the specification. On a more day to day level the CMT supplier would give the planning office a daily record of any new products that had started on the production line with a daily 'fabric cut' sheet.

The designer at the planning office attended the seven weekly range review meetings at the head office.

The findings show that there was a high degree of structured communication between the supply chain members and therefore the **proposition is supported** that textile and clothing supply chain firms use structured communication methods with each other in the NPD process.

### 4.2.7 RetailCo NPD Tools and Methods

The literature indicates that firms use a variety of tools and methods in an attempt to improve NPD success. These include idea generation methods including brainstorming, listening to the customer through 'Voice of the Customer' methods such as Quality Function Deployment and portfolio management methods such as scoring systems and strategic buckets. Firms also measure development cycle time and on time achievement as well as using CAD to speed development.

At RetailCo there was no use of brainstorming methods at the idea development stage since the planning office designer generally worked using the trend booklet and her own ideas. There was no use of voice of the customer or QFD by the CMT manufacturer to translate customer needs into product attributes. However there was use of CAD/CAM for the drawing of patterns and the lay plans where the different garment size panels were planned on to the fabric width to avoid excessive waste. The 'open to buy' that the category buyers had was a type of strategic bucket approach to portfolio management. The cycle time for new products was not measured by RetailCo at the start of the Industry Forum project although it was a part of the intervention for the purposes of tracking improvements. During the I.F intervention project delivery on time performance was measured for each new product, against the original date promised by the planning office.

As discussed above the time to manufacture was very short, in the order of eight days from the time when the manufacturer received the specification and order details. The planning office maintained a tight control over the production time through the use of a weekly delivery agreement with the CMT plant.
We conclude therefore that this supply chain did not use any methods to monitor the time for the whole development process. There was some time emphasis with the regular range reviews but these meetings did not monitor every development's progress. The high volume of new developments that went into the system (30 per week) perhaps made any tracking difficult although the Industry Forum Project did manage to introduce a scheme that tracked the key decision points including original prototype submission date, costing date, raw material call off date, order date, marker drawing

date and delivery to DC date. RetailCo did have a 'critical path' system but it was not used with the CMT supplier since the very short timescales made it inappropriate.

The findings therefore **do not support** the proposition that textile and clothing supply chain firms use tools to monitor adherence to the product development schedule.

### 4.2.9 RetailCo Summary

*NPD Models*

RetailCo does not use a standard Stage Gate NPD model where a committee reviews progress of individual new products. The main reason for this is that the emphasis on speed of development and launch into stores possibly makes management of this level of complexity too difficult. The category buyer is given a 'strategic bucket' called an 'open to buy' and then makes the decisions about which product to adopt to develop commercially about three weeks after receiving a prototype. An order is then placed and a race begins to gradually improve the prototype to meet technical and aesthetic needs in time to meet the arrival of the dyed up fabric raw materials that have been previously committed to by the category buyer in an undyed form.

The emphasis on speed and short cycle time in order to have product on store shelves have been achieved not through CAD or overlapping decision gates or multi-functional teams, but through empowerment of the buyer, and an assumption that the technical issues will be ironed out. Speed is also helped by the use of product templates and an early decision on a major time driver of the product development - the raw materials.

The NPD process is therefore affected by not only by the need for standards and systems of the sharing of development in a supply chain situation but also by the time saving built in through most key NPD decisions being made by the retailer.

*NPD Stage Activities*

Of the thirteen key NPD activities suggested as a requirement for successful NPD the retailer carried out six and the supplier a further two. There were a number of activities that were excluded largely on the grounds of the limited timescale available on seven week development cycle.

*NPD Strategy*

The high volume of incrementally changed new products in small quantities at good value prices aimed to give the consumer freshness every two months and maintain a range that was up to date with the latest fashion trends. This development cycle was very fast. Longer term development of new business arenas was not taking place at this particular case study supply chain although the retailer had future strategic plans to move into new areas.

*Success measures*

This supply chain focussed on launch date as a new product success measure. Individual new products were numerous and short lived and each of the 480 retail store had only 10 to 20 garments to sell. Sales targets for individual product go/kill decisions used a gross margin goal of 60% and the store chain's existing price structure to evaluate new concept garments. New products, once approved by the category buyer and given a commercial order were then always sold at the target quantity but the actual eventual average selling price might be less than the initial price. Delivery on time performance was a key measure for the CMT supplier.

*Newness*

RetailCo and its supply chain did have a high degree of freshness in their products rather than a high degree of innovation. Products were up to date in terms of fashion trends with ten newly styled items for stores developed by the case study supply chain every week across the main womens and girl's category ranges.

The business did use some CAD/CAM new technology but found that it was quicker, but perhaps more wasteful of materials, to manage the panel lays by hand tracing. Newness of manufacture was low with some product standardization evident through the use of previous product templates (blocks) that helped to speed the transition from concept to prototype. Rules for designing the range of garment sizes also helped the time from prototype to commercial production set up. New raw materials were used occasionally, and with mixed results due to the inexperience of the manufacturer. Most products used the same raw materials, production technology and served the same customer and market areas and were therefore product line extensions.

*Senior Management*

RetailCo senior management committees are not involved in the individual go/kill decisions at the various gates in the NPD process that would narrow down the choice of projects for the business. Rather the category buyers are given a 'strategic bucket' of 'open to buy' that they then use for the purposes of selecting projects and ordering commercial quantities to be manufactured. The fast development speed and high volume of new projects possibly makes control by committee unwieldy. The category buyers at RetailCo Head Office are also empowered to commit resources to undyed raw materials at the start of the seasonal development process. This saves time since the fabric pipeline can take many months to fill. At a later stage the buyer would approve prototypes that used the fabric when dyed in the latest fashion shades. The ranges, whilst being developed with the help of a central design trend booklet brief, did not necessarily conform to it since the trends would be out of date after a few weeks. The buyer had the ultimate responsibility for deciding what the category customer would want rather than a planning committee.

The owner of the CMT garment manufacturing factory was involved in individual projects to the extent of approval of the manufacturing price with the planning office when they needed to develop a costing, but the day to day approval of prototypes was in the hands of the retailer.

*NPD Organization and performance monitoring*

There was no multi-functional team used in NPD at RetailCo. There was no NPD department either and projects were passed in sequence, and sometimes cycled back again, from department to department. There was no project leader or champion that kept track of particular new developments. The whole system was designed to allow projects to quickly pass through the development stages although there were still delays, for example when the buyer was mulling over the incoming concept garments. The planning office manager did progress chase all current projects on a daily and weekly basis to ensure a smooth flow, helping to resolve problems as they arose on raw materials, product quality, specification or manufacturing issues.

The head office buyers and technologists made most of the approval decisions and the planning office manager maintained the flow of developments.

There were a variety of integrating mechanisms including range review meetings, specifications, seal approvals and quality documents.

*Tools and Methods*

Few tools were used to help NPD success. The main monitoring was on short term delivery promises into the Distribution Centre.

*Propositions summary*

The research propositions concern the impact of being a supplier in a supply chain. Of the eight propositions the following are supported by the analysis:

- **Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

- **Supply chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**

- **Supply chain firms use non sales based measures for new product success.**

- **Supply chain firms develop new products that are line extensions.**

- **Supply chain firms' senior managers are not involved in the individual project decisions.**

- **Supply chain firms use structured communication methods with each other in the NPD process.**

The following propositions were not supported:

- **Supply Chain firms adopt 4th Generation faster, flexible NPD models.**

- **Supply chain firms use tools to monitor adherence to the product development schedule.**

# 4.3 DyeCo Supply Chain Case Study

## 4.3.0 Introduction

**"The project has bridged the gap between the messages from the supply chain and the needs of the retailer." Managing Director, DyeCo, 2001**

DyeCo is a dyer and finisher of garments and hosiery providing a rapid local response to fast selling products. The company offer the opportunity to apply fashion colours to garment ranges near to the consumer buying end of the supply chain. DyeCo also provide a specialist colour and treatment service and consequently have a regular but sporadic business in rescuing poorly dyed garments from inexperienced offshore manufacturers. With state of the art equipment in Europe's largest garment dye house, DyeCo employs 250 staff and is located in Derbyshire, close to the key UK garment suppliers.

DyeCo's latest challenge, as part of a recent management buyout, was to survive away from the previous culture of being part of an integrated group. The dye garment processing firm had effectively lost the main parent company captive customer and now, having for many years been part of an integrated garment business, needed to develop a more market focussed approach. The UK supply chain for knitwear had also changed recently and major retailers were moving away from high cost UK garment manufacturers to lower cost offshore suppliers. For DyeCo then, not only had the previously integrated customer largely closed down its UK capacity but much of the remaining UK knitwear business had disappeared or was under threat from low cost imports.

At DyeCo the future prospects now depended on marketing the company services directly to selected target UK retailers. There was a need to become involved in the retail garment development process and to try and influence buyers to use a garment dyed route that would utilise the DyeCo capabilities. DyeCo had been a party to the largest UK garment retailer's NPD process as part of the previous integrated company. Then the retailer used local garment manufacturers and garment dyeing to enable the store group to offer consumers a wider range of fashion colours. Now that the retailer was buying offshore manufactured garments new supply chains were being developed and DyeCo would need to become involved with the new offshore garment makers.

First however the retailer had to be persuaded to use a dyed garment route. The Industry Forum was therefore asked by DyeCo to help them to focus the business on the new market situation.

The I.F. case study findings produced data concerning a target retailer in the supply chain, the retailer's NPD process and the development and marketing of new services by DyeCo. There is a good level of overlap between the research question and the data collected regarding the DyeCo Supply Chain.

### 4.3.1 DyeCo Supply Chain Type of NPD Process

The NPD process in this case study had the target retailer supply chain developing a range of knitwear garments by involved various partners in the supply chain working collectively to develop and launch the new products. The supply chain included the retailer, the garment maker and garment processor- DyeCo.

The NPD process in the case study involves various stages and decision points:

- The retailer and garment maker both investigate fashion trends.
- The retailer then decides, in a strategy review, which concepts to pursue - and it is the retailer who drives the timing of the development process to achieve the required store seasonal launch dates.
- The retailer reviews the competitive environment and the history of their own sales performance across various consumer garment product types.
- The retailer selects the concept to be developed.
- The new product idea is then worked on by the garment maker, who then submits sample prototypes to the retailer.
- The retailer decides on the range of products that will be developed from selected prototypes to go into the stores.
- Senior management approval meetings take place at the retailer to review and approve co-ordinated ranges across the store.

- The types of garments, width and depth of product offerings, target sales volumes, margins, selling prices and seasonal fashion colours are key elements of the retailer's decision processes.
- As the retailer's launch date must be met there are a number of 'critical path' due dates when the prototype sampling must be approved or 'sealed' by the retailer. Seals also apply to the validation process of fabrics, garment quality and colour standards.
- As part of an effort to widen choice for consumers some colours are planned to be dyed as late as possible in the supply chain – in garment form. This is when DyeCo garment dyers become involved in the development process.

Whilst these steps describe the NPD process that DyeCo was involved in for many years, there was a sea change taking place in the supply relationships when the retailer switched to offshore garment makers. DyeCo then had to re-examine its process offer. The source of undyed garments had shifted away from the UK and this has had an impact on the organisation of the dyeing process. When DyeCo was part of a vertically integrated garment business the dyer took in undyed garments from a UK knitter and sent them back for further processing to the garment maker before distribution to the retailer. The move to offshore supply of garments made this return of garments impossible. The changes in supply led DyeCo to contemplate new added services it could offer. For example the firm needed to offer pressing and labelling of dyed garments so that they could be sent direct to the distribution centres for the retailer.

The difficulty for DyeCo was that the retailer was not convinced that buying undyed garments sourced via an offshore route, for dyeing at DyeCo, was as profitable as using dyed garments direct from the offshore suppliers. However the alternative to garment dye was yarn dyed garments and this route had long lead times and meant a risk that the retailer could lose sales and profits if stock is not available to meet consumer demand. One example of this phenomenon was discovered during an Industry Forum study for DyeCo of retail store inventory performance of colour availability across a knitwear garment sample. This study demonstrated that the slow yarn dyed offshore supply was less responsive to demand, leaving customers short of the colours that they wanted and slow supply also led to high unwanted stocks of those colours of garments that were unpopular. There was a cost associated with high unwanted stocks in terms of write-downs and lost sales opportunity. The cost of lost sales and write downs might counter

the higher cost of UK dye processing and a balanced approach using undyed offshore garments plus UK garment dye might be seen to achieve better value and more responsiveness. The retailer needed to be convinced of this opportunity.
There was therefore both garment development by the retail supply chain and services development by DyeCo taking place during the study. The main development process considered here is that of the garments for the retailer. We now compare the literature NPD models with this retailer led process.

Successive NPD models have sought to integrate the functions within firms and improve the speed and efficiency of development processes. The early 1st generation NPD models were characterised by their focus on technology development within firms. The NPD processes were sequential and had no market input. The second generation NPD process model put forward by Rothwell (1994) saw a more market pull version, compared to first generation, and in the market pull model the market was scanned for ideas that then led to an incremental adapting of existing products. The 3rd generation Stage-Gate method has stages, reviews by a senior management team, pre-determined go/no go hurdles, a market focus throughout the process and was cross functional (Cooper, 1994b). The 4th generation innovation process (Rothwell, 1994) is characterised by Japanese style concurrent engineering and integration of the functions in order to reduce cycle time. There is also integration of suppliers into the NPD process at an early stage and the use of design for manufacturability. Cooper has also suggested some speed improvement on the basic Stage-Gate through the use of flexible fuzzy gates that are overlapping and conditional along with empowerment of project teams.

The 5th generation innovation process put forward by Rothwell (1994) suggests that the forces of networking and new I.T and CAD based technologies be used along with strong internal integration, quality control during development and fewer management layers to win at time based strategies.

From the discussion above regarding the retail garment and dye services development process findings we can conclude that the DyeCo supply chain NPD process has some of the aspects of technology push phase since:

- There is pushing of products to consumers

- The process is sequential
- There is little market input

However there are many aspects of the DyeCo Retail supply chain NPD process that are not related to the early technology push type:

- Retail is buying (selection) led not engineering or manufacturing led
- There is an attempt to predict market needs at an early stage by identifying fashion trends that will suit the consumer
- There are different companies involved in the NPD process stages
- There is a time and quality focus

In the DyeCo case study retail product development there is some market pull style 2nd generation adaptation of existing products going on. This incrementalism stems from the retailer wanting to capitalise on previous successes by still appealing to the core customers. The DyeCo target retailer was in the middle of the market and was less likely to try very innovative ideas out before they are established elsewhere. There was also scanning of the market by the retailer in the case study, for example, by using a comparative shop to establish what is selling well in the high street and what the competitor prices were. However with new concepts being generated at the start of the process the second generation market pull type does not appear to explain the case study NPD process because the final consumer was not involved and products were designed and pushed at consumers. The retailer and garment maker develops a range collection and puts them out in the stores and if they do not sell well then retailers mark the price down to stimulate demand. This is a kind of product push. However we can see that the quick response use of garment dye involving DyeCo is less of a push system since there is a clear attempt to respond to changes in demand with colours that the consumer wants. The same garment is still developed and garment dye then offers a change of colour late in the NPD process and launch to one the consumer might prefer based on recent sales trends.

The DyeCo Retail supply chain NPD Process does have some of the 3rd generation Stage-Gate model type of features:

- There are decision steps in the Retailer NPD process

- There is reasonably sharp early product definition
- There is a scoping stage where the retailer strategy is considered
- There is building of a business case with consideration of sales volumes and margins by the retailer
- There are pre-determined gate hurdles in terms of technical specifications and margins for the retailer

However the DyeCo retailer supply chain NPD process does not wholly conform to a basic stage gate model since:

- Marketing and production are not integrated
- The system is multi business but not integrated, since the suppliers compete
- Gates tend to belong to the retailer

Therefore the case study NPD process does not wholly use a simple stage gate process.

The DyeCo retailer supply chain method does appear to have the fuzzy (conditional) gates in that a prototype can proceed subject to meeting some hurdle such as correct colour or fabric testing later. There are no multi-functional teams, except at the retailer who then dictates to the suppliers and manufacturers. We conclude that the case study NPD system is not fuzzy stage gate. Whilst the case study NPD process has involved its suppliers in the process, this is not the same as the 'lean' Toyota type of integration. Different suppliers are still competing for the orders from the retailer and if the prices and gross margins targets are not attained then the concept will not be taken up by the retailer who has taken much of the supply offshore in recent years on the grounds of cost.

The 4$^{th}$ generation process has also a time focus, but the DyeCo retailer seasonal calendar was slow and did not always use time of NPD as a competitive weapon. The quick response use of local UK garment dyeing was a use of time to respond to changing demand although it was quite limited with the retailer and had been declining in recent years in knitwear. The case study also does not use 4$^{th}$ generation concurrent processes. For example the 'critical path' NPD timetable plan used was generally a sequential method of timed steps.

We therefore conclude that case study does not wholly use a 4G NPD model although it does use some of the 5th Generation style of NPD since:

- There is some networking and information exchange with suppliers although this is limited to the kind of information needed about concepts to allow target sampling of prototypes
- There is some use I.T in terms of computer measurement of colour standards although visual approval by the retailer is still the final arbiter
- The DyeCo Retail supply chain did build in the quality at the design and development stage through the use of specifications and seal approval processes
- There is strong retailer integration internally with each head office buying department having selectors, merchandisers and technologists who met regularly as part of the NPD process to discuss developments.
- There are similarities at the case study with the 'robust design' concept suggested as a 5G element through the use of fabric and garment testing to retailer specifications

However the retailer does not use fast development as a key driver. For the case study it is the garment dyed route that is a quick response to sales rather than any speed of development of new knitwear products which as we can see takes many months through layers of committees. There is also little integration of IT systems and the move to more offshore manufacturing from developing countries has if anything diminished the level of integration. The conclusion is that case study is also not using the 5G networking innovation techniques.

NPD Model Conclusions

The case study process has *some* elements from *each* of the generations of NPD models. The features of the DyeCo Retail supply chain NPD process are:

- Multiple businesses involved in a co-operative development effort
- The retailer makes the key strategic and approval decisions
- Pre-determined standards for validation stages
- Retailer has management range reviews

- Strong market focus early in the process
- Retailer has a critical path timetable to ensure meeting launch dates
- Timed gate reviews and 'seal' approvals allow development to progress to the next stage
- No cross functional co-ordination
- No concurrent engineering
- A quick response capability for a limited range of products

Having examined the NPD process at the case study the findings **do not support the proposition** that textile and clothing supply chain firms adopt 4th Generation faster, flexible NPD models.

## 4.3.2 DyeCo Retail Supply Chain NPD activities

As discussed in the previous section the case study investigated both the development of garment ranges by the retailer and the development of new added value services by DyeCo. In this section of the analysis the position of the retailer is considered as the prime place for NPD activities and also the participation others in the supply chain is considered. The types of NPD process activities are therefore explored *from the perspective of the retailer* in this retail supply chain where DyeCo processes garments for the garment manufacturer who in turn supplies the retailer.

### Initial Screening

Examination of the table below (adapted from Cooper & Kleinschmidt, 1986) shows the theoretical 'initial screening' options with a group decision using a formal list of criteria considered the best approach. Cooper later (2001, p133) suggests that this stage is where a list of 'must meet' and 'should meet' criteria are applied dealing with the new products strategic alignment, feasibility, magnitude of opportunity, market attractiveness, product advantage and ability to leverage the firm's resources. In the

DyeCo supply chain case study there was a retailer's group decision with a list of criteria suggested in the strategy review meeting with suppliers.

| Approach | Used in the Case Study firm |
|---|---|
| A group decision, based on an informal discussion – no formal techniques uses at all, e.g. no checklists of criteria, no rating forms, etc. | No |
| A single individual made the decision, again on an informal basis (no formal techniques). | No |
| A group decision, based on a formal checklist of criteria. | Yes |
| Carried out by supplier | No |

## Preliminary Market Assessment

At this stage the retailer company might examine the market for products of the type being considered for development using secondary market research data, review competitors' products or ask the consumer if they might be interested in this type of development. Activities could include questioning the sales staff who have knowledge of the market or only having an internal discussion about the suitability of the project idea for the proposed market.

| Approach | Used in the Case Study firm |
|---|---|
| Direct contact with customers | No |
| Discussions with the sales force | N/A |
| Review of competitors' products | Yes |
| Access secondary/published data | Yes |
| Knew market already – internal assessment/discussion session only | No |
| Carried out by supplier | Yes |

At the case study retailer there was some research data used about the consumer and there was a market assessment process that involved assessment of primary research data such as comparative shopping to examine the competitor offerings. There was also gathering of fashion trend information and an assessment of what would suit the retailer's customer. In the retail strategy review consideration was made of which styles from previous seasons would be kept and updated with new seasonal colours. The retailer also assessed previous season's sales levels by garment type and this can be considered a kind of market assessment of the secondary data type. The supplying garment manufacturers would also carry out fashion trend analysis and input this into their own NPD process when developing prototypes for the retailer's design brief.

## Preliminary Technical Assessment

The technical assessment of concepts is designed to eliminate those projects that are unsuitable since the firm may not have appropriate technology. This step also includes where a preliminary product development may be carried out, a specification developed or the idea's feasibility studied.

In the DyeCo retail supply chain the retailer does not carry out this step but does issue broad generic technical specifications in a manual and enforces testing standards at suppliers. The retailer therefore has intimate knowledge of the capabilities of the manufacturers. There is engineering assessment through the garment maker producing a prototype that was submitted to the retailer.

| Approach | Used in the Case Study firm |
|---|---|
| Capability/feasibility analysis | Yes |
| Engineering assessment | No |
| Product specification | Yes |
| Product design, model development | No |
| Carried out by supplier | Yes |

## Market Studies

This stage is concerned with a brief estimation of the demand for this type of new product. The competitors and existing products are studied. At best a market research study, involving a reasonable sample of respondents, a formal design, and a consistent data collection procedure is carried out to try and discover what customers need. Secondary data may be examined closely to establish the likely market opportunity. In the DyeCo case study there is a market scan by both the retailer and the garment maker to consider the fashion trends and competitor products at the start of the season that is covered in the preliminary market assessment stage. The retailer does have a broad estimate of market size and starts to plan the allocation of budget buckets to garment departments. These activities are not however detailed market assessments for individual new product concepts.

| Approach | Used in the Case Study firm |
|---|---|
| A study of competitor products and prices | No |
| A study of what customers needed or wanted | No |
| A study to determine market size | No |
| Carried out by supplier | No |

## Business/Financial Analysis

In the classic Stage Gate model there is a business analysis step before any serious commitment of resources to product development. This can vary in level between a Discounted Cash Flow to a 'quick and dirty' guess with costing estimates perhaps in the middle. At the case study retailer there was no DCF, ROI or Break-even analysis at any stage although there was a cost and margin calculation carried out and a retail selling price estimated. Suppliers are also involved in the gross margin negotiations and the

selling price to the retailer. (The use of margins is however not specifically mentioned in the Cooper & Kleinschmidt (1986) report.)

| Approach | Used in the Case Study firm |
|---|---|
| Costs and sales forecasts | Yes |
| Discounted cash flow analysis | No |
| Return on investment analysis | No |
| Payback period and/or break even analysis | No |
| Superficial analysis: informal; 'quick and dirty'; rough guesses and estimates | No |
| Carried out by supplier | Yes |

The main business analysis type of NPD activity is the use of gross margins by the retailer. Gross margins were a target for the supplier. These margin targets then become the subject of negotiation with the supplier and then relate to the incoming garment price. The retailer is not generally making a capital investment for an individual new garment concept and there are no DCF or ROI calculations. With dozens of new products each season the main financial target used is gross margin on each individual new product. There is an assumption therefore that the margin on individual products together with the budget of departmental sales will collectively reach the target retail profits. Warburton & Stratton (2002) have cast doubt on the gross margin approach since there may be losses due to lower store prices due to markdowns.

## Product Development

Product development is the actual translation of the idea or concept into a viable product prototype or sample.

The product concept is developed by the garment maker in response to the retailer's brief that was presented at the strategy review by the retailer in the case study. The retailer had suggested to the garment maker the type of previous products to be used as a basis for developments and the key directional styling trends that it considers are important. More detailed discussions on prototypes take place between the retailer and the garment maker. The set of prototypes put forward by the garment maker are then examined together with other developments as a co-ordinated range of garments at the retailer management reviews before a final selection takes place.

## Product Testing – In-House

This stage involves testing the product in-house, in the lab or under controlled conditions (as opposed to in the field or with customers). In the case study the retailer carries out fit tests and demands that the garment maker tests new garments and submits sample garments with the test results. There were also garment measurements specifications used. There were no internal wearer trials at the retailer and no wash tests of garments until the garments were on sale in stores. The retailer does insist on wearer trials at the garment maker and needs to see the results.

The table below summarises the in-house testing.

| **Approach** | **Used in the Case Study firm** |
|---|---|
| Prototype testing: to determine if the product functioned properly and reliably. | Yes |
| Operating tests: tests to check the functionality/reliability of the product under real-life working conditions. | No |
| Specifications check: tests and checks to determine if the product met specifications, outside (external) design standards, etc. | Yes |
| Field tests of the product. | No |
| Carried out by supplier | Yes |

There is a strict testing regime in place in this supply chain.

## Product Testing with the Customer

For most products this stage would involve the consumer trying out the product. At the case study retailer there was some testing in the supply chain in wearer trials by garment making staff before the product went on sale in the stores and the feedback results communicated to the retailer.

## Trial Market/Trial Sell

A test market or trial sell of the product involves trying to sell the product but to a limited set of customers or full scale sales but in limited geographic area.

| Approach | Used in the Case Study firm |
|---|---|
| Selling the product to a small sample of selected customers only. | No |
| Selling the product in a limited/specific geographic area only. | No |
| Carried out by supplier | N/A |

The retailer had generally long offshore supply routes and could not experiment with new products through making and selling a limited quantity for a few stores. The quick response route through DyeCo did offer this trial opportunity but the basic product would still be developed first without a consumer test sell or trial and the colour changed later in a reaction to sales demand

## Trial Production

With large new product launches one could expect a tentative production run to test the facilities and the extent to which the prototype translates into commercial volume manufacture. This is a way of testing both the product and the production line.

| Approach | Used in the Case Study firm |
|---|---|
| A test of the production system itself (e.g. the production equipment ran properly). | N/A |
| A test of the integrity of the product that the production system yielded (e.g. to see that the resulting specs were met). | N/A |
| Carried out by supplier | Yes |

The system at the case study retailer did involve the garment manufacturer and DyeCo sending samples (seals) of commercially produced samples for approval to the retailer. The retailer did not own production facilities.

## Pre-commercialisation Business Analysis

The idea of this stage is to have a final look at the sense of the project before committing the business to large scale resources and risk. It involves a financial or business analysis following product development but prior to full-scale launch.

| Approach | Used in the Case Study firm |
|---|---|
| A detailed financial analysis, involving a return or profitability assessment. | No |
| A review/integration of marketing information only: sales forecasts and marketing cost projections. | Yes |
| A cost review: a review of distribution, production and marketing costs. | No |
| Carried out by supplier | No |

The retailer carried out a final range review and had pre-contract seal meetings where details were finalised with suppliers.

## Production Start Up

Almost half the firms in the Cooper & Kleinschmidt 1986 study did not recognize this step in the NPD process. The 56% that did were mostly those who identified a need for changes to the production facilities.

| Approach | Used in the Case Study firm |
|---|---|
| A few changes to the production facilities needed for the new product. | N/A |
| Acquisition and commissioning of significant new equipment and production facilities, sometimes a new factory. | N/A |
| Quality control checks at product start up. | Yes |
| A recognized step but no changes to the production facilities. | No |
| Carried out by supplier | Yes |

This step concerns any changes in facilities and quality checks.

For the case study retailer the production facilities belonged to the manufacturer. Quality checks on first production were carried out by the garment supplier and samples (seals) of the product sent to the retailer for approval.

## Market launch

This stage involves the conscious launch of the product, on a full-scale and/or commercial basis; an identifiable set of marketing activities specific to this product.

| Approach | Used in the Case Study firm |
|---|---|
| Trade literature, trade shows and trade advertising but no special promotion or training for the sales force. | No |
| Trade literature, trade shows and trade advertising plus a strong sales force promotional effort; demonstrations, conferences, and seminars for customers. | No |
| Trade literature, trade shows and trade advertising plus special training for the sales force. | Yes |
| Carried out by supplier | No |

The retailer did carry out extensive promotional activities for the product range that covered presentations of the ranges to suppliers, press shows and detailed launch instructions for staff at the retail stores.

## NPD Stages Conclusions

The table below (Figure 4.22) summarises the situation at the DyeCo retailer:

| NPD Activity Stage | Use at DyeCo retailer |
|---|---|
| Initial screening | Yes |
| Preliminary market assessment | Yes |
| Preliminary technical assessment | Yes |
| Detailed market study/market research | No |
| Business/financial analysis | Yes – margin assessment |
| Product development | No |
| Product testing In-House | Yes |
| Product Testing with the Customer | No |
| Trial Market/Test Sell | No |
| Trial Production | No |
| Pre-commercialisation business analysis | Yes |
| Production start up | Yes – quality checks |
| Market Launch | Yes |

Figure 4.22: DyeCo NPD Activities.

The case study retailer scores 8 clear yes results out of 13 for the activities above. Of the other manufacturing related activities 4 were carried out by suppliers.

The findings **support the proposition** that textile and clothing supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.

### 4.3.3 DyeCo Supply Chain NPD Strategies

Strategy has an influence on New Product Development in supply chains since managers have to decide how the firm is focussing NPD resources in support of the overall supply chain strategy. Firms, in any event, make strategic choices about business arenas and whether to stay close to existing markets, products and technologies or to take a riskier approach. Project team members then need clear objectives that stem from the NPD strategy. There are suggestions in the literature that firms should have some resources working on long term developments. The strategy choices may be inward looking and a tendency to be technology led or a more outward looking plan of more market orientation.

We might expect a supply chain in search of speed and efficiency to be more concerned with close to home products in terms of technology and products since the customer in a supply chain is likely to be an existing customer who knows the existing product capability. There may be dangers that being a supplier in a supply chains diverts management attention towards the operation of the partnership rather than outward towards the final consumers.

In the DyeCo supply chain case study the retailer had layers of management reviews and no market research input or analysis. It is difficult to see this as anything other than an inward orientation. Products were developed using the strategy review, fashion trend predictions and critical path process with garments selected from those submitted by suppliers. This was inward looking process since the input from the market only uses information from fashion trends and by examining competitor products and the basic premise is that the retailer will decide what is wanted by the consumer. Responding to consumers was also difficult with the long lead times for replenishing offshore supplies of garments. The lack of market input was demonstrated by the fact that until recently the retailer did not have a marketing director.

The retailer set out the product development objectives in the seasonal strategy reviews and those involved in the NPD process, including the fabric and garment suppliers and processors, were involved in these review presentations. As far as long term strategy for NPD was concerned the retailer's objective of sourcing more of the cheaper offshore products with better margins was made clear to all those suppliers involved. But the

offshore sourcing, as evidenced in the store survey (Section 7.3.11), could not respond well enough to customer needs and it was questionable if the net margin was improved even if the gross margins were better off.

The retailer was staying close to its existing product types as we have seen from the strategy review (Section 7.3.5). The firm has been criticised externally for sticking to the existing methods and this was being blamed for the decline in market share and loss of profitability. The case study retailer, in response, was now moving their new product sourcing more offshore and changing supply away from the established UK sources. Whilst this was helping the retail business to compete with cheaper products there could be problems with replenishment time and the quality of products from new and inexperienced offshore suppliers. DyeCo, for example, had a significant reprocessing business of faulty garments sent to them by the retailer sourced from inexperienced offshore suppliers.

For the case study retailer the brand's product characteristics of clothing are:

- Good quality
- Value

As we have seen (Mintel, 2002) these values have now come under pressure from other retailers who offer more fashion content, faster response and better value; consequently the case study retailer market share has fallen. The retailer was spending more on good quality and this seemed to be not necessarily what value conscious consumers were looking for. The retail company was responding now by moving quickly to offshore supply in order to lower costs.

The objectives of the DyeCo new management buyout business were made clearer during the case study intervention creative problem solving workshop. The new strategy of widening the DyeCo services on offer and aiming to process undyed offshore garments was made clear to the internal managers at the workshop. In addition the aims of the new DyeCo services were outlined to the retailer at a joint presentation to the retailer with the Industry Forum.

In strategy terms DyeCo had been dyeing the same kind of products for many years and this had not helped the business to thrive in a vertical supply business. The case study intervention took place while the new management buy out company were trying to use different production and marketing methods.

DyeCo also seems to also have previously had an inward orientation when they were operating largely as part of a vertical organisation since the market was in effect a captive customer. During the case study intervention however DyeCo were aiming to be more market oriented and trying to understand the retailers problems by examining issues of stock write down experienced by the downstream retailer.

DyeCo's product characteristics (of knitwear processing) were:-

- Speed
- Quality

However the DyeCo product offer was in the past an integral part of the offer of the sister company supply chain and the total cost of this route was determined to be too expensive and the market had moved to offshore suppliers. The case study Industry Forum intervention aimed to widen the range of services that DyeCo offered and to give the retail supply chain the opportunity to combine offshore lower cost undyed garments with UK fast response on colour.

The strategy of both companies in this case study, DyeCo and the retailer, was to change the direction of their products and services to new areas. Whilst the products may have been similar to the existing ranges the sources of garments for the retailer were moving to new and inexperienced suppliers. DyeCo on the other hand was trying to find new business from new offshore garment makers having been previously involved with a local in house business for many years. Both firms were therefore taking longer term views about product and service development needs of customers.

The conclusions are that the findings **do not support the proposition** that textile and clothing supply chain firms select an NPD strategy that focuses resources on existing customer short term new product needs.

### 4.3.4 DyeCo Supply Chain NPD success measures

Success can be measured in financial, customer response and product level measures such as on time development and quality.

The case study research did not have access to individual new product sales figures or profits, although gross retail margin information was available for the garment sample in the inventory survey. The public accounts for the retailer (FAME, 2004) and estimates of market share available (Mintel, 2004) demonstrate that the retailer has been less profitable recently and has lost market share in clothing.

For the individual retail departments though we have seen, in the strategy review and critical path, that success for new product developments for the retailer had a number of parameters including on time launch and meeting sales and gross margin targets. The retailer was also generally interested in achieving overall garment category market share targets. It is also clear that gross margins were a key component of new product success since this was used as a hurdle for new products. For instance, if a manufacturer developed a product that could not meet both a gross margin and target retail selling price the development would not continue along the development process. Initially the target is a gross margin at the starting retail selling price. However, we have also seen from the store survey, products that do not sell well at the initial retail price are marked down progressively until the stock is sold. Sales success was also limited by the amount initially ordered since the long offshore lead times also meant that if a product sold well it could not be replenished within the selling season.

Further success/failure hurdles in the NPD process were achieving the critical path dates for each stage and obtaining 'seal' approval for quality aspects.

Success in new product range developments for the retailer then has at least the following parameters:

1. Sales targets
2. Gross margin
3. Net margin
4. On time launch

We conclude that success for the retailer in the DyeCo case study retail supply chain involves all of the following:

- Customer acceptance including sales revenue
- Financial performance such as attaining margin goals
- Product level measures including on time launch, quality and achieving seasonal launch dates

The researcher did not have access to profit information for DyeCo on individual new products or sales for an accounting year in order to judge the financial success of new products. A cost plus system was used for margins and prices, but the order book was very short and the plant was operating below capacity. It was nevertheless possible to gauge the way that the organisation saw success from the contact and discussions with the management during the case study intervention. In the creative problem solving workshop, for example, it became clear that the managers in the DyeCo business were concerned about the level of long term sales and how the firm could add services.

Success measures can include technical performance and part of the product development process was the testing of dyed garments for shade and wash fastness. Additionally the DyeCo business was measuring the turn round time for new customers order that were in many cases new products for the retailer. DyeCo therefore measured the time that orders for new products spent in the system. The lean paradigm suggests that time is a focus in supply chains and if the retailers were to be persuaded that a quick response UK dye route was an option that gave better levels of supporting store inventory (in shades that consumers wanted) it was vital that the DyeCo turn round performance was improved. When it became clear that the retailer had taken much of the knitwear business to offshore suppliers DyeCo also needed to find a way to sell the idea of a new route for dyed garments to the retailer. The route would offer an offshore undyed garment source for the supply chain retailer that then had DyeCo dyeing and a new store ready final garment processing service. The new route used undyed offshore manufactured garments and local dye and final processing service possibility at DyeCo. The dyer then needed to carry out dyeing and add the final processing services including label sewing, pressing, mending and packaging to deal with offshore garments and prepare them for distribution to stores.

The measures of success for new products at DyeCo during the case study were therefore:-

1. Turning round orders in good time
2. Meeting quality standards on colour and wash tests.
3. Obtaining additional orders for the new style of offshore undyed garments
4. Adding the new services to the technical capabilities of the business

For DyeCo NPD success therefore involved the broad success measures of:

- Sales - for the new service
- On time delivery of customer products

With sales a clear target for new product and service development for both DyeCo and the retailer the proposition that textile and clothing supply chain firms use non sales based measures for new product success is **not supported** in this case study.

### 4.3.5 DyeCo Supply Chain product newness

Newness can exist in products, services, marketing methods and production technology according to NPD literature, but not many new products are real 'new to the world' innovations.

Newness for the retailer was at a low level of innovation with each category department working within narrow boundaries that were defined by the existing garments in the retail category, the trends identified in the strategy review and development briefs to suppliers. Therefore the retailer did not allow, for example, the ladies casualwear tops department to develop casual knitwear because knitwear belonged to the knitwear department.

The retail category strategy reviews showed that the firm were not ambitious in terms of innovation. This limitation is demonstrated in the Tops department development list:

- Continue to buy ranges by fabrics
- Build on the casualwear range
- Offer true casual fabrics in authentic shapes
- Build on the success of the undersuit range
- Offer two ranges for undersuit
    - Classic
    - Seasonal newness
- Re-establish tunics
- Offer an ultimate occasionwear range, exploiting newness and embellishment
- Introduce garments with luxury yarns for Top stores e.g. wool/cashmere

Here we can see that 'build' is a well used word that implies extending the products through existing line additions and 're-establish' seems to imply an earlier product type. The ultimate occasionwear range, 'exploiting newness', appears to be a new line.

From the store survey we have seen that new colours of garment can offer a vehicle for additional sales and these new seasons fashion colours are therefore types of line extension newness, particularly where a quick response route is used with new colours introduced in the middle of the selling season. Nevertheless the new season's product ranges are built up thorough a full NPD process that starts with a strategy review and concept generation before moving on to the stage where garment manufacturers develop and present their new prototypes that meet the concept brief. The retailer was also using newness of the supply route in moving to cheaper products and products with better margins and taking supply offshore. This involved new suppliers with lower levels of experience and expertise and as we have seen this did mean that DyeCo was quite busy trying to rescue faulty and poorly dyed garments from offshore suppliers for the retailer.

The DyeCo business had also not been involved in much new product innovation recently since most of the business was the dyeing of types of garment that were made of familiar fibre substrates such as cashmere, acrylic, cotton or wool. The DyeCo business dyed new fashion shades for garment makers to meet retailers seasonal colour standard needs. This work involved sampling of products in the new shades to the garment makers.

During the case study the DyeCo business has branched out into new services including pressing, sewing, mending and packing. The business also tried a new kanban quick response system for organising the dyehouse priorities and speeding up the turnround time.

In summary then and in relation to the lessons of the literature, newness in the retailer involved in the case study has the following characteristics:

- Most products are product line extensions
- There is a limited degree of freshness of the products from a fashion trend perspective
- Innovation is limited by departmental boundaries, target margins and concept boundaries
- The level of innovation is relatively low
- Lower price products with higher margin are being bought from new and untried manufacturers.

For DyeCo newness has the following characteristics:

- Most products are product line extensions
- Sampling of new colours on known fibres
- Additional product services have been added recently
- New production scheduling with a Kanban has been trialled

We conclude that in the DyeCo case study the findings **support the proposition** that textile and clothing supply chain firms develop new products that are line extensions

### 4.3.6 DyeCo Supply Chain Senior Management

According to the literature, senior management are usually involved in setting the strategic direction for the business and this should also include the NPD strategy and

support for an innovation culture. They may also be involved in setting the NPD structure and making go/kill decisions on new development projects.

This section first examines the senior management involvement of the retailer in the case study in respect of the knitwear products that the supply chain developed. Later the senior managers at DyeCo are considered.

Retailer senior management

For the case study retailer the general senior management strategy for the past few years has been to seek better value (cheaper) offshore sources products with higher gross margins. It has been difficult to estimate the effect this has on new product development and success for the retailer since the study had no access to individual product records. However the move by the retailer to cheaper offshore products did pose a new challenge to DyeCo since the dyer then had to convince the retailer that the dyed garment route did not make margins worse for the retailer.

It has been argued in the literature that the development of better value products is a sensible part of the portfolio of new products. The retailer's move to offshore sourcing has led to a loss of business for UK suppliers and a contraction in the UK industry market for dyed garments that was served by DyeCo. The retailer's senior management was only belatedly following a trend started by other UK clothing retailers to source products offshore and therefore the DyeCo target retailer had to try to compete on price in a similar way. Price deflation is a major concern in clothing retailing. For example Jones (2002) has found that price *deflation* over the period 1994 to 1999 was of the order of 9% in women's wear when the average price change of all retail goods was an increase in real terms of +15.6%.

Whilst cheaper the offshore garments generally take longer to replenish the pipeline. In the Industry Forum DyeCo retail store survey, of an example knitwear garment, the cheaper offshore source had a much longer lead time than the garment dyed route. The longer time meant that responding to changing consumer tastes for fashion shades was slow. For instance when certain colours sold out quickly the retailer attempted to obtain additional garments to replace the depleted inventory but these only arrived in the stores when the selling season had virtually ended.

Apart from setting strategy, senior managers may be involved in more short term product development activities. The case study retailer's seasonal development of new product ranges did have senior management involvement in setting the budget targets and making decisions about ranges in the regular review meetings.

Senior managers may also be involved in setting the structure for NPD. The case study retailer organization structure has not, however, been studied in this research. It was clear though that as far as NPD is concerned the retailer senior management had already planned the organizational structure since it was obvious who within the business was responsible for NPD and what the roles were from the findings of the seasonal planning schedule of activities. The supply chain structure was also clear and the system worked well generally in terms of bringing products to market although it is never the retailer who actually carries out most of the actual physical development of the new products. Senior managers can also be influential in allocating resources to development activities. At the case study retailer senior management did allocate resources to garment category groups, such as ladies casual tops, through the merchandise budget setting and seasonal review process. Within the category groups the budget was broken down into individual ranges of garments types, such as T Shirts, and these collections were then taken through the development process. .

It has been suggested that senior managers are involved in go/kill decisions of individual projects in the Stage Gate model of NPD. The case study retailer senior management were involved in the go/kill decisions of individual new product ranges through the series of management reviews. This involvement of many layers of management, at times all the way up to the chairman, did produce a slow bureaucratic development system that could not respond quickly to changing consumer tastes. This is because the long timescales with many committees leads to decisions having to be made early when perhaps consumer needs are not clearly known. Forza & Vinelli (1996) suggest that decisions in long clothing supply chains are made before there is any sales reaction to the new products. The reasons for the long time scales may be related to the need to launch hundreds of products into one of the largest clothing chains in the UK at virtually the same time. This may need decisions early, but the committees are responsible for the slow and long development process.

In addition to managing the structure, senior managers should try to help those involved in NPD to understand the goals of the NPD strategy. At the case study retailer the NPD objectives and accountability were communicated through the departmental strategy review that set out the concept and range objectives and the responsibilities for a variety of aspects of the seasonal range development programme including those of the suppliers. The critical path also set out the timing and responsibilities for NPD activities. The critical path and strategy review did additionally ensure that the launch and product development proceeded on time.

Beyond communicating NPD strategy goals senior managers should try to encourage a climate of innovation. At the case study retailer there was no advanced innovation culture on the basis of this research since the NPD ethic was one of looking at existing ranges and moving them on a little. The innovations were sometimes inspired by examining competitor products in comparative UK shopping and seeking confirmation of trends through directional inspiration of international shopping. This retailer did not believe in being first into the market with novel products. We must also remember that the retailer did not design products themselves or develop them since the method used was one of selecting from suppliers' ideas. The suppliers were given the strategic brief by the retailer.

However as with possibly most clothing supply chains each season most of the ranges are re-invented and there was a high level of senior management involvement and support for this part of the range development process. It is also clear that the retailer was fairly prescriptive in setting the boundaries of concept development for suppliers. This seems to run counter to an innovative culture.

The case study retailer has a commitment to NPD at a senior level since managers and executives were deeply involved in the product development review processes and the seasonal range development programmes.

<u>DyeCo senior management</u>

DyeCo senior managers previously had limited experience of findings new markets and services prior to the current study since they were part of a vertical operation of a garment manufacturing business.

Recently however, DyeCo senior management was involved in setting the direction of the NPD strategy and in particular making the decision to add new services and to make a more determined effort to market the benefits of quick response. DyeCo new products offered during the study were not new types of dyeing but additional services such as label sewing. For DyeCo these changes in offering more services tailored to the needs of the offshore supply chain and the marketing of the benefits of quick response did produce more business in the short term.

Senior management strategy was a feature of the Industry Forum (I.F.) project to market the firm's capabilities after the management buyout from a vertical garment maker. The I.F. creative problem solving workshop at DyeCo, for instance, was aimed at helping management to consider the strategic issues facing the business including the need to improve the marketing and promotion of the products and services the business could offer to the retail supply chain. The intervention work also led to a presentation of the store survey findings by the DyeCo senior management to the retailer's procurement and category managers. The aim of the presentation by DyeCo was to market the benefits of local processing that could enable the retailer and their new offshore garment making supply chain to be more responsive to consumer tastes. The store survey was designed to improve the understanding that the dye business had of the cost implications for the retailer of using their type of quick response garment dye facility compared to the longer lead time of sourcing yarn dyed garments. It also led to the presentation of a cost model to the retailer that demonstrated the opportunities of local processing and the effect of poor sales of fashion colours on margins through inventory write downs.

Senior management also changed the DyeCo organisational structure during the case study intervention in two ways. Firstly the business started up an additional processing services department. Secondly, following the case study interim report that was critical of the way that the priorities were decided for the dyehouse, a change of the dyehouse management and the dyehouse was then made giving them direct responsibility for managing the priorities of the order book. This did help the responsiveness of the dyehouse and the case study kanban project showed improved productivity so that the Quick Response needed by the supply chain could be achieved. At DyeCo senior management supported the move to add new additional services and agreed for the necessary resources of recruitment of new sewing staff and addition of sewing equipment. The managers also spent time during the case study presenting the case for the new services and the Quick Response route to the retailer. The new services led to

new orders for the DyeCo business with a significant income level in average margin terms when compared to the existing dyeing only type of service. At DyeCo senior management made the go/kill decisions about the new added value services and quickly followed this through with processing resources and management selling the new service concept to the retailers. The approach led to the gaining of new orders during the case study intervention. At DyeCo the senior management set out the objectives of widening the range of services. The management at DyeCo was flat in terms of layers and structure and decisions once taken were quickly implemented in terms of responsibilities. To an extent the case study project intervention also helped the communication of the objectives through the Creative Problem Solving workshop but this was an ad hoc event. Additionally the situation of the dyehouse and the degree of conflicting and competing departmental prioritising of order processing discovered during the case study research and process mapping did indicate an earlier lack of clarity of objectives and communication.

DyeCo have been part of a vertically integrated garment maker for many years until the last year largely carrying out the same kind of processes until recently. Only during the relatively recent period during the case study intervention did the business contemplate new processes and services and therefore there may not have been an established innovation culture although perhaps the recent changes have signalled a more innovative culture for the future.

During the case study intervention DyeCo senior managers showed commitment to changing the product services offer through the support that they gave to the new resources. The managing director and production director gave presentations about the new services, store survey results and the cost model to the retailer category procurement managers and to the Industry Forum Steering Committee. The managing director of the DyeCo parent company also gave a presentation about the case study intervention at the Industry Forum Annual conference attended by the minister of state for industry and 150 delegates from the garment industry.

The conclusions of the findings regarding senior management involvement is that at both the DyeCo firm in the new services developments, and at the retailer's range review meetings, senior managers were involved in individual projects. We expected in a supply chain that the focus on cycle time speed would mean that senior managers

would not be involved since this would slow down the process. At DyeCo the new management focus after the MBO was in the development of particular new services that would open up access to new supply chains.
As we have seen the retailer did involve many layers of management in the NPD process and this made it much slower than the RetailCo or KnitwearCo supply chains.

Therefore the findings **do not support** the proposition that textile and clothing supply chain firms' senior managers are not involved in the individual project decisions.

### 4.3.7 DyeCo Supply Chain NPD Organization

We expected in the organization proposition to find that the case study firms would use structured methods to communicate between the supply chain partners on NPD. Here we therefore consider the methods that the retailer and DyeCo used to organize NPD internally and externally.

The literature is divided on the best way to organize for NPD although certain factors seem to affect success including the firm's organization and structure, the use of multi-functional teams, the responsibility for project progress, evidence of co-ordinating mechanisms and the role of the retailer in the supply chain. This section considers these factors in turn at the retailer and the dyer and how they communicated within the supply chain.

<u>Retailer</u>

The structure of the new product development systems were very well established at the case study retailer with departmental ownership of range development and a clear set of directions about which functions were involved and when in the process. So for instance the ladies casual tops department had its own range development organization that included the functions of selectors, merchandisers and technologists. The retailer used multi-functional teams for the internal aspects of range development and also involved the suppliers in the development process. Suppliers largely developed the new products from a brief from the retailer. There was a formal timetable of meetings with

dates for both the internal and external aspects of retailer product development using the critical path and seasonal timetables. However the suppliers were not involved in the decisions to approve and buy products that were naturally made by the retailer.

Project progress at the case study retailer was monitored using the critical path and seasonal timetables. The parts of the NPD process were allocated to different staff with for example fit and seal approval the responsibility of the technologist and the launch volumes, production levels and margins the role of the merchandiser. The critical path dates and management reviews gave the whole process a timetable to meet for the individual activities.

DyeCo

At DyeCo the NPD structure of the new MBO Company was in its infancy and the managing director had in any case only a small team responsible for all aspects of running the business. The firm's management were now responding to the loss of the parent company business and recognising the new offshore supply routes that DyeCo needed to be part of. There was no separate NPD function and the new services did not lead to a change in structure.

The DyeCo business had somewhat unclear organizational responsibilities. For example at the start of the Industry Forum project the DyeCo dye house was affected by the activities of various departments who independently changed the order of product priorities without any team consultation. The Industry Forum intervention project installed a kanban system that was designed to clarify responsibility and link the dye department to the preparation department.

There was no change in the NPD structure of DyeCo when the new services including labelling, pressing and packaging were introduced. The business remained without multifunctional teams although all the management were involved in the new services development and it was co-ordinated by the Managing Director. At DyeCo the small management team however met frequently to monitor progress on the new added services.

The retailer as we have seen was the driving force behind the NPD process. Suppliers and processors, like DyeCo, were given the strategy review information and the seasonal timetable for the range developments and expected to submit prototypes and seals on time. Meetings took place as part of the seasonal plan with individual garment and processing suppliers to discuss their new products.
DyeCo was only a peripheral part of this process and was only involved when parts of the knitwear and casual wear ranges were chosen to be garment dyed. The situation of direct contact regarding new supply routes for the retailer was new for DyeCo. In the past the DyeCo parent garment manufacturing company developed the products and had them dyed at DyeCo. The new situation, post the management buy out, needed DyeCo to actively understand the new offshore supply routes and influence the retailer to make a choice to use garment dyed rather than yarn dyed routes. This was a new situation and there were no real structured communication methods in existence for DyeCo and the retailer beyond DyeCo fitting in with the retailer's timetable for product development on garment dyed products.

The new DyeCo quick response route of dyeing in the UK using offshore undyed garments that would then be dyed and further processed ready for store was a new, shorter, fast response capability that was at an early stage and it cannot be said that there were any clear organizational or communication structures in place yet.

The findings show that the retailer generally had very formal and structured methods for NPD communications that were imposed on all the suppliers.

The DyeCo quick response system was too new to represent a clear organizational structure at the time of the study.

The findings **partially support the proposition** that textile and clothing supply chain firms use structured communication methods with each other in the NPD process.

### 4.3.8 DyeCo Supply Chain NPD Tools and Methods

Research indicates that firms use a variety of NPD methods in an attempt to improve success. These include idea generation methods including Brainstorming, listening to the customer through 'Voice of the Customer' methods such as Quality Function Deployment and portfolio management methods such as scoring systems and strategic buckets. Firms also measure development cycle time and on time achievement as well as using CAD to speed development.

We might expect that a supply chain with a fixed launch date would use tools to monitor adherence to the development schedule.

The use of typical NPD tools at the dye company and the retailer are considered in this section.

<u>DyeCo</u>

There was no evidence of routine use of structured methods for the generation of new product ideas at DyeCo. The decision to market the business capabilities and benefits more closely to retailer and to develop new services such as label sewing and pressing was the result of a brainstorming session as part of the Industry Forum project. This was an ad hoc process largely brought about by the need to respond to the new non-vertically integrated structure post the management buy out.

At DyeCo there was use of computer systems to monitor the time that products spent in the processing system. This included new products for the retail supply chain. The Industry Forum project did use 'lean' techniques to reduce the time in the Kanban system by half and cut inventory by 90%.

DyeCo did not use 'voice of the customer' or the related Quality Function Deployment techniques but did try to understand the need of the customer in terms of the impact of margin targets and inventory write downs when carrying out the Cost Modelling and store survey.

Retailer

The case study retailer used a critical path system with dates for the completion of key decisions and validation processes. New product idea generation used a set of formal procedures that included the components in the strategy review of supplier involvement and competitor and market trend scanning. There was a use of portfolio management and strategic buckets at the retailer. There was no evidence of idea creation using brainstorming.

The retailer's new product development seasonal timetable and critical path dates with management reviews were used to ensure that product developments kept to the launch timetable. Supplier managers were aware of the need to develop prototypes to time and then to obtain seal approvals for example before the management review dates.

The conclusion of these findings is that both the retailer and the DyeCo processor used techniques to monitor time performance on new products. The retailer used a critical path system that made the suppliers conform the timetable in order to achieve the required seasonal launch date for ranges.

The findings therefore **support the proposition** that textile and clothing supply chain firms use tools to monitor adherence to the product development schedule.

### 4.3.9 DyeCo Supply Chain Summary

*NPD Models*

The case study retailer did use a type of stage gate model of NPD where there were identifiable stages starting with a strategy review, competitor analysis, market fashion trend research and a new product concept. In order to achieve the same seasonal launch date for ranges of products the retailer used a critical path timetable that set dates for the various stages to be completed by. The process also had senior management reviews. However the actual product development side of the NPD process took place at competing supplying companies and the retailer selected the ideas that it liked the best. The retailer also imposed its own standards for suppliers in terms of technical product validation and whilst the retailer did test that the product looked right on a model the bulk of validation testing responsibility lay with the supplier.

Whilst we might have expected a supply chain to have more modern NPD systems designed to reduce development cycle time the retailer had a slow system that took many months and as a result was unresponsive to consumer needs. Nevertheless the system did have a focus on quality through the use of detailed retail specifications.

DyeCo was in a state of change having been part of a vertical company and now needed to find independent customers and have an influence on downstream decision makers such as retailers. The NPD system at DyeCo has an involvement in the development process of the downstream retailer and garment makers. DyeCo recognised that the clothing supply chains were moving offshore, driven by the deflation in retail clothing prices and the DyeCo business then developed a new service to suit this new situation so that they could process garments and deliver them to retailers. The DyeCo business was trying to influence the retailer to use their fast response garment dyeing capability to react with offshore garments to consumer demand changes.

Since it was a new commercial entity, with a new market, DyeCo did not have a well developed NPD system.

*NPD Stage Activities*

The retailer carried out more than half of the recommended NPD stage activities but actual product development was left to competing suppliers and therefore the process was shared, but not all the recommended steps were carried out. An understanding of the needs of the final consumer were not sought or investigated by the retailer and the products that were developed were on the basis of an interpretation by the retailer about what was best for the consumer customer.

*NPD Strategy*

We might expect those in a supply chain to be focussing on the existing customer base and supply chain partners. We also might expect that retailers would use existing suppliers and suppliers equally would focus on existing supply chain retail customers.

DyeCo had a new situation with a new immediate customer in terms of the offshore suppliers. However the main new strategy situation was the need to develop direct relationships with the target retailer in order to persuade the retailer to use a garment dyed route with the new offshore supplies.
The retailer was also establishing new supply chain routes with new and less experienced offshore suppliers.

*Success measures*

Much of the case study real world intervention was concerned with the reasoning behind the moves to more offshore garment supply for the retailer. The Industry Forum project work showed that whilst gross margin was used as a success/fail hurdle in product and supply chain development the new products themselves did not necessarily achieve the margin once the cost of quitting inventory was taken into account. The level of sales turnover provided a measure of customer acceptance of a new development rather than units sold since the price achieved would depend on the level of stock write off. On time development of new products and achievement of launch dates was important to success.

*Newness*

DyeCo and the case study retailer generally worked on new garments that were quite similar to the previous season's offerings. Colour is used as a fashion vehicle and the retailer had difficulty forecasting which new seasons fashion colours would be popular with consumers according to the results of the stores survey. Replenishing popular colours where stock was insufficient was not possible in the short selling season due to the long lead times with offshore supply. However both DyeCo and the retailer were moving into new territory in that the dyer was introducing new services and seeking new offshore garment making partners in the retail supply chain. The retailer was using new suppliers who were inexperienced in achieving the high quality standards needed.

*Senior Management*

The analysis aimed to test the proposition that senior managers in a supply chain would not be involved in the individual new project gate decisions since the aim of a lean supply chain would be to have fast NPD processes. Senior management reviews would slow down the process.

The DyeCo managers were part of a small management team and the number of new products and services were limited. The senior management was involved in the new services decisions and the company quickly implemented a new set of services including pressing, sewing labels and packing.

The case study retailer had a series of management reviews that approved new ranges of products. The system was slow and unresponsive to changing consumer needs. The retailer did have some validation of technical product features at a lower level of management where decisions were made by technologists without senior management involvement.

*Structured communication methods*

Whilst product developers in firms are recommended to use multi-functional teams who meet regularly to monitor and control projects as they progress between departmental

functions we might expect supply chain firms to also require structured communication methods.

The case study retailer had formal meetings with suppliers and processors as part of the timetable of product development. The case study retailer tended to be the instigator of the communications in the supply chain.

*NPD methods and tools*

Various tools are suggested as useful to improve the performance of NPD systems including Quality Function Deployment, cycle time reduction techniques and brainstorming for gathering new ideas.

We might expect that a lean supply chain would have less use for brainstorming since the retailer has its own new product ideas. We might also suppose that the supply chain concentrates on lean methods including fast development and therefore tools could include development time monitoring.

The retailer did not use 'voice of the customer' methods by monitoring consumer opinions. Instead the retailer defined the new ranges through budgets and the strategy review. The case study retailer used a critical path to maintain adherence to the development timetable with dates for key tasks for suppliers and the retailer including the submission, testing and approval of prototypes.

*Propositions*

The research propositions concern the impact of being a supplier in a supply chain. Of the eight propositions only the following four are supported by the analysis:

- **Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

- **Supply chain firms develop new products that are line extensions.**

- **Supply chain firms use structured communication methods with each other in the NPD process.**

- **Supply chain firms use tools to monitor adherence to the product development schedule.**

The following propositions were not supported:

- **Supply Chain firms adopt 4th Generation faster, flexible NPD models.**

- **Supply chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**

- **Supply chain firms use non sales based measures for new product success.**

- **Supply chain firm's senior managers are not involved in the individual project decisions.**

## 4.4 FibreCo Case Study

### 4.4.0 Introduction

> **"Part of the success of this project is that we have all had a part to play in making it happen. It's really been about learning together". UK retail account manager, FibreCo, 2002**

FibreCo is an international fibre producer. The company has invented the first new generic fibre type (FibreA) to be discovered and commercialised anywhere in the world in the past 35 years. This new fibre is however so innovative that supply chain fibre processing customers find it challenging to use in their existing production processes. It is taking time for the new fibre to penetrate into all clothing markets. The fibre is different to existing fibres and so yarn and fabric producers and consumers, retailers and garment makers are not as familiar with the attributes of the product as they are with more established fibres such as viscose, cotton and wool.

Part of the FibreCo production process is shown in Figure 4.23 below.

Figure 4.23: FibreCo Production Process

FibreCo will take many years to invent another new raw material in its research facilities and in the meantime, in common with other raw material firms, the business tries to maintain a high level of awareness and visibility for the existing, newly invented, product. With a low level of experience of the new product amongst supply chain customers there has been a need to also work on improving the adoption rate and to offer practical help to customers who work with the new fibre product.

The FibreCo firm has recently produced a new variant of the newly invented product and this new product variant (FibreB) is even more unfamiliar to the supply chain and its customers. The Industry Forum project was focussed on improving the market focus for the new variant.

The Industry Forum intervention project was aimed at exploring with the FibreCo project team the needs of downstream customers in the supply chain and the consumer.

The data collected, together with earlier unpublished data about FibreCo NPD methods, gave insights into the issues facing raw materials suppliers in the Textile and Clothing Supply Chain and the problems of obtaining adoption for new innovations.

### 4.4.1 FibreCo type of NPD Process

This section examines the situation at FibreCo with the aim of discovering if the firm uses a formal NPD process for all new products and if the system is a modern version 4th Generation model of the various NPD processes that have been identified in the literature.

The Industry Forum project did not involve mapping the supply chain NPD process. However the process has been mapped in a recent unpublished study in the company by the same research team leaders. The current intervention project aimed to develop a more market focussed approach for a new product developed by the company and this provided further details regarding the issues of new product application development.

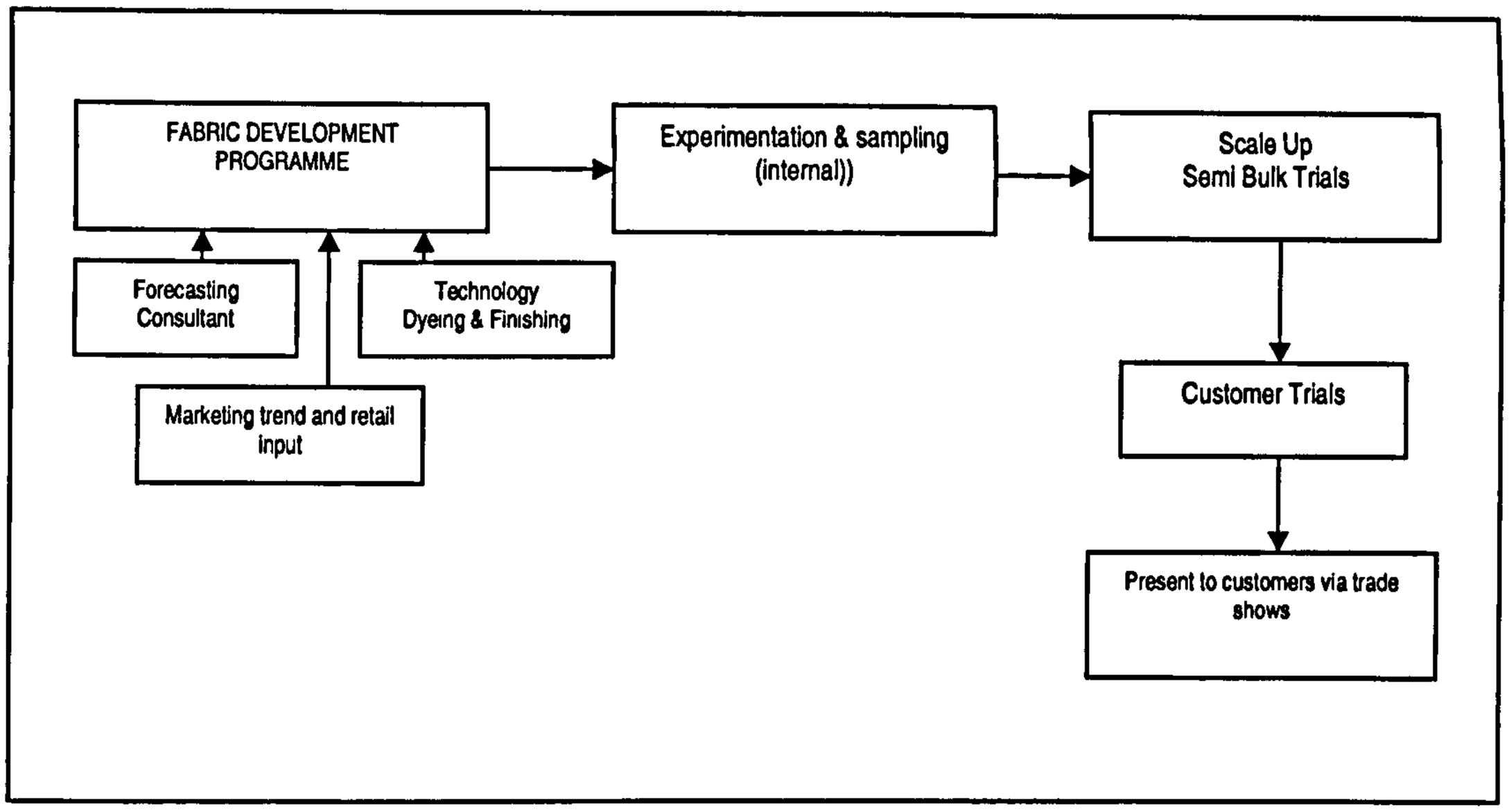



Figure 4.24: FibreCo Application Development (Source: Salford University)

The earlier process mapping shows that the company has three distinct product development approaches with a variety of timescales. The approaches include Applications Development, Fibre Research and Technical Services

## Application Development

This type of product development (Figure 4.24) takes the existing products and seeks to develop new customer products such as fabrics that can be shown at the European textile and clothing trade shows every six months. There are a number of stages:

- Fabric Development Programme
  - A plan of fabric developments using
    - Trend forecasts by consultants are used to assist the direction of the fabric developments so that they are in tune with the latest fashion trends
    - Retailer and consumer trend information
    - Results of trials in dyeing and finishing
- Experimentation & sampling
  - Internal production and trials on pilot plant spinning, weaving and dyeing equipment

- Scale Up
    - Work with external downstream trial partners to produce fabrics and garments
- Customer trials
- Present products at trade shows

The main process used here is in-house development of fabrics through the use of their own small scale equipment similar to that used at downstream processors including spinning, knitting, weaving and dyeing and finishing. Where there is not the expertise or equipment then downstream partners in the supply chain are sought that can produce fabrics or garments. The Technical Services staffs are often involved in selecting and finding trial partners.

The timescale is six months or less to meet the seasonal fashion trade fair dates. Some projects take longer than a season to resolve.

## Fibre Research

This type of development involves research into fundamentally new raw materials and products and this normally takes place in laboratories before leading to small scale production facilities and investment in full scale production facilities. A recent example of this is the FibreA development that began with the discovery of a simple way to dissolve cellulose from wood pulp in the laboratory using an amine oxide (Woodings, 2000). The company went on to build a laboratory production unit at the research unit followed by a semi-commercial plant in the North East UK, before installing a full scale plant in Texas capable of producing 43,000 tonnes per year. Driven by the environmental concerns with existing solvents the researchers developed a new class of fibre in FibreA. FibreCo estimates the timescales of this type of technology led development at about 5 years. FibreA was developed into some high fashion end uses largely as a result of work in Japan on the dyeing and finishing of fabrics that, whilst expensive, gave an ultra-soft touch to the fabric, particularly woven fabrics.

## Technical Services Development

The main driving force here is complaints by downstream processors including yarn spinners, fabric producers and dyers. These customers find that they are having problems developing their own new products and call for assistance from FibreCo. The problems may be related to the need to make changes in the fibre manufacture or to produce a special batch for the customer or may require that technical staff from FibreCo visit the processor and help them with advice on processing routes, equipment settings or types of processing chemicals and dyes to use. These projects can take days or months to resolve. The process is also one of building a knowledge bank about downstream processing of existing products. The process is also a possible source of new ideas, new applications and helps to build stronger relationships with customers provided of course the customer processing problem is solved.

These three types of development are as we have seen inter-related. FibreCo develop new fibre products through science research over a period of years. Once new fibre products are commercialised they are sold into the UK and international textile and clothing supply chains and the various downstream processors then work to develop applications and FibreCo help to resolve any problems that downstream processors have in developing their own products. FibreCo also work each season to develop customer type products for promotional purposes.

In considering if the NPD development process at FibreCo is a fast, flexible 4$^{th}$ generation NPD process we need to examine these three types of development activity at FibreCo and compare each of them with the various generations of NPD model.

*Technology Push Model*

NPD Process Models have evolved from technology push R&D based systems to more market pull where the needs of the customer are considered. NPD processes have also developed from phase review types characterised by their project management approach, sub division of tasks, a steering committee and a largely engineering led management focus that has little marketing function involvement or market focus. The Phase Review Model for example was engineering led and useful for controlling the activities and timing of many suppliers on large projects of the NASA type.

The fibre research type of NPD does appear to be a technology push type and therefore may be considered an early type of NPD process. The fibre research approach also has a mostly engineering dominance with the emphasis on building fibre production facilities. However the FibreA overall product development process did have some marketing focus with the product aimed at expensive, high fashion end uses and tight control over uses through a labelling scheme and development of the FibreA brand. Application development at FibreCo has a high level of marketing focus through the in-house or external development of downstream applications specifically aimed at the seasonal trade fairs every six months. There is market and fashion trend input into this process at the start (Figure 4.24).

Technical services development largely takes place for customers and is aiming to solve their technology problems through adjustments to the commercial FibreCo products or changes in the customers' process technology. The technical services approach might be interpreted as customer led since the catalyst for change is the customer. However the changes are incremental rather than wholly new products.

*Market Pull Model*

The second generation NPD process model put forward by Rothwell (1994) saw a more market pull version (compared to the first generation technology push) with the market being scanned for ideas that lead to an incremental adapting of existing products.

Of the three types of NPD approach used at FibreCo the fibre research is the least like a market pull model. We might however argue that the application development approach is market led with the aim being to develop customer type products to influence buyers at trade fairs. The technical services problem solving is also responding to the market when the FibreCo technical personnel visits customers to solve processing problems although one might consider this is a long term supply chain validation and testing process for new products.

*Stage-Gate Model*

The third generation Stage-Gate method has stages, reviews by a senior management team, pre-determined go/no go hurdles, a market focus throughout the process and is cross-functional (Cooper, 1994b).

The FibreCo fibre research approach is clearly more like a technology push process than a stage gate type since the method is pure science based research into new raw materials. The application development however has a market focus, a committee that review competing projects, a development team, a funding control and a launch of products at the trade fairs. The application development process therefore has many features of a Stage Gate system. The technical services approach at FibreCo does not systematically lead to a programme of new products for FibreCo since by its nature the process is an ad hoc one. The solving of supply chain customer problems on the downstream customer new products may be seen as part of product development for customers.

*4th Generation NPD model*

The fourth generation innovation process (Rothwell, 1994) is characterised by Japanese style concurrent engineering and integration of the functions in order to reduce cycle time. There is also integration of suppliers into the NPD process at an early stage and the use of design for manufacturability. Cooper has also suggested some speed improvement over the basic Stage-Gate through the use of flexible fuzzy gates that are overlapping and conditional. He also advocates the use of multi-functional teams.

The FibreCo NPD methods lack the integration of functions of the 4th generation model since the company have a functional separation to develop new fibres. The applications development at FibreCo involved both the marketing and fabric development staff. Technical services were another department who dealt with customers' problems. Projects varied at FibreCo and belonged to departments with different focus and timescales rather than being one integrated NPD system. There is a focus on time, but not in cycle time reduction in the application development, since the projects aimed for a particular launch date at the seasonal trade fair.

*5th Generation NPD Model*

The 5th generation innovation process (Rothwell, 1994) suggests that the force of networking, new I.T and CAD based technologies be used along with strong internal integration, quality control during development and fewer management layers to win at time based strategies.

FibreCo do network with downstream customers in the cycle of six monthly promotional activities in application development and through the technical services solving customer problems. There is also a focus on quality of the product in use at customers through the technical services work. There is a time base to the applications development of new product fabric applications that are presented at the six monthly trade fairs.

NPD Model Conclusions

The overall FibreCo NPD system does not easily fit into any of the existing models of NPD. Whilst the company has invented the first new man made fibre for 35 years from a basic research approach and built new fibre plants there is also activity on promoting the existing products to the supply chain and retailers and solving customer product development problems.

The promotional activity every six months leads to the development of new applications, for the existing FibreCo products for the supply chain, aimed at persuading retailers to use the FibreCo products in seasonal garment ranges. This type of NPD activity has much in common with second generation market pull models of NPD. Finally the technical services staff work on application problems where customers have adopted the current products but are struggling to make them work in their own new products. This might be seen as long term testing and validation of new products.

Having examined the NPD process at the case study the findings **do not support the proposition** that textile and clothing supply chain firms adopt 4th Generation faster, flexible NPD models since FibreCo has some elements of a number of NPD models.

## 4.4.2 FibreCo NPD activities

FibreCo as we have seen had very long term R&D projects that led to new fibres only rarely. The main product development activity was the seasonal development of customer and supply chain applications for FibreA. The Industry Forum project has only examined in detail the data related to this seasonal applications development type of activity.

There are three types of NPD activity at FibreCo. However the Industry Forum intervention project was only largely concerned with the seasonal application development type of NPD in regard to knitwear and so the analysis of the detailed NPD activities is only concerned with the application development NPD.

## Initial Screening

| Approach | Used in the Case Study firm |
|---|---|
| A group decision, based on an informal discussion – no formal techniques uses at all, e.g. no checklists of criteria, no rating forms, etc. | No |
| A single individual made the decision, again on an informal basis (no formal techniques). | No |
| A group decision, based on a formal checklist of criteria. | Yes |
| Carried out by supply chain customer | No |

At FibreCo there was a formal meeting to examine the current product application developments aimed at a particular trade fair date and retailing season e.g. Spring/Summer 2001. The main criterion was the ability of a project to meet the timescale of the next trade fair.

## Preliminary Market Assessment

At this stage the company might examine the market for products of the type being considered using secondary market research data, review competitors' products, ask the customer if they might be interested in this type of development, quiz the sales staff who have knowledge of the market or at least have an internal discussion about the suitability of the project idea for the proposed market.

At FibreCo there was market input in terms of scanning of fashion trend information and gathering data about new seasonal colour trends. Marketing personnel were involved in the review meetings. Customers in the supply chain were not yet involved.

| Approach | Used in the Case Study firm |
|---|---|
| Direct contact with customers | No |
| Discussions with the sales force | Yes |
| Review of competitors' products | No |
| Access secondary/published data | Yes |
| Knew market already – internal assessment/discussion session only | No |
| Carried out by supply chain customer | No |

## Preliminary Technical Assessment

The technical assessment of concepts is designed to eliminate those projects that are unsuitable since the firm may not have appropriate technology. This step also includes where a preliminary product development may be carried out, a specification developed or the idea's feasibility studied.

At FibreCo there is some available small scale equipment for spinning yarns, weaving and knitting fabrics and for dyeing and finishing. There is a conscious decision step to assess the capability and know how at FibreCo and to bring in external customers who

have production and development capacity where needed when FibreCo do not have the internal expertise or sampling capacity.

| Approach | Used in the Case Study firm |
|---|---|
| Capability/feasibility analysis | Yes |
| Engineering assessment | Yes |
| Product specification | Yes |
| Product design, model development | Yes |
| Carried out by supply chain customer | Yes |

## Market Studies

This stage is concerned with a brief estimation of the demand for this type of new product. The competitors and existing products are studied. At best a market research study, involving a reasonable sample of respondents, a formal design, and a consistent data collection procedure is carried out to try and discover what customers need. Secondary data may be examined closely to establish the likely market opportunity.

At FibreCo there were no real market research studies to determine consumer demand for the company's products although in the case of FibreB the managers were concerned about the low rate of adoption and wanted to know from the Industry Forum knitwear partners what their perceptions were. The I.F. project researchers then carried out detailed test market research and developed a marketing questionnaire in conjunction with the FibreCo managers and discovered new consumer attitudes that the company were not aware of.

In the applications development at FibreCo the projects were of customer product types including yarn and fabrics aimed at a seasonal trade fair. The trade fairs such as Premier Vision were a vehicle to try and show off the FibreCo products in the latest fashion trends in order to influence the seasonal buying decisions of garment makers and retailers. Garment suppliers would be hopefully inspired by the trade fair samples

to use FibreA or FibreB (in yarn and fabric constructions) for their own developments. Garment suppliers carried out their own market assessments of fashion trends.

| Approach | Used in the Case Study firm |
|---|---|
| A study of competitor products and prices | No |
| A study of what customers needed or wanted | No |
| A study to determine market size | No |
| Carried out by supply chain customer | Yes |

## Business/Financial Analysis

In the classic Stage Gate model there is a business analysis step before any serious commitment of resources to product development. This can vary in level between a Discounted Cash Flow to a 'quick and dirty' guess with costing estimates perhaps in the middle. At FibreCo there was no DCF, ROI or Break-even analysis at any stage although there was a budget for the costs of sampling and promoting at the trade shows. For the Industry Forum project for example yarn was purchased and costings obtained by the researcher for the knitting of sample garments by KnitwearCo. Application developments that were made at customers would have a costing.

| Approach | Used in the Case Study firm |
|---|---|
| Costs and sales forecasts | Yes |
| Discounted cash flow analysis | No |
| Return on investment analysis | No |
| Payback period and/or break even analysis | No |
| Superficial analysis: informal; 'quick and dirty'; rough guesses and estimates | No |
| Carried out by supply chain customer | Yes |

## Product Development

Product development is the actual translation of the idea or concept into a viable product prototype or sample. FibreCo carried out actual product development but of downstream supply chain types of products. These would be manufactured either internally or with partners who were spinners, knitters and weavers. So for example a yarn might be purchased from a spinner or a fabric made by a weaver to a specification for FibreCo who might then dye it in the new fashion colours in the FibreCo sample unit.

## Product Testing – In-House

This stage involves testing the product in-house, in the lab or under controlled conditions (as opposed to in the field or with customers). FibreCo carried out internal tests of development samples and also used customers for this stage.

| **Approach** | **Used in the Case Study firm** |
|---|---|
| Prototype testing: to determine if the product functioned properly and reliably. | Yes |
| Operating tests: tests to check the functionality/reliability of the product under real-life working conditions. | No |
| Specifications check: tests and checks to determine if the product met specifications, outside (external) design standards, etc. | No |
| Field tests of the product. | No |
| Carried out by supply chain customer | Yes |

## Product Testing with the Customer

For most products this should involve the consumer trying out the product. At FibreCo the internally developed products were not sent to customers since the main use for the products was for promotional ideas at trade fairs and so products were not fully commercial. Where customers made the samples testing probably took place at the customer as part of a normal commercial production.

## Trial Market/Trial Sell

A test market or trial sell of the product involves trying to sell the product but to a limited set of customers or full scale sales but in limited geographic area.

| Approach | Used in the Case Study firm |
|---|---|
| Selling the product to a small sample of selected customers only. | N/A |
| Selling the product in a limited/specific geographic area only. | N/A |
| Carried out by supply chain customer | Yes |

FibreCo were producing these samples for promotional purposes at trade fairs and so it was inappropriate to sell the products when only small sample quantities were available. Where a downstream customer was making the samples the customer then had an opportunity to evaluate the yarns and fabric products produced.

## Trial Production

With large new product launches one could expect a tentative production run to test the facilities and the extent to which the prototype translates into commercial volume manufacture. This is a way of testing both the product and the production line.

| Approach | Used in the Case Study firm |
|---|---|
| A test of the production system itself (e.g. the production equipment ran properly). | No |
| A test of the integrity of the product that the production system yielded (e.g. to see that the resulting specs were met). | No |
| Carried out by supply chain customer | Yes |

At FibreCo the whole focus of the applications development effort was to produce samples but on sample equipment that gave only a limited view of full production conditions. The external sample production was more likely to have been produced on full-scale production equipment. The samples produced for the Industry Forum market study, for example, were produced on production equipment at KnitwearCo and a commercial yarn spinner rather than in the FibreCo development unit.

## Pre-commercialisation Business Analysis

The idea of this stage is to have a final look at the sense of the project before committing the business to large scale resources and risk. It involves a financial or business analysis following product development but prior to full-scale launch.

| Approach | Used in the Case Study firm |
|---|---|
| A detailed financial analysis, involving a return or profitability assessment. | N/A |
| A review/integration of marketing information only: sales forecasts and marketing cost projections. | N/A |
| A cost review: a review of distribution, production and marketing costs. | N/A |
| Carried out by supplier chain customer | N/A |

This stage was not applicable at FibreCo for what were small scale trade fair samples.

## Production Start Up

This is a less recognised stage where changes to production facilities might be needed for a new product.

At FibreCo applications development since the samples are only for the trade fairs. Nevertheless not all samples worked either at the internal Pilot Plant or at partner customers. Production changes were then needed to succeed but if these were of a major nature there was not much time to carry out extended changes and still meet the trade fair deadlines on either internal or external developments.

| Approach | Used in the Case Study firm |
|---|---|
| A few changes to the production facilities needed for the new product. | Yes |
| Acquisition and commissioning of significant new equipment and production facilities, sometimes a new factory. | No |
| Quality control checks at product start up. | Yes |
| A recognized step but no changes to the production facilities. | No |
| Carried out by supply chain customer | No |

## Market launch

This stage involves the conscious launch of the product, on a full-scale and/or commercial basis; an identifiable set of marketing activities specific to this product. At FibreCo this was the main focus of the applications development activity and culminated in showing new products at the trade fairs and this was a marketing activity.

| Approach | Used in the Case Study firm |
|---|---|
| Trade literature, trade shows and trade advertising but no special promotion or training for the sales force. | No |
| Trade literature, trade shows and trade advertising plus a strong sales force promotional effort; demonstrations, conferences, and seminars for customers. | Yes |
| Trade literature, trade shows and trade advertising plus special training for the sales force. | No |
| Carried out by supplier | No |

## NPD Activities Conclusions

The table in Figure 4.26 below summarises the situation at FibreCo:

| NPD Activity Stage | Use at FibreCo |
|---|---|
| Initial screening | Yes |
| Preliminary market assessment | Yes |
| Preliminary technical assessment | Yes |
| Detailed market study/market research | No |
| Business/financial analysis | Yes |
| Product development | Yes |
| Product testing In-House | Yes |
| Product Testing with the Customer | No |
| Trial Market/Test Sell | No |
| Trial Production | No |
| Pre-commercialisation business analysis | No |
| Production start up | No |
| Market Launch | Yes |

4.26: FibreCo NPD Activities

FibreCo scores only 7 clear yes results out of 13 for the activities above and must therefore be considered average in terms of the NPD Process efficiency. Of the six steps not completed efficiently at FibreCo, three were carried out at customers in the supply chain.

The findings **support the proposition** that textile and clothing supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.

### 4.4.3 FibreCo NPD Strategy

There was only limited internal documentation or data available about FibreCo strategy in the case study findings. However the external effects of strategy decisions could be seen. For example the company was re-organising the NPD area during the study and downsizing the development staffing with redundancies. Only recently the parent company had been sold and the FibreCo business was for sale.

The FibreCo business was basically a raw materials company developing fibres in the research laboratories. Much of the NPD effort seen in the case study project intervention was concerned with short term development of downstream supply chain types of product prototypes designed especially to promote the FibreCo products. The company was also keen to obtain a better level of adoption of its latest new product, FibreB. The Industry Forum project was concerned to investigate FibreCo management perceptions regarding FibreB and attitudes of downstream consumers to products containing FibreB. The company NPD strategy can be understood in terms of the focus of development efforts. Firstly the company continued to research new materials. The business also helped downstream supply chain customers to resolve problems in the development of their own products. Finally the company developed new downstream customer types of products. The strategy therefore was, having invented a new fibre, to maintain a high level of visibility for the new product amongst supply chain users and to increase the level of customer acceptance and adoption.

The fashion supply chain has to develop new products for each season, following fashion trends that include changes from previous season's use of raw materials. With new fibres taking more than five years to develop, the focus of the NPD strategy of this raw material supplier was therefore to ensure that, at the appropriate time in the garment development cycle, FibreCo show fashionable new product ideas in fabric form at six monthly trade fairs. The objective is to make the FibreCo products appear to be a logical choice, that fit the latest fashion trends, for garment and retail buyers for the coming seasons rather than alternative products that are available. Application development was not the only customer focus since the technical service department was busy solving day to day customer processing problems on new supply chain fabrics.

The research proposition suggests that a supply chain supplier would have a strategic NPD focus on the more immediate and short term customer needs on the basis that of the choices between long term and short term projects or between existing or new markets should prefer the short term and existing customer. The evidence from this case study is that FibreCo does concentrate on the shorter term projects and the focus is the existing customers for technical service and potential short term customers for the coming season's fashion garment products.

The conclusions are that the findings **support the proposition** that textile and clothing supply chain firms select an NPD strategy that focuses resources on existing customer short term new product needs.

### 4.4.4 FibreCo NPD success measures

From the literature on NPD, success measures for new products can include:

- The level of acceptance by customers as measured by sales revenue
- The extent to which a new idea passes through the development stages and reaches launch
- The ability of the product to achieve margin goals
- The achievement of a launch date on time
- The quality of the product

FibreCo managers were concerned about sales revenue from the main new product FibreA since it had fallen by 40% in a year at the time of the case study intervention projects. The latest new product FibreB was not being adopted by downstream decision makers and FibreCo managers were keen to discover why this was happening. There was a clear link between the lack of adoption and poor sales in the mind of some staff.

> **"Our brand is an ingredient brand not a consumer brand." FibreCo Marketing Manager, 2001**

The company saw a need to get closer to the retail buying decisions. Success for a retailer with FibreB would mean success for every part of the supply chain including FibreCo.

**"We need to get ourselves in a better position to have influence on the supply chain. We need to get further up the supply chain." FibreCo marketing manager, 2001**

FibreCo, as we have discussed above had three timescales for NPD including long term Fibre Research, the six monthly applications development for influential trade fairs and day to day resolving of problems for customers product development by the technical services team. We have seen that only the fibre research type of NPD at FibreCo leads to new products of the type made by FibreCo since the applications development leads to customer products and the technical services also leads to new customer products. Success for these different NPD routes was measured in various ways. Fibre research was a success when a new type of raw material could be discovered and then commercially developed for use by downstream applications. The Applications Development side was successful when new products containing FibreCo products were developed in time for the trade fair and then if downstream customers took up the FibreCo products for their own NPD programmes for the coming fashion season. Technical Services were successful when a customer processing problem with FibreCo products was resolved and the database of knowledge about how to process the new fibres was increased.

FibreCo had two products, namely FibreA and FibreB. FibreA had been very successful and this had led to the building of two production facilities. However FibreA had then lost sales when fashion trends moved away from soft touch fabrics.

Success for FibreB, which had been developed for knitted applications, would be when more retailers and knitwear manufacturers realised the benefits of the product and began to use it more in their own product developments.

In a supply chain one might expect that sales success had already been assured by the supply chain existing to supply a particular product range and that success was therefore more about meeting launch and delivery deadlines rather than sales targets.

For FibreCo, with an investment in new production facilities, financial success in the long run was more likely when the fibre production plants were full and this in turn needed a steady demand for the products caused by the use of FibreCo products in each

season's new garment manufacturer or retailer ranges and the resolution of the processing problems that the supply chain experienced on a regular basis.

Success for FibreCo NPD teams, with most development effort aimed at the trade fairs and solving processing problems, was when the new products were developed on time and when more downstream customers had success in using the products. The Industry Forum findings suggest that before downstream customers would develop products there was a need first for customers to accept FibreB and adopt it for their own new product developments. This reflects the notion that NPD success can be in the opening up of new opportunities and markets (Cooper & Kleinschmidt, 2000).

For FibreCo, a company based on a new raw materials technology, success for most of the product development activity is when downstream customers accept the new innovations and start to substitute them for existing products in their own new product ranges. The first milestone and hurdle for FibreB success would be when knitwear firms adopted the basic attributes of FibreB as advantageous and started to sample and use the product in their own ranges. Downstream adoption was the key to eventual sales success.

The proposition that textile and clothing supply chain firms use non sales based measures for new product success is therefore **supported** in this case study.

### 4.4.5 FibreCo product newness

The NPD literature suggests that:

- Most new products are line extensions
- Newness exists on a continuum from low innovation to high innovation
- Being a high or low innovator is better than being in the middle
- Newness factors can be in terms of product, delivery, market or production technology
- Familiarity with existing factors helps success
- New products and markets that match existing company skills help success

FibreCo as we have seen had three types of NPD:

The Fibre Research type had led to two 'new to the world' products that were highly innovative and had unique features. The Industry Forum workshops had investigated the perceptions of FibreCo managers about the benefits of the new products compared to other existing products in the marketplace. Whilst FibreB had unique attributes, not all of them were necessarily sought by customers. Some attributes were expected. The Kano model mapping highlighted the various attributes in the Figure 4.25 below and we can see that FibreCo managers though that colour depth, dye uptake, biodegradability and luxury handle would 'delight' garment customers. This was in contrast to the results of the consumer survey that showed that the delighters were luxury feel and washing performance.

| ***Must-be attributes*** | ***Linear attributes*** | ***Delighter attributes*** |
|---|---|---|
| Doesn't shrink<br>Moisture absorbency<br>Excellent laundering | Natural in origin<br>Easy to dye<br><br>Value for money | Depth of colour<br>Superior dye uptake & retention<br>Completely bio-degradable<br>Luxury handle |

Figure 4.25: Kano Mapping. Source: Redfern & Davey, 2004.

Technical services staff was involved in trying to enable downstream customers to be able to process FibreA and FibreB without any problems. FibreCo had found it difficult to obtain adoption by some key garment markets such as knitwear for FibreA, partly due to the physical properties of the new product that made it unsuitable. FibreB was designed to alleviate these problems in knitting but customers were still not convinced. It seemed that a reputation had developed of 'difficulty' with FibreCo products.

The applications development team were focussed on the seasonal promotional activities of applying FibreA to the new seasons fashion looks. The fabrics produced were still relatively new in terms of raw materials since FibreA was a new type of fibre but the fabrics were line extensions of existing types of fabric.

The type of newness at FibreCo therefore included:

- New to the world products
- Line extensions
- Market development
- Technology development
- Application development

We conclude that in the FibreCo case study the findings **do not support the proposition** that textile and clothing supply chain firms develop new products that are line extensions

### 4.4.6 FibreCo Senior Management

The NPD literature suggests that senior managers in a company can have an influence on the NPD process in a variety of ways:

- Using their authority in:
    - Setting the direction of NPD strategy
    - Setting the NPD organizational structure
    - Managing resource allocation to NPD projects
    - Making project go/kill decisions
    - Communicating NPD objectives
    - Establishing accountability for meeting objectives

- Giving their support in:
    - Establishing/signalling an innovation culture
    - Managing people and functional relationships
    - Giving personal commitment to NPD
    - Having a balanced approach covering both technical and marketing aspects

The research proposition suggests that senior managers in a fast moving supply chain environment would slow the NPD process down if they were too involved in every project go/kill decision at each stage on the NPD process.

At FibreCo the senior management had, over time, established the direction of NPD strategy to have the three arms to NPD of fibre research, applications development and technical services. This strategy had also established the structure of NPD organization and the resources allocated to each arm. Senior managers were not involved in the individual projects for the applications development or for technical services. The applications development team met to discuss progress on developments and had a budget for the work preparing for the trade fair.

Senior managers were involved in the Industry Forum project at intervals and came to support the final presentation of the consumer survey results. The FibreCo project leader supported the I.F. work personally by giving a presentation about the project at the Industry Forum annual conference.

FibreCo had a balanced approach to NPD in terms of working on both the technical aspects of NPD through the fibre research and technical services and the company also put effort into the marketing aspects through the sample development and promotional work at trade fairs. However FibreCo did find it frustrating to not understand why knitters and retailers did not adopt the latest product FibreB and the Industry Forum market survey and workshops were designed to investigate the needs of the downstream stakeholders including consumers.

The conclusions are that whilst senior managers would almost certainly have been involved in decisions about building new manufacturing plants to commercialise the FibreB invention they were generally not involved in the day to day decisions about the customers technical problems or the seasonal development of fabric samples for the trade fairs.

Therefore the findings **support** the proposition that clothing and textile supply chain firm's senior managers are not involved in the individual project decisions.

### 4.4.7 FibreCo NPD Organization

The literature on NPD suggests that firms need good structures to manage NPD across departmental functional barriers and multi-functional teams that meet regularly are the best way to manage this. The proposition suggests that supply chain members were likely to have structures in place to deal with the other partners in the supply chain.

FibreCo were not as involved in individual new product projects in the retail clothing supply chains. The focus of seasonal NPD efforts was in general persuasion and promotion at trade fairs rather than on specifics range developments.

Teamwork within FibreCo was in evidence with a co-ordinated effort across the FibreCo departments to manage the development and launch of fabric samples for the trade fairs. The applications development department also had contact with downstream processing customers who were producing products for the trade fair where FibreCo did not have the expertise or capacity. There was no evidence that FibreCo was in regular contact with downstream customers or retailers about future garment developments for the season ahead.

The main communication method for FibreCo was the trade fair. The trade fair for fabrics takes place before garments are developed and represents an uncoupling of the textile development cycle from the garment development cycle (Tyler et al, 2000). The effect of this de-coupling is that retailers and garment makers may work closely together on specific developments for an approaching season and even try to respond to demand within a season. However fibre, yarn and fabric producers tend to be less involved in these individual projects.

The evidence of the case study is that FibreCo does not have regular structured meetings or mechanisms to communicate with other supply chain members.

The findings **do not support the proposition** that textile and clothing supply chain firms use structured communication methods with each other in the NPD process.

### 4.4.8 FibreCo NPD Tools and Methods

Research indicates that firms use a variety of tools and methods to improve NPD success including brainstorming new ideas, CAD/CAM to speed development cycles, strategic buckets to focus NPD resources and project management techniques. The research proposition suggests that in a fast moving responsive lean supply chain situation time is of the essence and tools to ensure on time development might be used.

At FibreCo there was a timetable for the upcoming trade fairs. Projects tended to be submitted to the trade fair if they were ready rather than being managed for a particular date. In addition projects were often initiated by internal staff members who had their own pet projects and ideas. FibreCo had recognized a need for a better internal management of the whole NPD portfolio and timing in the applications development department.

The conclusions of the study are that FibreCo was not really involved in supply chain projects with customers where product ranges were being developed to a deadline launch date. Whilst FibreCo did have an application development NPD process with a deadline there was no use of planned submission dates for prototypes.

The conclusion is therefore that the findings therefore **do not support the proposition** that textile and clothing supply chain firms use tools to monitor adherence to the product development schedule.

### 4.4.9 FibreCo Case Study Summary

*NPD Models*

The analysis found that FibreCo had various types of development activity ranging from fundamental research into materials taking many years, to production of prototype fashion fabrics aimed at trade fairs and development of processing routes at supply

chain customers. FibreCo therefore did not fit neatly into a particular type of generic NPD model although in overall terms it appears to be mostly a technology push system.

*NPD Stage Activities*

FibreCo, in developing seasonal fashion fabrics for trade fairs, carried out some activities themselves but since products were generally only samples and not for sale they did not carry out production oriented validation steps. About 30% of samples were made externally at downstream customers and processors.

*NPD Strategy*

Whilst the NPD strategy of basic research into materials did produce new products this was a long process and FibreCo needed to ensure that the latest products continued to be marketed to try and improve the adoption rate. The company also allocated resources to solving customer problems. In terms of the Kano model thinking though these would be seen as customer complaints and as such cause dissatisfaction. The process of providing technical service might also be seen as a continued testing and validation process with customers for the original FibreA product. Much of the development work of FibreCo was aimed at influencing supply chain customers in the short term in their seasonal range development.

The firm wanted to get nearer to retailers and the intervention project was aimed at first understanding consumer attitudes to the garment features that were influenced by fibre product properties.

*Success measures*

With a low level of sales and overcapacity the main aim of NPD effort was to improve adoption rates by supply chain customers. With little direct contact with decision makers at retail or garment manufacturing it was difficult to see the immediate impact of development and marketing activities. Success was difficult to gauge for the effort that went into developing samples for the trade fairs since whilst supply chain customers may visit the fair and take samples away the decision to follow up with a range development was not obvious. However the in-house controlled labelling control

scheme ensured that FibreCo was aware of the level of downstream activity in garment making using FibreCo products.

*Newness*

FibreCo was a fibre company and the existing products that it had were types of fibres that had recently been invented and commercialised. The efforts of the company whilst still researching into new raw materials was largely directed towards producing new products that were not fibres but new yarn and fabric products of the type developed by downstream supply chain customers. These were promotional materials for the existing FibreCo products aimed at trade fairs. The company also put resources into solving downstream application problems that supply chain customers had with FibreCo existing products. This was a type of extended field testing and validation of the products. The Industry Forum intervention project was aimed at extending the market range and obtaining adoption of the latest products in knitwear end uses. The company therefore had a range of newness types as a focus of NPD activity.

*Senior Management*

At FibreCo the long term fibre research took many years to develop new products. Most of the NPD activity in the interim was based around developing yarns and fabrics that could be used at trade fairs to influence downstream manufacturers and buyers of garments. Senior management were not directly involved in the development of individual products for these promotional activities but agreed a budget cost allocation. Senior managers were also not involved in the day to day selection of customer processing problem solving using FibreCo products.

*Structured communication methods*

With NPD difficult enough within firms in terms of obtaining good communications between departments the research proposition is that supply chain firms would require structured communications.

At FibreCo whilst there was interaction between the company and customers on the subject of improving processing of FibreCo new products on the customers'

manufacturing equipment, this was an ad hoc arrangement. FibreCo did have regular use of customers who would process FibreCo products in order to generate the trade fair samples but again this was not a formal arrangement since FibreCo would purchase products.

The main regular contact with the downstream supply chain customers was the six monthly trade fairs such as Premier Vision in Paris. Here FibreCo would show the development fabrics that had been produced at FibreCo as examples of the latest fabric fashion trends.

The FibreCo efforts to communicate with the supply chain customers were not about a specific new product development launch by the retailer or garment maker and this together with the fact that FibreCo was at the start of a long supply chain may explain the lack of structured methods of communication.

*Monitoring adherence to the development schedule*

The research proposition suggests that in a lean supply chain there would be a focus of NPD activity on the time taken to develop products and appropriate monitoring.

At FibreCo much of the NPD activity was focused on marketing and promotion and the development of samples for the trade fairs. However whilst the trade fair was on a fixed date developments were often pet projects of NPD staff and there was no focus on monitoring progress to ensure that developments would be ready for a particular fair.

*Propositions Conclusions*

The research propositions concern the impact of being a supplier in a supply chain. Of the eight propositions the following are supported by the analysis:

- **Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

- **Supply chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**

- **Supply chain firms use non sales based measures for new product success.**

The following propositions were not supported:

- **Supply Chain firms adopt 4th Generation faster, flexible NPD models.**

- **Supply chain firms develop new products that are line extensions.**
- **Supply chain firms use structured communication methods with each other in the NPD process. Supply chain firm's senior managers are not involved in the individual project decisions.**

- **Supply chain firms use tools to monitor adherence to the product development schedule.**

## 4.5 Case Studies Conclusions

This chapter has analysed the four case studies and considered the research propositions in each case in order to establish the extent to which the UK Textile and Clothing Supply Chain uses methods for NPD that are oriented towards the needs of the supply chain partnerships. The research propositions have each been tested in turn for each of the four case studies to determine the extent to which this sector is similar to the findings of the extant literature or has a unique set of sector specific systems and methods for NPD.

The next chapter examines the four case studies in order to discern similarities and differences and overall answers to the research propositions and the research question.

# Chapter Five - Discussion of Findings

## 5.0 Introduction

The previous chapter analysed each of the case studies' findings in turn with respect to the eight research propositions. This chapter looks at each proposition and summarises the analysis for each proposition identifying those common features of NPD in the UK Textile and Clothing Supply Chain and answering the research questions which were:

- How is NPD organized?
- How is NPD managed between the clothing retailer and manufacturers?
- Are the NPD processes considered efficient?
- What are the stages in the NPD processes?
- What is senior management involvement?
- How is success measured?
- How new are the products and services concerned?
- Are the latest generations of NPD model in use?

## 5.1 NPD Models

The proposition tested in this section is:

**Textile and clothing supply chain firms adopt 4th Generation faster, flexible NPD models.**

The thinking behind this proposition is that a supply chain, like the UK Textile and Clothing Supply Chain that has both deadline launch dates for consumer clothing garments and a 'lean' paradigm, would tend to use faster NPD models. Over the past 30 years successive NPD models have aimed to show conceptually how to speed up

development and therefore the more recent faster models should apply in the sector under consideration in this study.

The table (figure 5.1) below shows the various factors that have typified the NPD models in the literature.

| Factor | 1st Generation Technology Push | 2nd Generation Market Pull | 3rd Generation Stage Gate | 4th Generation Fuzzy Stage Gate | 5th Generation Lean Innovation |
|---|---|---|---|---|---|
| Sequential | Yes | Yes | Yes | No | No |
| Technology focus | Yes | No | Yes | Yes | Yes |
| Market focus | No | Yes | Yes | Yes | Yes |
| Incremental | No | Yes | No | No | Yes |
| Functional separation | No | No | Yes | No | No |
| Supplier integration | No | No | No | Yes | Yes |
| Multi-functional team | No | No | No | Yes | Yes |
| Fixed decision gates | No | No | Yes | No | No |
| Concurrent methods | No | No | No | Yes | Yes |
| Flexible gates | No | No | No | Yes | Yes |
| Time Focus | No | No | No | Yes | Yes |
| CAD/CAM | No | No | No | No | Yes |
| Quality Focus | No | No | No | No | Yes |
| Robust design carry over | No | No | No | No | Yes |
| System enablers | No | No | No | No | Yes |

Figure 5.1: Factors in NPD Literature Models

We can see from the table in Figure 5.1 that NPD models have development a more balanced focus on both market and technology and that the sequential method with departmental separation has been abandoned in favour of multi-functional teams and concurrent styles. More recently there has been a move to a time focus and the use of

I.T. methods, robust design carry over and system enablers. Suppliers have also been integrated into the NPD process.

In this section the four case studies are compared with this same list of factors (See Figure 5.2). The proposition set of factors is also included in order to show the proposition test. Each factor is then discussed.

| Factor | KnitwearCo | RetailCo | DyeCo Supply Chain | FibreCo Application Development | 4th Generation Fuzzy Stage Gate |
|---|---|---|---|---|---|
| Sequential | Yes | Yes | Yes | Yes | No |
| Technology focus | No | No | No | Yes | Yes |
| Market focus | Yes | Yes | No | Yes | Yes |
| Incremental | No | Yes | Yes | Yes | No |
| Functional separation | Yes | Yes | Yes | Yes | No |
| Supplier integration | No | No | Yes | No | Yes |
| Multi-functional team | No | Yes | Yes | No | Yes |
| Fixed decision gates | No | No | No | No | No |
| Concurrent methods | No | Yes | No | No | Yes |
| Flexible gates | No | No | No | No | Yes |
| Time Focus | Yes | Yes | Yes | No | Yes |
| CAD/CAM | Yes | Yes | No | No | No |
| Quality Focus | Yes | No | Yes | No | No |
| Robust design carry over | Yes | Yes | No | No | No |
| System enablers | Yes | Yes | Yes | No | No |

Figure 5.2: Cross Case Comparison of NPD Model Factors

Sequential

All of the case studies had a sequential approach to NPD where product development moved from one department to the next in a logical sequence. This contrasts with the 4th generation NPD model where more concurrent methods are included and steps may be taken out of sequence.

The sequential nature of the clothing development process is best illustrated by the critical path methods used. In the typical critical path each step in the process was set out in a sequence with clear responsibilities for action and decisions.

The critical path in turn was driven by the deadline launch date for the clothing ranges where for example all the autumn/winter ranges across a store were launched in August each year. With a fixed end point of the launch date the various retail category departments all needed to co-ordinate the range development stage timings. It follows that individual products and supply chains had to conform to the launch date. In turn the various new product developments each had to conform to the steps and timing of the critical path.

The 4th generation NPD model avoids sequential methods in order to achieve the faster development time of concurrent methods. In the case studies the launch date and need for speed were achieved through the use of the critical path timetable and the use of structures and systems. For example clothing suppliers used existing product templates, similar to the Rothwell (1994) notion of carry forward of robust design. This use of previously tried and tested designs made the cycle times faster. RetailCo even used the same component raw materials from previous products to speed up the process.
Modern NPD models in the literature suggest a flexible approach. However it would not be sensible for suppliers and retailers in the clothing supply chain to have varying dates and ad hoc approaches to NPD steps because this would jeopardise the launch date. The conclusion is that the flexibility of more modern NPD processes has possible disadvantages when a supply chain is seeking to achieve a deadline launch date. The case studies demonstrated the use of rigid processes that retailers and suppliers understood and adhered to. For instance clothing suppliers were aware of the quality standards and fit specifications of the retailers and had systems in place to check new

products to these standards automatically, knowing that if the standards were met the retailer would then generally approve the product.

Technology and market focus

The notion of technology or market focus appears in many aspects of the NPD literature from the early NPD models where firms invested in scientific research to develop new materials, to the need for a strategy that balances the natural production orientation of a manufacturer with a need to ensure that market needs are satisfied. Later NPD models have market focus as well as technology focus.

Only in the FibreCo example was there a dominance of a technology focus. The company NPD effort in fibre research was clearly science based. But the technical services and applications development were aimed at customers' new products that would demonstrate the FibreCo raw material capabilities. Therefore, even in this raw material company, where we might expect a technology focus, there was recognition that the market needs had to be understood. The fibre firm therefore developed customer new products as a promotion aid or assisted customer new product development.

The remaining case studies were dominated by the market influence of the retailers. Products were developed in response to the retail's brief and that brief was in turn a result of fashion trend research. Moreover the need for speed to meet the launch date had an influence in that this limited the level of innovation to the more familiar technologies. RetailCo, for instance, developed products in under seven weeks from concept to store launch. This left little time for development of new production technology.

The UK textile and clothing supply chain case studies consequently demonstrated a lack of consumer focus in the development process since clothing ranges were created and assembled with the use of fashion trend forecasts rather than from consumer market research. Retailers planned the level of sales without market research regarding potential sales. The development process timetable was in any event far too short and volume of new products very high, making it difficult to make project based market research a viable proposition. There was therefore an element of pushing products at

consumers. If the consumer did not appreciate the new product the retail price would be then reduced until it represented a bargain at which point the excess stock would be sold.

The very fast development time at RetailCo effectively gave a market responsive system. The much slower methods in the DyeCo supply chain meant that the development cycle took many months and the firm was less responsive. The use of a system where retail buyers decided 12 months in advance what consumers will want cannot be considered as a market focus system. KnitwearCo on the other hand, as a supplier, developed every idea that the retail customer put forward and must therefore be considered market focussed.

The case studies also showed that supply chain managers were cautious in technology in that tried and tested production methods were used for new product development. They did 'stick to the knitting' and these tried standards helped to produce robust products quickly.

The retail customer also dominated the focus of product development for suppliers and therefore we automatically conclude that suppliers had a market focus in NPD. In the retail part of the chains, however, the buyers were given the responsibility to make selections of new products and they therefore had to understand the needs of their consumers through a somewhat trial and error approach and surveillance of competitor products.

Incremental

The literature suggests that incremental approaches are a part of the market push approach to NPD and yet with Stage Gate systems this was less of a feature. Rothwell suggests (1994) that 5$^{th}$ generation NPD has moved back to incrementalism that is almost continuous and has associated carry over of previous designs.

All the case studies used incremental methods for NPD that stayed close to previous lines except for KnitwearCo where the retailer developed the concept, in the form of a new sketch and swatch. The technicians at KnitwearCo had to then interpret the design,

using CAD and a library of stitch constructions, but even then previous templates and the same machinery were used.

At RetailCo there was use of supplier-originated prototypes that were put forward directly to the retailer for consideration by the supplier or in the case of FibreCo via a trade show. These prototypes were often made using standard product templates and were therefore incremental. The fixed launch timescale and need for standards for quality mean that suppliers were less innovative than they might have been if acting independently of their supply chain. KnitwearCo was also working to a short timetable and deadline launch date but had allocated enough resources to allow the retail customer to send in hundreds of concept sketches per season. The short timescale meant that new products had to be somewhat similar to earlier designs and also meant there was no time allocated to longer term cost reduction developments. KnitwearCo additionally stayed close to existing production methods for most new products, but whilst designer sketches and colours were often different from last season, the yarns and production equipment were generally those that had been used before.

The overall conclusion is that the processes and systems in the case studies were in general similar to the 2nd generation NPD models of incremental adaptation of earlier technology in order to meet future market needs and to reflect fashion trends.

Functional separation and multi-functional teams

The literature recommends a move to more multi-functional teams to avoid the 'over the wall' slowness of NPD where projects pass from one functional department to another in turn.

The development process at KnitwearCo was a 'pass the parcel' type with departments managing their own part of the development often as a small commercial order. There were no multi-functional teams. At RetailCo each head office category team worked closely together and involved the planning office designer and production staff in meetings about developments. Each function still carried out the tasks separately and the meetings were not used to monitor progress of each project since once the buyer had selected a project it would go through the stages of development automatically with junior staff managing the validations. A similar situation existed in the DyeCo retail

supply chain. The retailer had strong internal multi-functional teams but the functions and suppliers, independently and at junior levels, managed the prototyping, validation and adherence to the critical path.

FibreCo was not really involved in retail projects since the firm was developing its own samples of downstream customer products. Each FibreCo project was worked on by separate functions. And the team meetings were more of a reporting than progressing nature.

The lesson from these studies is that systems and standards are used by junior staff to make progress on the prototypes that have generally been selected by buyers early in the process. Importantly new developments *are expected* to complete the development process and the functions are expected to carry out the testing and approval using the established standards and formal systems of master copies of products.

In the literature, multi functional teams are designed to:

- Speed up NPD
- Remove the problems of functional differences of objectives and perspective
- To improve communications
- Progress projects

What is noticeable in the textile and clothing supply chain is that the speed is achieved differently by:

- Early buying decisions for products that make up co-ordinated ranges
- Critical path timetable for stage completion and launch
- Prototyping cycling with validation and approval mechanisms
- Projects are expected to complete development once selected by the buyer
- Teams meet to feedback information
- Raw material suppliers are not involved in seasonal range development except to influence the early buying decisions

Clearly the UK textile and clothing system uses a different NPD model to achieve speed without multi-functional teams.

Supplier integration

Supplier integration is a feature of the 4th generation NPD model as part of a lean paradigm based on the Japanese Toyota principle of not owning all the manufacturing and then developing new products with supplier involvement. The proposition was developed assuming that in a supply chain the case study firms would have suppliers, or be suppliers, who were truly integrated into the development process.

However only in the DyeCo supply chain was true supplier integration apparent since the retailer gave the suppliers a development brief. Additionally the supplier involvement was planned in to the retailer's critical path process and then suppliers went to the retail product development meetings.

Elsewhere the case study firms did not involve the supplier in NPD or were not involved as suppliers in the development process.

This lack of involvement had two cause types. First the retailers made all the important decisions on the basis of a concept that they had developed. This left the supplier with a minor role of developing a similar product to previously, using similar technology and competing with other suppliers. The second cause type was at FibreCo where the firm was simply not involved in seasonal project development so there was no opportunity for integration on specific products.

As a consequence of the power of the retailer and the general failure of suppliers in clothing to become truly involved in decisions, project teams are not operating in a true way that breaks down functional barriers. In spite of a lack of true supplier integration the clothing supply chains operated quickly and co-operatively as a result of clear retail-led systems and specifications that were understood and used by those involved.

Fixed/flexible decision gates

The classic stage gate NPD process uses decision gates after each process stage to allow senior managers to make go/kill decisions about the various competing projects. Flexible or conditional gates are proposed in the later fuzzy stage gate model in order to

provide concurrent stage work or overlapping of stages. The reason for this change was to improve speed of development.

The case studies involving suppliers and retailers in specific range development projects did not use this successive go/kill decisions system. Instead there was a single and early go decision made by the buyer or selector who had a budget to spend. There were therefore no successive, post-stage gates of either the fixed or flexible variety. The deadline launch date would make flexibility difficult to allow in a retail clothing supply chain since the timetable would have dates by which steps had to be completed and by whom. Flexibility would imply some scope for early or late stages and clearly in a critical path system where ranges are being developed for commercial launch on the same date, and in quantity, the suppliers need to have approval decisions made on time by the retailers in order to obtain materials. Additionally the retail buying teams need the prototypes on time for assessment relative to the concept brief. Thereafter the successive master copies of the products - the seals - need to have passed the technical specifications on time. The entire critical path system relies on everyone understanding the standards and detailed steps and working to the timetable.

Successive gates manned by senior managers are not used since junior staff carry out validations, retailers decide on which products to develop and financial decisions are avoided by the use of set gross margins.

Concurrent methods

In the literature the use of concurrent methods in the later models was also a method to speed up the development process.

As explained in the previous section, in the case studies there were no overlapping gates and we have seen that there were less stages and importantly fixed timings and therefore concurrent methods were not used. RetailCo, though, did have a system that allowed the planner to call off raw material and at the same time the fit/prototype iterations continued. This was a type of concurrent method although the time saving was mostly in having the buyer commit to the base raw materials at the start of the season. In other words the speed came from a single early go decision.

These textile and clothing supply chains therefore used other means to obtain speed although with functions working separately there were times when more than one part of the process was taking place at the same time. This was not organised concurrent development but a case of opportunity due to early buying decisions and the type of product. For example at RetailCo the prototype could be made using the base fabric in any colour and the fit and concept interpretation checked. Once an order had been placed the planning office could book capacity and order commercial quantities of raw materials in the right colour. A similar situation existed at KnitwearCo where the yarn test would use any colour and this allowed the designer to check the stitch look without waiting for the right fashion colour.

At FibreCo, timing was less important for promotional prototypes and if a project missed the next trade fair then it could go into the following one. In the DyeCo supply chain the retailer had a step-by-step approach but again the buyer made a go decision early and this did allow development, testing and validation to go ahead.

Concurrent methods help speed and also imply flexibility in the NPD process. As we have argued in the previous section a critical path system or a deadline launch date for co-ordinated ranges covering various supply chains needs rigidity not flexibility because there is a need for strict adherence. For instance submitting a prototype in early when there is a deadline date for approvals to be fed back may not in any case lead to a saving in time. A good example of this was in the RetailCo case where the planning office designer would send in submits and the buyer would wait for three weeks until other samples from competitors could be seen, before making a decision.

It appears that the deadline launch date in clothing leads to fixed dates for other NPD steps and concurrent methods are not suited to this.

Time Focus

Later NPD models have a time focus with faster development the aim. As we have discussed in detail in the last two sections there is a time focus for those case studies directly involved in retail range developments for a seasonal launch date. FibreCo on the other hand was less committed to a time focus in development although the seasonal trade fair had a fixed date.

The most obvious evidence of time focus is the deadline launch date and associated critical path used by two of the three retailers. At the third retailer the NPD process had a fixed seven-week replacement cycle and the methods used of early buying decisions, pre ordering raw materials and using standard product templates gave a fast development time.

CAD/CAM

Rothwell (1994) suggests that the fast lean 5th generation NPD model uses I.T. to speed up development.

The study results are mixed. Both RetailCo and KnitwearCo used CAD and CAM and this helped the suppliers to cope with the high volumes of new product development in terms of translating concepts into production specifications. There was little evidence of the use of I.T. to speed communication between any of the supply chain partners in any of the case studies. There was a reliance on the physical product that buyers wanted to see and put on a rail next to other products in the range.

Robust design carry over

Rothwell (1994) sees that modern NPD uses existing product building blocks and components to speed the process of development.

There was detailed evidence of the use of standard garment templates and stitch constructions in the RetailCo and KnitwearCo cases respectively. This did help the firms to cope with the high volumes of new developments and to quickly produce a new prototype that would work in high volume production. There would seem to be a trade off here between robust design carry over and higher levels of innovation.

The FibreCo and DyeCo cases did not provide evidence of detailed design carry over. Although it seems certain that in the case of the DyeCo retailer, who wanted only small changes to most new products from the previous products, the domestic suppliers would have used a previous template. However the retailer had moved sourcing offshore and the new suppliers were unlikely to have previous product templates. At FibreCo the company was producing ad hoc promotional samples and these were sourced from a

variety of customers and therefore there were no previous designs available on a regular basis.

System enablers

Rothwell (1994) describes a range of 5th generation primary enabling factors such as flatter structures and more overall integration that includes supplier involvement, internal databases with metrics and external data links.

Almost by definition, supply chains have supplier involvement and external data links. These links in supply chains have been mainly of a logistical nature. However in a product development situation there is an expected use of links as part of the NPD process.

Most of the case studies had links between suppliers and retailers who were working on range development. There were shared metrics that set out the common specifications for new products. Only FibreCo was excluded on the grounds that products were generally mock up prototypes for promotional purposes and so specifications were of less interest than the products' aesthetic appeal.

It is interesting to consider that the UK textile and clothing critical path, use of seals, target margin, price architecture and work with specifications set up a type of enabling system that allows fast development to take place. This will be discussed in more detail in chapter six.

NPD model conclusions

So far we have seen in section 5.1, that the case studies do not fit neatly into any of the five basic NPD models. Even though time is a key focus for the sector in this study, with a deadline launch date for products, the methods used are not those recommended in the NPD models literature. Stage gate methods are not used although there are naturally stages and some selection. However the buyers are those with the empowerment of the budget and they replace the need for gates.

Market focus is also generally missing in the UK textile and clothing supply chain. The products are developed using trend information and a retailer's knowledge of the consumer. Technology focus is also not apparent expect that the same technology is generally used with low levels of newness.

Time is a key part of the focus of those involved in the UK textile and clothing supply chain. The sector does not use the methods of teams, concurrent development and flexibility to achieve a fast development to a launch deadline. Rather there are timetables and enabling systems in place that allow fast development. These are discussed in more detail in the next chapter.

The overall proposition conclusion is that the firms involved in the supply chain **do not use** the 4th Generation type of fuzzy stage gate NPD model with concurrent development, multi-functional team and conditional gates. The sector does not appear to use <u>any</u> of the suggested key NPD models from the literature. The main reasons for this are:

- The NPD models used are not technology push although there is pushing of fashion trend influenced new products to consumers.
- Clothing consumers are not canvassed for views about new products and therefore the market pull model is not apparent. Most new products are however minor adaptations of existing products that reflect the fashion trends for an approaching season.
- The go/kill decisions of Stage Gate types are not generally in evidence in the supplying firms in retail supply chains. Retailers make the decisions on behalf of consumers on what they need for the coming months. Retailers make early new product concept decisions and source product ideas that they select from suppliers' prototype submissions. Once selected the rest of the process has few management reviews but uses master versions of prototypes as a reference point.
- There is a focus on time but not necessarily through the use of concurrent engineering or fuzzy gates to reduce development cycle time.
- The clothing supply chain firms often achieve a deadline for launch through a timetable known as a 'critical path' that the retailer specifies.
- Quality is often built in to the NPD development process through the use of product standards.

## 5.2 NPD Process Activities

The proposition tested in this section is:

**Textile and Clothing Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

As discussed in chapter two it is suggested that NPD processes should have particular activities carried out efficiently (Cooper, 2001; Cooper & Kleinschmidt, 1986, Hart & Baker, 1994). Opinions vary about the total number of steps and the exact activities (Mahajan & Wind, 1992; Page, 1993; Phillips et al, 1999; Griffin, 2002). Cooper and Kleinschmidt (1986) have been able to use empirical studies to show those particular key steps that had been used in the development of more successful products. But firms rarely carry out all the recommended steps. Cooper & Kleinschmidt (ibid) have linked success with the quality of execution of the key steps.

The key steps are those that integrate the NPD process where a balanced approach is used between a market focus and a technical focus all along the development process so that, for example, there are both preliminary technical and market assessments of a project at the start of the process. The pre-development types of activities are considered to be particularly crucial to eventual success (Cooper, 1988). Maintaining the balance of technical and market focus is also important as the project progresses so that for example product testing takes place not only in-house but also by the customer (Cooper & Kleinschmidt, 1986).

The research study found that firms in the retail supply chains shared process activities and there were formal NPD systems that crossed the boundaries of organizations for the development of new products to a deadline launch date. The presence of recommended NPD stage and gate process activities in the case study findings are summarised in Figure 5.3. Here we can see that none of the case studies carried out all the activities, but only carried out between five and nine of the recommended thirteen steps. However, as the table also shows, some stages were carried out elsewhere in the supply chain and therefore the proposition was supported in all the cases.

| NPD Activity Stage | Use at KnitwearCo | Use at RetailCo | Use at DyeCo (Retailer) | Use at FibreCo |
|---|---|---|---|---|
| Initial screening | No | No | Yes | Yes |
| Preliminary market assessment | No | Yes | Yes | Yes |
| Preliminary technical assessment | Yes | Yes | Yes | Yes |
| Detailed market study/market research | No | No | Yes | No |
| Business/financial analysis | Yes | No | No | Yes |
| Product development | Yes | Yes | Yes | Yes |
| Product testing In-House | Yes | No | No | Yes |
| Product Testing with the Customer | Yes | No | Yes | No |
| Trial Market/Test Sell | No | Yes | No | No |
| Trial Production | No | No | No | No |
| Pre-commercialisation business analysis | No | No | Yes | No |
| Production start up | Yes | Yes | Yes | No |
| Market Launch | No | No | Yes | Yes |
| **Yes Count** | **Six** | **Five** | **Nine** | **Seven** |
| | | | | |
| Stages carried out elsewhere | Yes | Yes | Yes | Yes |
| **Proposition Conclusion** | **Supported** | **Supported** | **Supported** | **Supported** |

Figure 5.3: NPD Activities Summary

The findings summarised in Figure 5.3 show that not all the recommended NPD activities are carried out in the case study individual firms. The reasons for this are:

1. The sharing of activities by supply chain partners
2. Less market focus due to:
    a. Private label development
    b. Fashion trend focus
3. Less financial analysis

Sharing of activities

The proposition suggested that in the UK Textile and Clothing Supply Chain the NPD activities would be shared along the partners in the chains. The findings supported this theory with each case study using others in the chain to carry out some of the steps.

This study found that retailers carry out the concept, market and financial assessment activities and suppliers carry out other (production and technical) activities. This may not be surprising. We would expect a retailer to concentrate on sourcing and then selling products.

Less market focus – Private Label Development

The case study firms failed to carry out product specific market focus activities such as market research, often because the retailer decided on exactly which products to develop and what to sell.

Whilst sourcing products, clothing retailers have a choice about the extent to which they develop their own private label products, or purchase products that have already been completely designed and developed by clothing suppliers, or choose to distribute clothes developed by brand names (e.g. Levi or Nike). The retailers in this study had their own private label brands and this may explain why they needed to be involved in many of the NPD stages themselves since the retailers, for instance, needed to co-ordinate designs across and within garment ranges.

It may seem obvious that retailers are not manufacturers and therefore they do not have production facilities and therefore need to involve suppliers in product development. What is not so obvious is why the retailer would not simply buy completely developed new products from a supplier or backward integrate. There are a number of possible reasons why the retailer would rather not completely delegate NPD tasks to a supplier:

1. The retailer sells own label products and wants control over product design, quality and development.
2. The retailer wants to co-ordinate ranges of products.
3. The retailer wants control over the steps and timing so that a launch date may be met.
4. The retailer does not want to backward integrate.
5. The retailer also may achieve exclusivity for new products; maintain a design lead and secrecy if it controls product development.

Equally the supplier has the choice either to own the whole development of new products or to share some of the process steps with a retail customer. The supplying

manufacturer may be able to lock in to a supply chain customer's NPD process and be assured of sales and avoid the need for owning marketing resources. The danger is that the manufacturer may be the weaker partner and supplier margins may be squeezed and thus the supplier will have a weakened product development system.

We conclude that private label clothing retailers have good reasons to want to control NPD and then have to involve others in the NPD process but they do not pass the whole responsibility to suppliers. Product selection decisions by retailers subsequently eliminate the need for market research by the supply chain partners and this reduces the number of NPD steps.

Less market focus – Fashion Trend Focus

Another reason for this reduced market focus is that the main market oriented method used by retailers is to develop new products that are influenced by fashion market trends. The retailers then plan (early in the process) the sales level during the coming season. This left raw material and garment suppliers in the supply chains needing to market their capabilities in order to influence the retail buyers' product selection decisions. The retailer product selection decision makers attend the trade fairs many months before the development season in order to see the new materials developments.

Less financial analysis

Firms tended to carry out less financial analysis due to the use of gross margin targets set by retailers and retail selling price architecture. Thus products were developed aimed at a particular retail selling price and an agreed cost to the retailer from the supplier. The gross margin effectively set a profit level for the manufacturing product developer and the retailer. This meant that there was no need to check the profit at later stages.

The study illustrates that rather than carrying out the recommended NPD steps and decision gates sets of activities, the case studies used a sector specific system for developing new products for retailers.

In the literature the NPD process stage gates are each designed to enable managers to make an assessment of the best products that should proceed along the scarce resources of the NPD process. However in the retail clothing supply chains in this study these decision stages do not take place in terms of committees approving the latest test of the new product or the financial case for each product. Rather the supply chain system agrees early on the size of the market it is hoping to capture, and also decides early on the new products that will be developed at a set profit margin. Then those involved, including retailers and suppliers, progress new developments automatically through the NPD development and validation stages expecting the product to be launched.
The case studies are driven by a deadline retail launch date and the retailers' need to co-ordinate launches of ranges of products. Having templates and specifications, set margins and a 'critical path' of timings for activities help the chains to meet the launch date by reducing the need for management reviews.

Sharing of activities did take place as predicted in the proposition. At KnitwearCo (section 4.1.2) the manufacturer developed the concepts into prototypes and then into commercial products, but it was the retailer who came up with the concepts, set the target level of sales into the market, produced promotional literature and made the go/kill decisions. The retailer in RetailCo also carried out many activities in the NPD process (section 4.2.2) and set many of the parameters for the new products but the supplier did the work of product development. This was a fast process with many small-scale developments that quickly responded to consumer demand with new products every week and whilst some market-oriented NPD process activities were missed, the fast response to the market (sales) was apparent. There was however scope for improvement in the involvement of the manufacturer earlier in the NPD process and faster decisions from retail buyers.

In the DyeCo supply chain case study the retailer carried out most of the planning, analysis, and decision stages (section 4.3.2) whereas the garment suppliers carried out the more physical product aspects including product development and testing.

FibreCo was a raw material manufacturer (4.4.2) and used downstream customers to carry out product development. Unusually perhaps the fibre manufacturer carried out development of customers' types of products and so often produced yarns and fabrics developments and not fibres. The investigation suggests that those raw material

manufacturers and garment processors who were more detached from the retail development of specific product ranges tried to involve themselves in the early concept development decision stages of retail buyers and garment-making supply chain customers.

There is therefore strong support for the idea that supply chains share product development work. This has not made the process slow and those involved know what is expected of them, have standards and structures and have organised appropriately prior to the current development season. Retailers are not manufacturers and whilst they must then delegate the physical tasks of product development and testing of materials they nevertheless use procedures to ensure that their own set of product standards are achieved in the product development.

Whilst the study partly explains that the ideal NPD activities are not all carried in one firm but shared amongst the supply chain partners; the study also demonstrates that the market focus aspects of the NPD process are carried out less often in these case study companies than in supposed literature ideal, since there was little evidence that detailed market studies into consumer needs take place. We might expect product developers to try to answer the question 'Which product should we develop?' by carrying out market research. However in the case studies this market research was missing.

The conclusion of the findings **strongly support** the proposition that UK Textile and Clothing Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.

The reasons for this are that the many retailers sell private label products that they need to co-ordinate in terms of ranges and seasonal launch date. Without manufacturing facilities, retailers work with preferred suppliers on the development process and share the activities. The retailer makes many of the key decisions including selection, selling price, margin and amount to sell. This removes the need for some market and financial assessment stages. Interestingly even a fibre producer at the start of a supply chain develops new products in a co-operative way. These promotional products that were developed were not new fibres but customer's types of new fabrics and garments. This was partly due to a lack of facilities and partly due to the partnerships that existed to develop applications for the first new fibre for 30 years.

## 5.3 NPD Strategy

The proposition tested in this section is:

**Textile and clothing supply chain firms select an NPD strategy that focuses resources on customer's short term new product needs.**

The Innovation Funnel (section 2.1 Figure 5) introduced the idea that there needs to be an NPD strategy *before* the NPD process begins. Those firms that have a strategy step in their NPD process achieve better new product success results (Cooper & Kleinschmidt, 1995a; Griffin, 1997). Crawford (1980) also suggests that better managed firms have an NPD strategy and goals in terms of target business arenas, sales and profits and a program of activities to achieve the goals. Crawford believes firms should try to exploit their strengths and avoid their weak areas. If new product failure is to be avoided there needs to be a balance between the strategic orientation of the firm in both technology and marketing (Cooper, 1975).

The literature (section 2.5) suggests that new product strategies are more successful if they stay close to existing products, customers, markets and technology. Managers need to make a conscious choice of this strategy before the NPD process begins. However managers are also advised to respond to the longer-term needs of the market and changes in technology (Cooper & Kleinschmidt, 1995a). The dangers of only concentrating NPD strategy on short-term needs are that firms may not spend enough time on the right balance of products.

At KnitwearCo the strategy (section 4.1.3) was focussed on the customer's short-term range planning requirements although both the manufacturer and retailer recognized the need for better value products. The customer perception survey found there was nevertheless no work to develop cheaper products or to invest in new technology by KnitwearCo. KnitwearCo devoted most of the NPD resources to the existing customer base and had no long-term product development programmes.

At RetailCo (section 4.2.3) the retail business and supplier were also mostly focused on the short term in the development effort where products were developed in a matter of

weeks from concept to store. This, obviously, gave little time for long-term development. The retailer's strategy was for fast fashion. The DTI intervention project tracked 37 products being developed and launched in 12 weeks providing evidence of the development speed. RetailCo was especially focussed on keeping stores supplied with new fashions that changed every seven weeks. The supplier involved had no long-term development projects and only had the one customer. Product development used existing standards product shapes and dimensions standards. Raw materials were committed early in the development season so products were forced to use these basic materials. Resources were therefore focussed on short-term needs of the value sector clothing consumers.

At FibreCo (section 4.3.3) there was an emphasis of development on short-term customer needs with new products developed for the six monthly trade fairs which would reflect the season's fashion trends. The fibre business hoped to influence retail and garment buyers in seasonal purchasing decisions. The FibreCo business also helped customers to solve their processing problems on new products using the fibre products and this too was fairly short term. The invention of new fibres by comparison took many years.

At DyeCo (section 4.4.3) the dyer and retailer were involved in more far-reaching changes in the types of development efforts, with new supply chains the aim for both. The other case studies where partnerships were stable had a focus on more short-term development projects. At DyeCo there was still short-term ongoing new product business but the retailer was being driven by price deflation to seek cheaper offshore products and the dyer needed to become involved in the new offshore supply route. The existing supply chain relationships had been severed by the move to offshore supply by the target retailer for much of the knitwear product base. In the DyeCo case the business had lost the previous markets and in-house partnerships after the management buyout and the business was trying to develop new long-term partnerships that would lead to future processing orders. The DyeCo target retailer on the other hand was finding UK garment prices uncompetitive and was seeking to build new long-term offshore supply partnerships.

NPD strategy concerns senior management choices about the direction of the firm with regard to NPD objectives, market goals, target arenas for new products and setting programmes of activities to achieve the NPD goals. Strategy for NPD also concerns the level of newness and risk that the firm is aiming at. Is there a plan for steady growth in existing markets using small short-term incremental new product moves or does the firm plan to reach new markets and customers?

One implicit aspect of a supply chain is that it will have been set up to exploit existing competences with a view to achieving a fast lean distribution of new products rather than working on long term developments or new markets. If, as Crawford (1980) suggested, firms should plan their NPD strategy regarding the arenas (where they will market products) and set targets for the development of products for particular markets, these supply chain firms would then have to decide on whether they continue the arrangements between suppliers and retailers since these partnerships represent the chosen market.

The conclusion of the study is that companies in existing supply chains do develop new products that satisfy short-term needs. This was particularly the case at RetailCo and KnitwearCo where there were virtually no other development projects than the ones needed in the next few weeks and months and FibreCo had much of the effort devoted to the next trade fair timing.

However in the clothing business the sales are seasonal and, therefore, this short-term focus may be driven by seasonality rather than the reason for a short term approach being that those involved are part of a supply chain.

The findings **partially support** the proposition since three of the four companies were largely involved with seasonal development of products for existing customers' short term needs.

## 5.4 NPD Success Measures

The proposition tested here is:

**Textile and clothing supply chain firms use non sales based measures for new product success.**

With success factors a key focus of NPD research (Craig & Hart, 1992; Ernst, 2002) it is surprising that empirical studies lack a clear definition of success. However firms themselves do use more than one measure of success (Griffin & Page, 1993). Whilst there are no clearly agreed definitions, researchers agree that there is a limited list of success factor types including customer and financial. There are also product related measures such as speed to market and development cost. There is an additional suggestion that a product may be successful if it opens up a new window of opportunity (Cooper & Kleinschmidt, 2000).

There may well be some trading off in terms of success measures since it may be difficult to develop a new product that meets more than one success criteria. The goal is presumably to develop a new product that is a commercial success, has good sales, a large market share, is very profitable, easy to manufacture and is a technical marvel at the same time. This represents a difficult goal. Being first into a market with a totally new product may well give opportunities to make good profits and grow market share but unless patents protect the product then competitors are bound to join in soon with copycat products. Success measures may also have an impact on portfolio management where for example a project may be selected at decision gates because it promises a better level of sales than another project.

The proposition is based on the notion that in a supply chain the retail customer may assure some level of sales for a supplier's new product and therefore we might expect success to be measured in other ways. The analysis demonstrated some support for the proposition. The current research findings are interesting since they show that the speed of the development was linked to the early definition of financial targets for supplier and retailer through the mechanism of the gross margin. Once a product concept was selected, the level of success was not measured in terms of unit sales but as a mixture of

the speed of sales and the average price. The rate of sale at full price (sell through) was a measure used by retailers to gauge how much stock had been written down and sold at a discount. New products were developed with an agreed retail selling price and cost for the retailer. Once a concept was selected it was then given a commercial order quantity that gave the supplier some guarantee of both sales and profit. The retailer always endeavoured to sell the (ordered) volume in the stores but often had to mark down products to sell them before the end of the selling season.

At KnitwearCo (section 4.1.4) the company always developed every concept that the retailer thought of and then priced the new product at an agreed target profit margin for the retail customer. Sales were therefore not a measure of portfolio decision success since KnitwearCo was not aware of the sales potential when it developed the products to a launch ready stage. KnitwearCo gave prices and developed prototypes for the retailer regardless of the eventual level of orders. A high volume of new products was developed and half were selected (Figure 4.7) for seasonal commercial launch. Whilst KnitwearCo received the full manufacturing selling price, half of the products achieved the full starting retail selling price in stores. The other half had to be marked down in sales and sold off through outlet malls. Achieving the launch date and the required quality in terms of specifications on dimensions, fit and shade were also important success measures.

At KnitwearCo the retail customer decided on the level of sales and the price and the manufacturer developed all the customer's ideas into commercial prototypes. The customer had a strict timetable for the developments of concepts, prototype delivery, reviews, validations, approvals and launch dates. Success for the knitter was delivery on time of a prototype. In the customer perception survey the retail customer did not rate products' sales or profits as important factors but did rate on time development as highly important and in need of improvement.

A similar situation existed at RetailCo. Products were developed to fill the stores regularly and on time development was important. The Key Performance Indicators used by the retailer to rate the suppliers included on time delivery and quality adherence. Products that did not meet profit margin targets were not developed and sales were allocated as part of buying 'buckets'. At RetailCo (section 4.2.4) there was a high volume of new product development leading to the launch of relatively small

commercial volumes of each new product every few weeks. The target margin stemmed from the limited retail pricing structure and products were selected early after a commitment had already been made to raw materials. The main aim was to put fresh new designs into stores every two months. The retailer had on-time delivery and quality as Key Performance Indicators for the supply chain. It can be argued that RetailCo was responding to consumer short-term needs for new fashions. The strongest evidence for non use of sales measures for new product success at RetailCo was the use of 'open to buy' for each product category buyer who could use the bucket of resources to develop new products. Category buyers rather than consumers then determined unit sales levels of new products.

At FibreCo (section 4.4.4) new fibres were a rare occurrence and so the company also put resources into developing new products that were prototypes of downstream customers' products such as yarn and fabric. These new products were not sold but used at trade fairs to influence garment makers and retailers. FibreCo additionally spent time solving customers processing problems and therefore success here was the resolution of the customer's processing problem. At FibreCo the new developments were prototypes and not expected to meet full commercial standards and so success did not include quality or sales. The cost of overall development was nevertheless monitored to a budget. FibreCo also spent time and resources attempting to solve application problems. Success was when the customer was helped to develop a rigorous process route and method. Overall FibreCo wanted to expand the uses of its new innovations into a wide range of clothing markets and this required success in processing by downstream customers, success in appealing to buyers at trade fairs and success in supply chain users understanding the new innovation product attributes sufficiently to want to substitute the innovation for competing products.

In the DyeCo supply chain the retailer measured sales (section 4.2.4) of all new products every week and compared these sales with the targets and previous year's sales of similar products. The study demonstrated that retailer could lose sales due to a product's colour rather than the other attributes such as style or price.

The processing dyer was concerned about achieving delivery dates but had a very short-term order book and therefore was interested in immediate sales of those new products that were being developed by customers. The retailer involved in the DyeCo Case

Study was focused on sales and profits for new products. The retail company tended to carry on with existing product types and make only small moves in innovation terms. On time launch and quality were also important and success was therefore multifaceted for the retailer. The Dye Company however was driven by short-term orders and therefore sales were a success measure. The business also had to meet short-term delivery needs of customers and measured the speed of processing of new products. New processing services were also being developed for the offshore suppliers, therefore the adoption of these by the retailer and resulting ongoing processing sales would be a measure of success for this new service.

In the developed theory success measures for new products and new product programmes vary from customer acceptance measures such as sales to financial measures such as Return on Investment. Product level success measures may also include quality achievement and on target meeting of launch dates. Success measures can be used in portfolio management to eliminate unsuitable products. In a supply chain we might expect that timing was important and that new products are assured some kind of customer acceptance for the preferred supplier with agreed costs and sales. Therefore the focus should be on non-sales related measures for product success and perhaps focussed on timely development.

The conclusion of the research is that in the UK clothing retail supply chains new consumer products are developed for a six-month fashion season and this requires an early commitment to concepts and prototypes with suppliers. Sales and profits for suppliers are also assured at an early stage along with target margins. With a deadline launch date and a need for commercial products to meet quality standards there is a focus on adherence to the 'critical path' timetable schedule. For a retailer there is early planning of ranges and agreement on initial selling prices, purchase costs and gross profit margins in order to achieve the deadline launch date. The initial selling price cycle does not last long however and margins are eventually eroded. Since ranges of new products are only developed for a season of six months or less the stock of new products must be quit before the new season and this leads to marking down and lower net margins for the retailer.

It can be argued that, in the long run, all retailers need sales success to stay in business and with clothing retailers this means success each successive fashion season. With a need to commit early, these clothing supply chains have managed new product development by agreement on sales units and gross margins. The consumer then ultimately decides if a clothing retailer sells at a higher or lower price depending on how shoppers buy the product during the selling season and if stocks are left in store that need to be sold off before the season ends. Importantly, as a result of using target margins and the particular success measures of the rate of sales and average price, this sector can manage fast development since there is no requirement to carry out a series of three financial reviews that are suggested in the Stage-Gate™ model for each project. This system also obtains agreement between retailer and product developer about the costs at the concept stage, thus avoiding the development of projects that do not fit either the retail price architecture or target margins and this again adds to the speed of development.

The findings **partially support** the proposition (with agreement in three of the four case studies) that textile and clothing supply chain firms use non sales based measures for new product success.

## 5.5 Newness

The proposition tested in this section is:

**Textile and clothing supply chain firms develop new products that are line extensions.**

There is no clear agreement (section 2.7) on what constitutes newness in product development. Newness can exist on a continuum of the degree of innovation from incremental changes (to existing products) to new to the world inventions (Craig & Hart, 1992). Nevertheless there can be newness in services, markets or sources of supply and production or distribution methods (Johannesen et al, 2001). Firms have been more successful in terms of financial return if they took less risks and developed

modifications to products using familiar technologies for markets that they had experience in (Cooper & Kleinschmidt, 1987b; Kleinschmidt & Cooper, 1991). On the other hand firms that took risks with much more innovative products tended to open up windows of opportunity. The investment for low innovation products tends to be lower. There are 26% of new products that are similar to existing products and sold to the same markets (Cooper, 2001, p14). However being first to market with a new to the world innovation gives a lead that may be advantageous.

The proposition stemmed from the idea that in a supply chain, with a lean fast response paradigm, there would be a tendency for line extension type products because there simply is not enough time to generate 'new to the world' products. The findings give some support to the proposition.

KnitwearCo sold products based on existing product templates, (section 4.1.5) made on the same equipment and then sold most of the output to the same customers. There was no development of cheaper products or products with tangible quality improvements and the retailer did not want KnitwearCo to develop their own product ideas. KnitwearCo kept close to its existing products and did not significantly use new technologies or try to sell to new customers or try to develop better value products. The retail designer did not expect KnitwearCo to develop its own product range. There was little investment in new equipment at KnitwearCo.

RetailCo (section 4.2.5) also used previous product templates, pre booked fabric, a tight margin target and a limited price structure. It was not surprising that products appeared to be line extensions again since it would have been difficult to do otherwise in the seven week timeframe from concept to store launch. RetailCo, in collaboration with the supplier, did not attempt to develop major new types of product using new materials or new technology. The raw materials were committed at the start of the season and the product margins and selling prices were restricted and as a result so was the development range of products. The supplier themselves only had one customer.

DyeCo and the target retailer (section 4.3.5) stayed close to the existing range for most supply chain new products. Again there were fixed margin targets and the retailer set the boundary of concepts. Whilst this supply chain was slow, and could have developed 'new to the world' products in the long development time, there was little evidence of

this in the case study data. The retailer was busy moving sourcing offshore and struggling to get new untried suppliers to make the new season's line extension type products. It was not likely to try out radical new products with these untried suppliers until they had mastered the basics. There was newness to the supply chain in using a new supplier but this would not be apparent as innovation to the final consumer, except in lower prices. DyeCo and the target retail customer stayed close to existing products and services for most of the development effort. The dyeing business was also trying to develop added value services for new customers. However the retailer also selected new products and the selection was quite cautious. Nevertheless the retailer was taking some risks in sourcing clothes from untried offshore sources. This led to DyeCo having to rescue some orders from inexperienced offshore suppliers on behalf of the retailer by a strip and redye process.

FibreCo (section 4.4.5) had invented the first new fibre for 35 years to reach the market and downstream customers and consumers were unsure about the new innovation. This was a 'new to the world' product and the FibreCo business was working to find applications and to replace existing competitors' products with the new fibre. Customers in the supply chain who used the new raw material needed help to process it for their own new products. At FibreCo much of the development effort was short-term development of samples and the company had a technical approach that concentrated in resolving application development issues at downstream processors. The FibreCo management wanted a better appreciation of consumer attitudes about the new products and an Industry Forum project was started to help with this (Section 7.4.1).

The main conclusion regarding newness from this research is that the retail end of the clothing supply chain collaboratively developed 'line extension' types of new products to achieve development speed and meet a short-term launch date. Line extensions may also be what many customers wanted but the launch date was probably the main driver. Speed, it seems, may be possible if innovation is sacrificed. There are risks of course in that sacrificing innovation for speed may give consumers products that they are not happy with. However the RetailCo case showed that new product freshness was possible every two months and the DyeCo case showed that consumers wanted the garment but in the right colours. The degree of newness was not the driving influence behind sales success. Success could depend on a product feature, such as the

attractiveness of the colour. The colours that had sold well were the basic (non high-fashion) colours including black and beige. Light raspberry was the major unsold stock. Newness in product development can refer to the product, the markets, the technology used for production and the methods of distributing products. In a supply chain it is suggested that the market and distribution already exist in the supply chain partnerships and therefore these are not new markets. Since speed is important then clothing supply chains may avoid the time and risk of totally new products by staying with many small scale incremental developments.

The findings **partially supports** the proposition above since three out of the four firms were found to develop mainly line extensions. Developing similar products helped the speed of development since quality and technical standards; experience of production technology and cost information already existed in the supply chain.

## 5.6 Senior Management Involvement

The proposition tested in this section is:

**Textile and Clothing Supply chain firms' senior managers are not involved in the individual project decisions.**

Senior managers are a key part of the classic Stage-Gate™ NPD model since projects are reviewed after each stage at the gates by senior managers who are divorced from the project teams. With a five-stage NPD model there would need to be five management review meetings. Ideally, the senior managers make decisions based on formal criteria (Cooper, 1994a) and then decide for example if the project has met the criteria to a greater extent than competing projects which are then killed. For example a project may have a good financial case in terms of potential return on investment or internal rate of return and fit in with the corporate portfolio strategy to develop a new market. There are various criteria measures that can be used in portfolio selection. Typical types are shown in Figure 5.4 with financial and strategy methods the most popular.

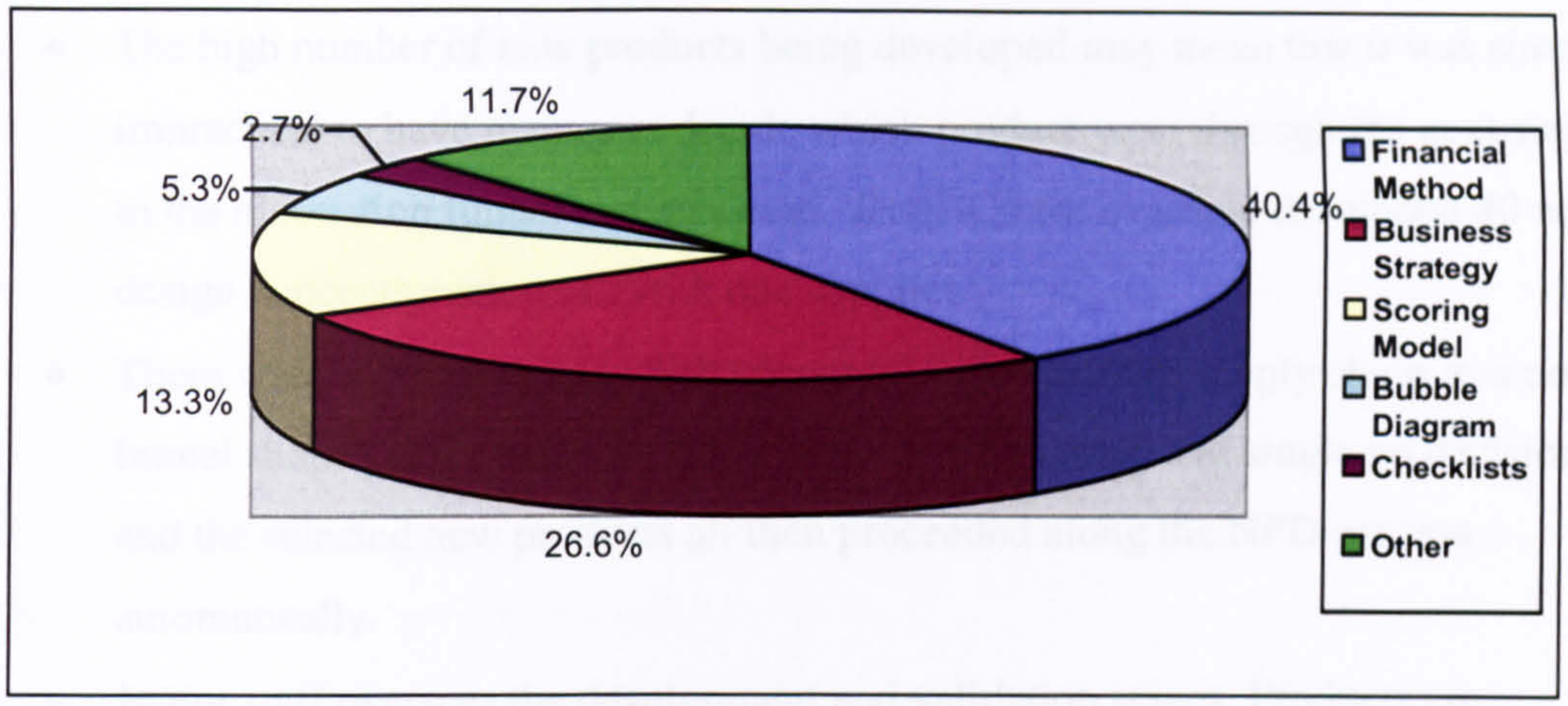



Figure 5.4: Portfolio Management Tools. Source: Cooper, Edgett & Kleinschmidt, 2002

As projects progress along the classic NPD process they are routinely reviewed with the weaker projects being killed and the few strongest going forward. The process appears like a narrowing funnel.

In the literature on new product development, senior management (section 2.8) is also considered to be very influential since they can be responsible for setting up the NPD structure and have an impact through the encouragement or otherwise of an innovation culture. However a correlation between top management support and new product success has not been widely shown. Managers can, however, also interfere in projects too much (Cooper et al, 1999) by encouraging pet projects that should be killed on more rational bases (Ernst, 2002). More research is needed regarding the impact on success by senior managers (Craig & Hart, 1992).

The proposition was based on the notion that top managers would slow down a supply chain process if they were involved in go/kill decisions at gates for individual projects.

The research gives some support to the proposition. The main reasons why senior managers were not involved at gate reviews in the case studies were:

- Some suppliers had no gates since they developed whatever the supply chain customer wanted.
- The speed focus of the process made senior management involvement unlikely since they would burden and slow the process with committees.

- The high number of new products being developed may mean that it was simply impractical to have managers decide which product went through the next stage in the innovation funnel in every case. RetailCo for example developed 40 new design concepts each week with one supplier.
- There was evidence that the NPD process in the clothing supply chain was not funnel shaped since many products were given an early and single go decision and the selected new products all then proceeded along the NPD process automatically.
- Junior staff oversees the development and validation stages. Products are expected to pass these stages since the specification standards and production processes and materials are largely already known.

Whilst not every idea was developed, the innovation funnel was wide and did not narrow after every stage. At KnitwearCo this was particularly the case (section 4.1.6) with a single go decision after the concept stage when the retail category designer selected a prototype and this then proceeded along the development process to be fully developed into a commercial product ready for launch. Gates were outside KnitwearCo because the buyer at the retail partner made the go decisions although there was a single retail management meeting to review the upcoming product ranges and to formally approve the order giving to suppliers. The knitting firm developed all the ideas from the retailer and submitted prototypes and commercial samples to the retail designer who made the go/kill decisions and decided the sales level.

At RetailCo the category departmental buyers were given an allocation of 'open to buy' and they made the go/kill decisions on all projects and ordered commercial quantities of their selections. Once selected, the prototype would then continue all the way to launch. There was again a single management review of the ranges.

At FibreCo the development and technical services teams had overall budgets to work within (section 4.4.6) and made the decisions about which individual projects to work on.

However in the DyeCo Case Study the target retailer had several layers of committees who were involved in individual project selections and this would slow the process.

Nevertheless the company also used junior managers to validate seals (master copies of new products) and had set standards for quality and profit margins to manage some of the gate decisions and therefore concepts were identified early in the development process and then they were fully developed to launch. DyeCo as a small company had few managers. The Dye business had little new product development although those in the small flat management structure were involved in the decision to offer new added value services including sewing labels and pressing (for store readiness) that would open up new supply chain opportunities.

The conclusion from the research is that many senior management gate decisions for suppliers are not necessary since the supply chain customer decides. The development process additionally has a great deal of junior management empowerment and automation of the review gates. Buyers, for instance, make selection decisions early and the assumption is that the product will be developed barring the unlikely inability to reach target specifications. Some of the other post-concept decisions including concept development, business case and product validation are made automatically and quickly through having set standards, systems and specifications that were all managed routinely by junior staff without recourse to a committee. This includes, for example, the use of colour and dimension standards, fit sessions, wash test standards, master product seals and target profit margins.

Senior managers are nevertheless usually involved in cross retail garment category departmental reviews where they see the efforts of various garment category developments put together in a coherent store offering. Managers therefore still reviewed the cross-departmental co-ordination of ranges prior to launch.

The need for speed and a high volume of projects seems to be the driver for these systems that largely do not involve senior management once they have empowered the development and buying teams with budgets, target margins and open to buy amounts.

Speed of development relies on there being a structure in place with standards that suppliers and retailers agree to. Once systems and standards are in place the seasonal or even within-season development can be very fast.

In summary, senior management committees were not involved in the individual project go/kill gate decisions for the following reasons:

- Suppliers did not have gates since they belonged to external retailers
- There were fewer financial gates due to agreed standards on cost and margins
- There were fewer marketing focus gates because sales were agreed early
- Retail buyers were empowered with category buckets to make single early go decisions
- There was a high volume of development projects
- There was a fixed short term common launch date for a range of new products from different suppliers so the retailer made an early go decision
- Junior staff had retailer set standards for technical factors and could approve projects if they meet the standards
- There were agreed methods for validation between suppliers and retailers that include the production of master copies of final prototypes

The findings partially **support the proposition** since three in four of the firms' senior managers were not involved in the go/kill decisions at all stage gates in the NPD process. Much of the time this was due to the supplying firms not having gates internally.

## 5.7 Structured Supply Chain Communications

The proposition tested in this section is:

**Textile and Clothing Supply chain firms use structured communication methods with each other in the NPD process.**

The literature is divided (section 2.9) on the extent that communications between a firm's internal departments influences NPD success. On the one hand, there is a trend to teams working on NPD projects (Page, 1993) with multifunctional teams having replaced the early departmental based sequential NPD models. On the other hand, there

is no best structure (Griffin, 1997) so functional areas and 'over the wall' NPD seem to persist. Communications between departments is an important area since marketing and R&D staffs have different perspectives (Griffin & Hauser, 1996) and more structured communication between groups is required (Pinto & Pinto, 1990).

In a supply chain (section 2.12) one would assume that the functional and inter business situation is even more difficult than in an individual firm with more possibilities for misunderstandings and 'over the wall' attitudes. There is a need in a supply chain then for structured methods with standard procedures, norms and regular meetings. However the supply chain relationship may be one sided. The UK clothing retailer, for example, is more powerful than suppliers (Bruce & Moger, 1999) and trust is hard to build. Nevertheless, there are benefits of collaboration (Birou & Fawcett, 1993) including faster development time, less duplication, better products and cost savings. However managers are not convinced about the benefits of collaboration (Bruce et al, 1995). Researchers agree that new product development appears to be difficult enough to co-ordinate and achieve ownership within a single organization and better methods of communicating are needed particularly if departmental over the wall, sequential NPD still takes place. It appears that the balance of departmental involvement is still heavily focused on the R&D, engineering and production departments with marketing less involved.

In the case studies there were a number of structured methods of communication in place:

> KnitwearCo (section 4.2.7) had a customer liaison manager who spent 3 days each week at the retailer and the KnitwearCo yarn buyer accompanied the retail designer to the Trade Fairs. The retailer used a published 'critical path' timetable, standard product concept format 'sketch and swatch', 'seal' sign offs and specifications to ensure that products were developed on time and to the correct standard. Internally KnitwearCo used a 'Product Plan' and tracking of product progress but had no team meetings and this made external communication unreliable at times with poor information about delivery times being passed on.

At RetailCo (section 4.2.7) the head office issued a seasonal trend booklet to guide concept generation for remote designers and purchased fabrics centrally. A standard specification sheet, fit comments form, quality check sheet and validation seals were used between retailer and suppliers. There were standard garment measurements, seal approvals, prototype progress forms and care label approvals. The supplying designer attended the seven weekly range review meetings. The planning manager met the manufacturer's staff every day and agreed weekly delivery targets. The supplier would issue daily production records to the planning manager.

At the DyeCo target retailer (section 4.3.7) there were organised scheduled range review meetings internally and externally. There were strategic presentations to suppliers, target margins and standard specifications for products and quality, colour and wash standards, seal approvals and a critical path timetable of dates for key decisions and set allocation of responsibilities to departmental staff. The retailer would circulate weekly store sales details to suppliers. The dye company were in a new situation after the management buyout and structures with new supply chains were not yet in place.

There were fewer communication structures and partnerships on projects at FibreCo since the raw material supplier had less involvement with seasonal development of ranges and the whole emphasis of the communication was then though the seasonal trade fairs with product presentations of product concepts. Helping customers was also less structured for the technical services team since these processing problems occurred and were dealt with on an ad hoc basis. FibreCo development activity was inward looking or ad hoc, in the case of the problem solving for customers. The seasonal development of fabric samples for the trade fairs was organised by the development team who had review meetings but this did not involve downstream customers.

One might expect a supply chain to need good communications in NPD and to have systems in place to achieve the necessary transfer of information about product development to those concerned in both retailer and supplier firms. The results of this research study showed that many of the firms in the case studies used agreed systems and paperwork to manage supply chain NPD to the tight timetable and short term

launch deadline. These methods include published development stage timetables, planned meetings; standards, specifications and tolerances, fit sessions and feedback forms. There were also quality and sampling standards and validation seal (master) prototypes and approval decision records.

The conclusions are that the clothing retail supply chains use formal methods to ensure that suppliers know what is required, and when, in the development process. These systems have to be set up and agreed by supply chain partners in advance if they are to work well when the development season begins.

The proposition suggested that supply chains would use structured methods of communication for NPD. The research shows **good support** for the proposition since all the retail supply chain partnerships employed structured methods.

## 5.8 Tools and Methods

The proposition in this section is:

**Textile and Clothing Supply chain firms use tools to monitor adherence to the product development schedule.**

The literature suggests that firms try to improve the prospects of new products through the routine use of various tools and techniques (Nijssen & Lieshout, 1995). Some of these tools are related to idea generation whilst others concern portfolio management and product testing (Mahajan & Wind, 1992). The portfolio management methods are perhaps tied up with the more structured gate reviews (Cooper et al, 1999) when managers must often decide which products should continue along the NPD process.

The proposition stems from the notion that in a supply chain there may be a focus on methods to ensure that the launch date is achieved rather than use of NPD tools such as idea generation or portfolio management techniques suggested in the literature. Ideas and new product selection in a supply chain probably come from the customer.

Timetables were used in the clothing retail supply chains to encourage launch date adherence. At KnitwearCo (section 4.1.8) the use of a critical path timetable helped the projects to meet the launch date. Each stage in the process had a fixed achievement date and a progress review meeting in the NPD process leading up to store launch. Failure to meet a critical path date could lead to a new development being left out of the range.

The retailer at the DyeCo Case Study (section 4.3.8) also used a detailed 'critical path' and a series of review meetings for key decisions with validation steps that, if not met, led to developments failing.

However at RetailCo whilst there was a 'critical path', the very fast speed of development made it obsolete for the buyers and supplier in the case study. For example, there were only eight days between the manufacturing supplier becoming involved in development of a new product project and the product then being launched into stores. There was not time therefore for the head office to plan the process with a variety of suppliers. The RetailCo planning manager therefore spent time each day in the supplier factory monitoring progress. RetailCo new product development was high volume and high speed and the decision to go with a project was made once early on the process by the buyer. Buyers were not using the 'critical path' or under any pressure to make decisions to meet a launch deadline since they had slack in the system that allowed them to defer decisions.

At FibreCo (section 4.4.8) the firm was simply not involved in seasonal product development with retailers or garment making suppliers and did not need structured systems. The fibre company did have an internal timetable and review meeting for the seasonal trade fairs but the development team generally managed the process of project timing internally and did not involve customers in the meeting. Equally FibreCo was not involved in retail supply chain development activities, apart from labelling schemes. FibreCo had a seasonal deadline for the trade fairs but projects were not subject to a 'critical path' and if a project missed a particular trade fair it would continue to be developed for the next trade fair.

There was no use of brainstorming methods in the cases. There may be less need for suppliers to use the NPD idea generation tools described in the literature since the ideas emanate from the retail customers. In addition portfolio analysis or market analysis techniques may not need to be used by all members of a supply chain since the retailer may well carry out these tasks. For instance the results of the process activities findings above (section 5.2) demonstrated that the retailers developed the concept ideas rather then the supplier. There was then no need then for idea generation tools to be used by a supplier.

The conclusion of the findings is that some retailers use 'critical path' methods to manage the product development cycle but there are also retail supply chains that are simply too fast for any bureaucratic 'critical path' system. In some of the case study supply chains the development samples became production orders with a delivery date and the normal manufacturing monitoring of due dates applied.

In addition raw material suppliers, further back in the chain, may not be involved in the seasonal development timing but nevertheless have to be aware of the retail development timetable in order to maximise the impact of marketing efforts on buyer decisions.

The research findings found **little support** for the proposition. This proposition was not generally supported since in only two of the four cases was there a focus on tools for monitoring new product progress on timing.

## 5.9 Conclusions

This chapter has presented the findings for each research proposition. The study has demonstrated that there is good support for the proposal that the UK Textile and Clothing Supply Chain is a responsive lean sector that uses its own NPD methods to support the fast collaborative development of products to achieve deadline launch dates. The sector has largely ignored the suggestions of the literature that fast NPD requires new flexible NPD models that embody multi-functional teams, concurrent methods with overlapping stages and flexible decision gates. Instead the sector has methods that are

co-operative with development activity sharing by retailers and suppliers. The methods are more rigid with timetabled stages and approvals that ensure launch on time. There are fewer decision gates and less senior management involvement in projects than the literature recommends since junior staff have clear guidelines and are empowered to make decisions. The study has also shown support for the propositions that suggested a lean supply chain would focus on short term and incremental developments. The UKTCSC additionally uses structured methods to ensure good inter company communication along the supply chain during development phases. The sector also uses enabling systems to ensure standards are achieved and launch dates are met.

The next chapter discusses the findings and implications.

# Chapter Six – Conclusions

## 6.0 Introduction

The previous chapter examined the research findings for each proposition with each case study examined in turn.

This chapter first summarises the overall findings for each proposition and then key aspects of the NPD methods and organization in the UK Textile and Clothing Supply Chain are described as a contribution to knowledge from this research. From the research findings a new model of the UKCTSC new product development process is developed and differences from the traditional NPD model explained. The chapter then discusses the different concepts that separate the new retail clothing supply chain NPD and the traditional model and explores possible reasons for the differences. Finally the chapter examines the limitations of the research and suggests possible areas for further study.

## 6.1 Summary of propositions findings

The thesis aim has been to ascertain if the lessons of the NPD literature were generalizable into product development in the UK Textile and Clothing Supply Chain (UKTCSC) or if the methods and organization of NPD in the sector were different. The investigation was structured on the hypothesis that the case study firms involved would provide evidence of a supply chain approach to NPD that differed from the lessons of the literature that were based on individual firms. The study set out to answer the following questions:

- How is NPD organized?
- How is NPD managed between the clothing retailer and manufacturers?
- Are the NPD processes considered efficient?

- What are the stages in the NPD processes?
- What is senior management involvement?
- How is success measured?
- How new are the products and services concerned?
- Are the latest generations of NPD model in use?

The research questions led to the development of eight 'lean supply chain NPD' related propositions.

The literature on NPD has suggested that firms that wish to speed up the process of new product development should use modern flexible stage gate systems. Firms are also encouraged to employ multi-functional teams to overcome the barriers that exist between departments that have different perspectives and timescales within firms. The best practice for faster NPD, according to the literature is to have overlapping steps, conditional 'fuzzy' gates and flexibility.

This investigation has discovered that many of the methods used in the UKTCSC are not those suggested by the literature even though they have the same aim of faster development. The findings give credence to the existence of new set of lean NPD lessons for supply chains since six of the eight lean supply chain propositions were supported. The proposition findings are now summarised:

1. **Textile and Clothing Supply Chain firms adopt 4th Generation faster, flexible NPD models.**

Based on the research of seven firms in four supply chains, the findings in section 5.1 demonstrate that the UK retail clothing supply chain sector does not conform to the traditional view (section 2.5) of NPD methods and organization suggested by the literature. Whilst the existing latest models of NPD have flexibility, the UKTCSC used methods that are far more rigid to achieve a deadline launch date for co-ordinated ranges of new products from a variety of suppliers. The sector has a new model that is specific to the UK Textile and Clothing Supply Chain. This model is discussed in more detail later in section 6.3.

2. **Textile and Clothing Supply chain individual firms do not carry out all NPD activities themselves but some of these activities may be carried out by other members of the supply chain.**

In the case studies it is clear that a shorter and faster NPD process existed than in the literature because the average number of stages carried out internally was eight rather than the recommended (section 2.6) thirteen and yet the firms involved did launch high volumes of new developments at a deadline launch date. There was strong evidence that some of the missing stages were carried out by other partner firms in the supply chains. However some stage activities were missing altogether (section 5.2) where for example a retail customer would place an order early in the development process on the basis of a prototype. The supplier then did not require financial or market analysis steps and this improved development speed. Retailers and suppliers in the clothing supply chain have however to first invest in the setting up of common systems and standards for the fast development process to operate and meet launch date requirements.

3. **Textile and Clothing Supply chain firms select an NPD strategy that focuses resources on existing customer's short term new product needs.**

Existing research (section 2.7) results suggest that those firms that use a strategy step, before new product development starts, have been shown to be more successful at NPD. Staying close to existing competencies is also recommended although a balance of some long-term projects is also necessary. The study findings (section 5.3) supported the view that the textile and clothing supply chain firms selected strategies that focussed on short-term customer projects with fast development of new ranges rather than longer term projects to for example change production technology or make cheaper products.

4. **Textile and Clothing Supply chain firms use non sales based measures for new product success.**

With all of the supply chains in the study aiming for a deadline launch date for new developments it was not surprising that on time development was often a success measure in these cases. Retail supply chains had target retail gross profit margins for new products and suppliers generally agreed to these targets. It also appears that in clothing retailing (section 5.4) the financial measure of new product success is counted

in terms of unit sales in the seasonal sales period along with the average retail selling price achieved – the sell through rate. In these case studies there was no use of large project financial measures such as return on investment, since investment in new equipment was usually very low. Retailers placed orders with suppliers at an early stage in the development process. This represented a commitment by the retailer and a guarantee of sales and margin for the supplier and so measuring sales was not the most important measure of NPD success.

The use of agreed levels for profit, quality and sales early in the NPD process can be seen then to *enable* the NPD activities to proceed because junior staffs of suppliers and retailer have clear standards that can be applied to profit margins and quality performance. Junior retail managers are also empowered to utilise planned budget spending amounts to select from prototypes and place commercial orders before new products are fully developed and validated. With standards in place for many factors and sales guaranteed for suppliers success seems to be focussed on being on time.

**5. Textile and Clothing Supply chain firms develop new products that are line extensions.**

Products in the study tended to be low innovation (section 5.5) and this helped the speed of the development process since new standards did not have to be developed for production or for technical specifications. RetailCo, for example, could respond within a few weeks with new designs using raw materials that had already been bought and existing templates and production methods. This is in sharp contrast to the Forza & Vinelli Model (1996) that shows a response time of 15 months.

**6. Textile and Clothing Supply chain firms' senior managers are not involved in the individual project decisions.**

Senior management involvement in individual projects has been seen (section 2.10) to be a success factor in the literature. However as shown in section 5.6 the retail supply case studies had very many small scale developments with little time in the launch calendar and therefore senior management bureaucracy, that would slow the NPD process, was avoided. Junior managers and buyers are instead given the responsibility for product selection early in the NPD process. From then on senior mangers were not

involved in individual projects since once selected there was an assumption that the new products would be developed technically without problems, be workable in manufacturing and meet the target profit margin. There was also no need for senior managers to be involved since junior staffs had sets of budgets, standards and procedures to work to.

**7. Textile and Clothing Supply chain firms use structured communication methods with each other in the NPD process.**

The study findings (section 5.7) suggest that clothing supply chain partners have clear communications structures and systems that make the NPD process more transparent to those in the supply chain. The critical path, for example, is available to all in the chain and shows who in the supply chain has to carry out which NPD tasks and when. The sector also uses clear validation methods that are also transparent to the partners involved. Seals, for instance, provide evidence for partners of achievement of standards and of approval and the validation of new products.

**8. Textile and Clothing Supply chain firms use tools to monitor adherence to the product development schedule.**

Whilst the case study clothing supply chains did not use idea generation or market analysis methods suggested (section 2.12) in the literature; they also did not all use tools to keep track of development projects' progress through tracking methods. This may have been because many projects quickly became production batches and these were tracked using production-monitoring methods. There was not much time for paperwork with RetailCo, for instance, having only ten days between prototype approval and launch into stores

The study showed (section 5.8) that the retail supply chains had formal methods and timetables for stages in the development process and may not then have needed further tracking methods. Brainstorming methods were not used for idea generation by suppliers due to the retailer normally providing a concept brief at the start of the NPD process. Market analysis was also not used since retailers, quite early in the process, ordered new products in commercial quantities based on prototypes. Suppliers then had

the information regarding market size, prices, profits and sales before full prototype development and validation had been completed.

## 6.2 Contribution to knowledge

The research set out to discover more about NPD in the UK Textile and Clothing Supply Chain. The findings show that in a range of NPD areas the sector differs from the findings of the existing literature. Nevertheless the clothing retail supply chains manage fast collaborative new product development through the use of special methods and organization.

Key aspects of these UKCTSC NPD methods and organization are now described and as such contribute to knowledge about NPD in the UKCTSC.

### 6.2.1 Deadline NPD

**The clothing supply chain develops new products with a short-term deadline focus.**

The NPD model used in clothing does not conform to the any of the main Stage Gate, flexible Stage Gate or technology or market led NPD models. Fast and successful NPD has been the aim of successive NPD models described in the literature. However the UK Textile and Clothing Supply Chain achieves a high volume of product development across separate organizations in a short time scale without many of the suggested literature techniques of multi-functional teams, review gates and ongoing market research focus. Developing new products in a few weeks to a launch deadline that appeal to customers and sell well was demonstrated by the RetailCo case study results and timeline (section 4.2.1). Waiting for decisions slows the NPD process and even at RetailCo the process could be speeded up to since a large part of the time taken from concept to launch of the product was slowed by the time taken to make decisions by the buyer.

Clothing speed of development may relate to the setting of a deadline by retailers of a deadline launch date for clothing ranges of related products. This logically leads to deadline dates for the earlier parts of the NPD process in the use of a critical path timetable. Designers at KnitwearCo parent company, for example, in preparing for the spring range had to develop new concepts at the rate of 45 per week between September and October

There is also transparency and sharing of the retailer's critical path timetable with the supply chain. Indeed the suppliers' responsibilities are mapped on to these timetables. Whilst critical paths were used in the supply chain by KnitwearCo and in the DyeCo supply chain, RetailCo was a fast developer and did not use the critical path system. However the RetailCo timeline study did show that very fast development could still take place in weeks helped by early decisions and buyer empowerment with the 'open to buy' system where the buyer had a free rein to approve concepts, order materials and place orders with suppliers.

### 6.2.2 The Sell-Through Measure of NPD success

**The clothing supply chain may be able to move quickly as a result of the use of a target gross margin and proposed full retail selling price for the retailer for a category of product.**

For example in the KnitwearCo case this was a retail gross margin of 60% for all the products for womenswear. The retailer would for example purchase a sweater that was sold at retail at £117.50 (including VAT of £17.50) for £40 from the manufacturer and have a gross margin of £60. This type of target margin then enables a decision regarding a concept product's financial acceptability to be made early, through setting out the price for the supplier and the profit margin for the retailer. This gross margin target for all new products relieves the supply chain of the necessity to make a business case for a product and if the retail buyer has a budget to spend an order can then be quickly placed for a quantity of the product based on the agreed gross margin.
The retailer however is then taking the risk that the product will be a success and this is reflected in the trade off between the higher starting gross margin and the 'sell through' figure - the percentage of the retail sales to consumers that were at a full price. The

KnitwearCo retailer had a very high gross margin but the sell through rate was only 50%. The cases studies illustrate this concept.

Products in most of the clothing supply chain were developed for a selling season and the launch quantities were designed to last only as long as the season. New product development success therefore was about how well a product sells for a season and not about long term sales of a new product. Complete seasonal success would be when garments sell out just as the next new product arrived in store and no stock had to be discounted. Sales for the supplier are guaranteed early in the NPD process. Sales for the retailer would follow as the stock is all eventually sold but the average price the goods were sold at was a measure of the popularity of the product.
Having a target margin that suppliers and retailers agree then led to a fast development cycle with low risk for the supply side although with some risk for the retailer if selling prices then have to be reduced.

However the system of target margins does mean that the business case and financial stages in NPD are unnecessary in the supply chain and there is no need for management reviews of the financial case. With a large number of small scale new products this may be the fastest way to manage the business case stage since management reviews would slow the process.

### 6.2.3 Standardization speeds NPD development

**Standardization was used to speed NPD.**

For example, in the use of standard product templates called blocks. At RetailCo the time to develop a new product from concept prototype to store launch was on average 52 days. The designer dedicated to the Midlands garment supplier developed 30 to 40 new concepts each week for womenswear and childrenswear for the retailer. A starting point for many designs was a previous product template, known as a block, which had standard dimensions for example for a size 12 ladies top. Thus the retailer had standardized the dimension and shape of the typical garments previously. A new design would therefore start to be developed using a block that was close to the design for the new product. A ladies top block would for example then have the neck altered to match the latest trends from a scoop to a V-neck, but the length of the top from shoulder to

waist would for example be standardized so that the prototype was based partly on a previous design. A similar situation occurred at KnitwearCo where previous knitwear stitch designs and garment dimensions of standard blocks would be held on a computer CAD system and used to start the development process for a similar new garment design.

An important part of the retail supply chains development processes was the use of a 'fit' session where new product prototypes were tried on by a model at the retailer. Buyers could then decide on any further small changes to the products dimensions and request a further prototype. At RetailCo, for example, the children's product group had more fit sessions than the womenswear category since the blocks were not as well developed and the mannequins used did not reflect the real world physical dimensions of girls. This shows that the retailers understood that whilst blocks are a starting point that may speed new development there is still a need for new products to be field tested by customers.

Most of the study supply chains had standards that helped the validation process to be progressed by junior managers. At the DyeCo business, for instance, the quality standards for each retailer were set for wash test and colour tolerance results. Additionally at RetailCo there was also a standard set of tolerances for fit measurements and standard statistical sampling methods used for all development tests.

It is important to realise that the speed of the NPD process in these retail supply chains relies on these *enabling* standards. However, the use of standards set by retailers requires the retailer first to decide on standards and obtain prior agreement by suppliers to implement them. At RetailCo and the DyeCo retailer these standards were contained in manuals distributed by the retailer. KnitwearCo also had agreed standard measurement tolerances for women's knitwear tops agreed in advance with retailers and their preferred garment manufacturers.

Standards went beyond specifications and data records in the retail supply chains. There was also use of approval and holding of master prototype garments at RetailCo and at KnitwearCo and the retailer in the DyeCo supply chain. These 'seals' were garments that had been approved by the retailer as meeting the standards for fit, colour, wash tests, etc. Seals save the time of having a review committee to approve the validation or test of a product. With hundreds of products to approve by a retailer, often

from a variety of suppliers, it may be more efficient to set global standards at the outset for key product parameters rather than have a committee approve each one and possibly bend the rules for pet projects.

There are therefore clear set standards for a product type that the supplier is aware of and so the testing stage is relatively straightforward since the supplier knows when he has met the standard. Each side in the supply chain holds the seal sample and this provides an agreed, approved master version of the product. The seal is then used to ensure that full production produces the same standard, making ramp up easier. The retailer also holds a master seal copy that can be used as a standard against which to compare any stock that arrives in the distribution centre.

We can see that the use of standardization may help to speed development and reduce the need for senior management reviews of each project. However the standards have to be developed and agreed beforehand and this requires resources and time for those involved in the supply chains.

### 6.2.4 Early Single Go/Kill Decisions

**Retail buyers are empowered to make early go decisions.**

The Innovation Funnel described in the Literature Review Chapter Two section 2.2 is a simplified theoretical construct that has ideas flowing into the wide start of the funnel against a background of the firm's NPD strategy, the needs of the market, competitor influences and the technology available to develop new products. As the ideas progress along the NPD process stages there are gates where organized management decisions are made that eliminate the weaker new product contenders, and the funnel then narrows with less contenders progressing along it.

In the research case studies a picture evolved of the organization and methods used in each supply chain and the evidence is that the process shape is not a funnel with successive go/kill narrowing decisions since management review gates do not take place along the NPD. As we have discussed above the supply chain works to a deadline for range development. This deadline appears to lead to a need for early and almost final decisions about product ranges and products. These decisions were made very close to

the start of the process. The assumption appears to be that the products will be successfully developed, validated and launched. At RetailCo the buyer made the go decision to ask for a costing 12 days after receiving the concept garment from the designer. After another 11 days the buyer placed an order for the chosen style with the supplier for a fixed quantity of garments to be delivered 29 days later into the distribution centre. There are clearly no layers of senior management reviews here checking if each product is technically feasible, meets a market need or if it makes a sound business case or is the best product compared to other alternatives. The assumption is that the product will be technically feasible and that the buyer knows the market and can take the responsibility for selecting the best prototypes. The buyer has the CMT costing, knows the store price architecture and profit margin, has bought the raw material and can then make a judgment about the product meeting the customer needs. The RetailCo buyer makes the selection decisions and has an open to buy amount to spend on new products for a period.

At KnitwearCo the Designer at the retailer sent in 45 concepts per week to the supplying knitwear factories over a period of two and a half months. KnitwearCo developed these concepts into commercial garment prototypes for the retailer. The retail designer would then select two thirds of the developments for launch, presentation at range review and subsequently place an order, before the final seal approval of the product technically.

At the DyeCo retailer the NPD process was more akin to the traditional model of senior management reviews. The retailer nevertheless used target standard margins; target retail prices and more junior staff approved technical performance of the product and signing off seals.

The importance of the early concept decision is demonstrated by the work carried out at FibreCo to develop fabrics for the seasonal trade fair with a view to influencing the buyers into selecting the FibreCo products in the next season's concepts prior to any development work on retail products.

### 6.2.5 Summary of contribution to knowledge

Examination of the conclusions from the research findings leads to a number of identifiable aspects of the UK Textile and Clothing Supply Chain that help to explain a little researched area of new product development. The contribution of this research is to improve the level of understanding of an important sector and at the same time show how new product development works there in detail and how the sector uses special methods to achieve a deadline launch date in spite of the involvement of different businesses in a collaborative development effort. The list below shows the main aspects of the sector highlighted by the findings of the research propositions:

a) NPD clothing concepts are retailer driven
b) NPD is driven by retailers' deadline launch dates
c) NPD process activities have deadline completion dates
d) NPD activities are shared between suppliers and retailers
e) Retailer impose standards on suppliers for product development and validation
f) Go/kill decisions are made once and early by empowered retail buyers
g) New products have a short life cycle expectancy and target profit margins
h) Product success for the retailer depends on average retail selling price
i) Products are minor adaptations of previous products
j) Market needs are anticipated by buyers early in the NPD process
k) Suppliers focus on retailers' seasonal needs
l) Development speed is assisted by early buy decisions, use of product templates and no senior management involvement in go/kill stages decisions
m) Supply chains use structured forms of communication on NPD projects
n) Long term standards and structures are developed before seasonal NPD takes place

The lessons of this research may have wider implications since there has been an assumption in the literature that fast development is a result of using NPD stage processes (with up to thirteen stages), concurrent methods, overlapping stages and multi-functional project teams, aided by information technology. This study shows a different approach that is at times very fast and responsive to consumer needs.

This research has demonstrated that speed can be achieved by the use of deadline launch dates, timetabled stage dates, less stages, sharing activities with suppliers and customers, less senior management involvement, less innovation and clear standards and procedures for validation and approval.

## 6.3 A New NPD Model

This study has identified alternative approaches to NPD taken by the UKCTSC. These approaches differ from those stated in previous studies of NPD. As a result, we are able to develop a theoretical understanding of the specific nature of NPD in the UK Textile and Clothing Supply Chain. And, indeed develop a new model of NPD theory.

This section describes the model in figure 6.1 and discusses the various elements of it

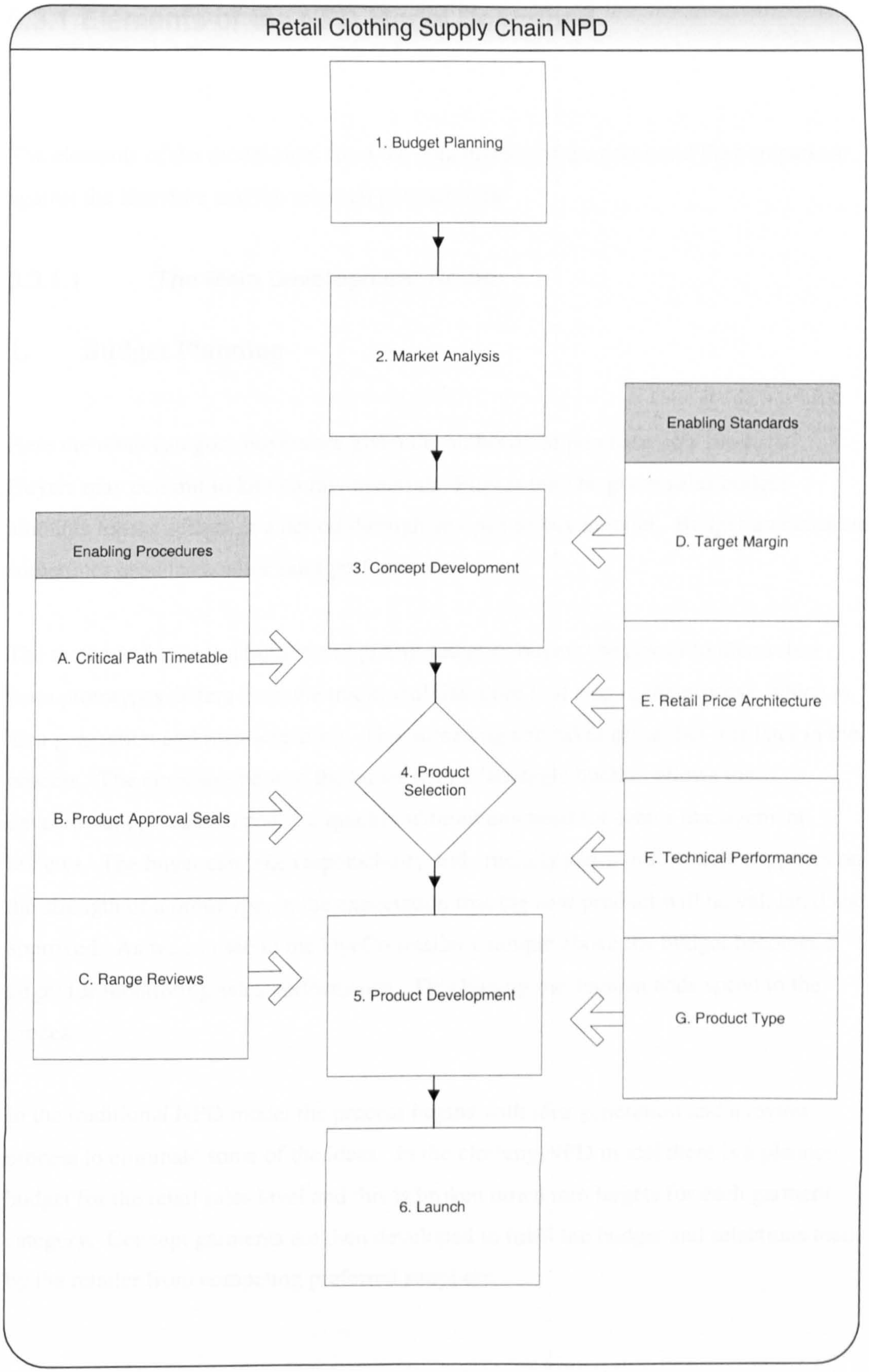



Figure 6.1 – A model of retail clothing NPD

## 6.3.1 Elements of the NPD Model Described

The elements of the model stem from the conclusions of the cases and the comparison against the literature and the research propositions:

### 6.3.1.1 The Main Development Route

### 1. Budget Planning

Here the retail category buyers are given the authority to purchase new products. Buyers may commit to known raw materials. Buyers may be given sales budget amounts for the season or a period through an open to buy amount. Budget amounts are sometimes used to monitor sales performance.

The method of setting a budget and giving category buyers the power to then select from prototypes differs from the traditional literature first step in the process, which is idea generation and idea screening. This screening still takes place, but it is later in the process. The empowerment of the buyer with a 'strategic bucket' allows the development process to proceed quickly without any need for senior management reviews. The buyer can take responsibility and crucially *place orders* with suppliers on the strength of a prototype, in the expectation that the new product will be validated and approved. As we can see in the DyeCo retailer example above the budget becomes a target for monitoring sales performance. This buying mechanism adds speed to the process.

In the traditional NPD model the process begins with idea generation and a review process to eliminate some of the ideas. In the clothing NPD model there is a planned budget for the retail sales level and this is broken down into targets for each garment category. Concept garments are then developed to fulfil the budget and selections made by the retailer from competing preferred suppliers.

## 2. Market Analysis

This step involves retailers, and suppliers, both examining the predicted fashion trends, visiting trade fairs for new raw material ideas and considering previous sales performance from their own and competitor products and ranges in order to develop a brief for suppliers to work to in the development of new products. Raw material suppliers develop products beforehand that include downstream products for these influential trade fairs.

This step also differs from the traditional NPD model where the developing firm is expected to carry out market research and discover if there will be a market for the new product and also what the sales and price might be. In the textile and clothing supply chain the firms involved plan new products on the basis that:

- The previous season's merchandise will soon be sold and that stores need new products to meet consumer needs
- Retailers will give orders when they have approved a prototype and then the suppliers can purchase raw materials and plan production
- The profit margins have been agreed for this supply chain and product category between retailer and suppliers.
- The retailer will take the risk of the selling price of the product to consumers being below target
- The retailer will take the risk of the inventory for the order
- The agreed retail order, selling price and margins for supplier and retailer represent the market information required for the supply chain to proceed with speed

We can see that the clothing supply chain uses better information about sales than in a typical new product discussed in the literature where most of the information is an educated guess.

The clothing supply chain is also making a guess that certain predicted fashion trends will be appreciated by consumers and purchased at a high selling price without having to resort to discounting to quit inventory. However what seems important here is that the supply side is relatively immune to the risk and can then proceed with development

and capacity planning with confidence that sales and profits will be achieved on the individual projects. The retailer takes the risk of poor average selling prices.
In the clothing model there are no market assessments preliminary or otherwise. In addition there are no financial assessments since the level of profit margins for supplier and retailer is agreed for the garment category in advance of any development work. Having less assessment steps saves time and avoids senior management involvement.

## 3. Concept Development

Suppliers, guided by the retail brief and their own market trend analysis develop prototypes and costings for submission to retail buyers. The suppliers and retail buyers are influenced by a number of standards including the known retail price architecture and gross margin targets, previous products, technical requirements and quality levels. Retailers may have facilities to develop their own concept garments. A number of prototypes may need to be developed, submitted and assessed before a final approval of the product is 'sealed'. The retailer will assess the new product technically and commercially. Semi-commercial prototypes must be available for the retail range review so that senior managers may see that the entire store or category offerings look well together. Further work will be needed to produce fully commercial standard products. Retailers publish the critical path timetable for development so that suppliers and retailer staff are aware of the dates of reviews and for completion of key stages that will ensure an on time launch.

There are three main differences in the clothing model compared to for example a fuzzy stage gate type of NPD process. The first difference, in this step, from the traditional NPD model is that the clothing supply chain does not waste time developing products that the customer - the retailer- will not want. In clothing the customer has often set the concept brief whereas in the traditional model the developer may be guided by market studies and contact with the customer but there is not the same narrowing of concept choices that the clothing sector has. The second difference is that there are also a series of enabling standards that set *limitations* on the range of development scope. In traditional NPD the limitations are set by the business strategy, goals and objectives. The clothing limitations are far more detailed and specific. For instance, the margin standards and retail price architecture effectively limit the type of raw material, production technology and product attributes. This restriction combined with the third

difference - the use of previous product templates and base costs rather than developing these - leads to new products with features that are robust, at prices and profits that are expected and most importantly in a timescale that is expected. In a traditional NPD model there are stages of customer evaluation to ensure that the new product is acceptable. In clothing these stages are limited to approval and selection by the buyer at the next stage.

## 4. Selection

The retail buyer takes the go decision. This is followed by an order to the preferred supplier or manufacturer for a quantity of garments to be made for delivery in the forthcoming seasonal period. There is an assumption that the prototype will continue to be developed and tested by suppliers and retail technologists.

In a traditional NPD model there are a series of go/kill gates after each development stage. What is different about clothing is that the go decision is taken once and early on the basis of a prototype. This then means that there are fewer gates and less management involvement. The open to buy gives the responsibility to the buyer to make an early once and for all decision. This is possible since the new product, it is assumed, will be subject to the approval of technical attribute validating procedures, will meet the profit margin and retail price architecture standards and be delivered on time for the launch in the agreed sales quantities. It should be noted that senior management still has control of open to buy amounts as the buying season progresses. Senior managers may allow more open to buy or restrict it if stocks are a rising in order to conserve cash.

Selection is a key part of the clothing supply chain NPD process, embodying as it does the capability to give a go decision and remove the uncertainty that pervades much traditional NPD that then needs multiple management reviews and checks to ensure that risks are minimised.

## 5. Product Development

Working to the set timetable for submission of further semi-commercial and full pre-production samples, the supplier will continue to develop the product. The retailer will

also finalise details of the order including colour of product and garment size ratios. As product development continues by the supplier, further product prototypes will be submitted for approval by the retailer if they meet the required standard and tolerances for product technical and quality performance. The iterative cycles of prototype development, submission and approval may be seen as development steps with gates or hurdles that the projects have to pass through. However these approval and subsequent seals do not involve senior management review gate meetings of the type used in a traditional stage gate model. Rather, junior managers in both the supplier and retailer have clear standards and specifications to work with, for example on garment dimensions. Junior managers in the retailer then have the authority to approve or 'seal' the prototype that then becomes master copy of the new product that will be held by supplier and retailer for future reference.

Much of the product development process relies on the fact that new products are similar to earlier products in terms of many product attributes. In practice this means that the new product development may begin with an existing template. In the RetailCo case the templates were used by the garment designer and this then ensured that the fit process would quickly be completed because the garment measurements would be nominally correct even though the buyer may wish to have a looser fitting garment if the fashion trends are for a more casual look. The existence of templates also may lead to existing production technical standards. In the KnitwearCo example the firm had computer databases of stitch details that enabled the development of a new product to quickly proceed including the use of computer based instructions for the production machinery.

This similarity of new products to existing ones helps, in that generic standards exist for use by suppliers and retailers. The use of standards by which to judge the acceptability of a new product is not surprising. Much of the new product development described in the literature is of the line extension or product revision or repositioning type and we therefore might expect that standards exist for the technical and production methods for all but the new to the world and new product line types of new development projects.

The main benefit of the existing product similarity compared to the traditional NPD stage gate model is in the systems in the retail clothing supply chains that then are fast

and have standards and specifications that can be managed by junior staff. The result is less need for senior management reviews.

## 6. Launch

Production is ramped up and deliveries take place into the retail Distribution Centre for quality checking and distribution to stores for the new season.
The launch date has been the driving force behind many of the attributes of the retail clothing NPD model. The date is fixed and relatively nearby. As a result of the short term deadline launch date the stages in the process also have timings that are fixed. Even the start of the process has a date. In the KnitwearCo retail division firm, for example, the designers had a fixed time window in which to create new concepts for submission to KnitwearCo.
The existing NPD models ignore the concept of a deadline launch date. Indeed the newer NPD models suggest that flexibility is the key to fast development. The clothing findings take the opposite view. In order to achieve the launch deadline there are *rigid* timings for process steps. Moreover the steps and activities in a supply chain are made clear to all those involved and changes to the system are not expected. If the suppliers and the retailers share a common view of the NPD process and know who has the responsibility for each task, the deadline launch date may be more likely to be achieved.

### 6.3.1.2 Enabling Procedures and Standards

The model in figure 6.1 has a central flow of NPD stages that are fast as a consequence of a number of enabling procedures and standards that are shown either side of the main flow. Only when the procedures and standards are in place and operating with suppliers and retailers can the central flow of development take place with the achievement of the deadline launch date. The procedures and standards therefore <u>enable</u> the fast development.

The notion of procedures and standards between suppliers and customers in a supply chain have not been widely reported in the traditional NPD literature perhaps since the reports have been conceptual and concentrating on success factors that have been developed as constructs by researchers. The discovery of these enabling systems is one of the benefits of a detailed case study methodology.

## A. Critical Path Timetable

The critical path timetable is the master plan for meeting the launch date with the new product ranges. Dates are given for the start initial concept and the final delivery into retail distribution centres. In between theses two dates there are dates for various approvals to be completed. Significantly there are dates for designers to create ideas by and issue the concept sketches to suppliers. Later the first prototypes are expected from suppliers. Senior management reviews the groups of products together and gives overall approval. The commitment to buy from a supplier is made early although actual colour and size ratios will be determined later. Prototype development continues and each stage of verification has an approval by junior staff. Seals are approval sheets and garment master copies that are kept by both supplier and retailer. The seal colours, white, gold and black, relate to the degree of finality of the product development. Suppliers have to send successive prototypes in to retail customers whose buying staff have to approve these (or conditionally approve, subject to fixing any problems) by certain dates.

The literature on NPD does not generally report the concept of timetabled launch dates.

The critical path can be seen as the focus of many of the NPD timed activities and from these stem the need for standards and specifications and transparency between suppliers and retailers about exactly what is required at each step and who is responsible so that neither side is unclear about the requirements.

## B. Seals

Seals are physical master copies of garment prototypes that represent a standard that the supplier agrees will be manufactured and the buyer agrees will be acceptable. The seal is signed off by the supplier and contains a garment with the written specifications and test results showing that the sample conforms to the tolerances. The buyer signs off (if the seal is acceptable) and sends back one copy of the garment and specification to the supplier and keeps the second sample in a library for future reference. Seals may be approved with comments about for example fit or colour that may need to be changed before the next seal stage is approved.

Significantly, concept and buying decisions are made early before development has been completed. Junior buying staff manage the seal approvals rather than senior management committees.

The literature on NPD has generally been of a high level conceptual nature and based in many cases on the responses to questionnaires sent by academic researchers to managers in firms. The notion of a master copy of a new product that is kept by both parties in a supply chain co-operative development has not been raised by most researchers. However the seal concept is an integral part of the timetabling process and it does give reliable information to the developers. The retailer will examine and approve a supplier's prototype, for example. The retailer is firstly aware that the prototype has been produced to an existing generic set of quality standards. With the seal system the retailer, secondly, has the confidence that the subsequent high volume production that will follow will match the seal in every respect. The buyer may then confidently approve the prototype and order the commercial volumes required for launch into stores. Equally the supplier will receive back from the retailer a signed approval of the seal. When the product has been finally 'sealed' no further changes are required and the supplier may confidently order raw materials and commit manufacture to production volumes of the product knowing that it will be accepted if the seal is copied.

## C. Range Reviews

Various garment types are sold together in stores but developed separately by different retailer departments such as Menswear and Womenswear or Casualwear and Formalwear. Senior management reviews take place in order to approve early prototypes, and all the ranges that will be sold in stores, to ensure that the brand image is coordinated.

Significantly senior managers are then not involved in the balance of the detailed development process or the financial assessments. There are standards for technical and financial assessments that are used to approve products.

## D. Target Margin

Retailers use gross margin targets for new developments. Taken with the retail price target for the garment this allows the supplier and retailer to calculate the target cost that the retailer will pay to the supplier for the new product. Retailers will tend to use global gross margin targets for a particular range of products so that, for example, KnitwearCo expected to have gross margins of 66% for the in-house retailer women's knitwear. If KnitwearCo sold the garments to the retail division for £28.00 then the retailer would have the following price architecture:

| | | £ |
|---|---|---|
| (A) | Store retail selling price | 96.76 |
| (B) | VAT at 17.5% | 14.41 |
| (C) | Income (A-B) | 82.35 |
| (D) | Cost of garments from supplier | 28.00 |
| (E) | Gross margin (C-D) | 54.35 |
| (F) | Gross margin as % of income (E/C) | 66% |

In this example we can see that the store will have an initial selling price of £96.76 for a knitwear garment. Of this price £14.41 goes in VAT that is 17.5% of the income that the store receives after the sales tax. Having paid £28.00 for the basic garment the gross margin is calculated at £54.35 that is 66% of the Income.

This type of calculation means that the supplier knows that if the retailer typically sells garments at about £100 at retail then the supplier has to develop products that cost no more than about £28 at the supplier selling price to the retailer. This has an obvious impact on the complexity and raw materials of any new product developments.

## E. Retail Price Architecture

Stores have typical selling prices that are set by the brand image and influenced by competition. Overall clothing prices have suffered from deflation in the past few years as a result of cheaper imports. Stores carry out competitor surveys of similar products to establish market prices as part of the development process. The store will also have price architecture with, for example, a basic entry-level T-shirt at £15 and a more styled

product at £20 with a top-level exclusive collection of T-shirts priced at £30. Taken with the gross margin target these prices help retailers and supplier to target new product ranges and developments with costs that will achieve the selling prices and aspirational styling content of the product.

The main impact of retail prices and gross margins is to set boundaries for the cost and features of new product developments.

## F. Technical Performance

Each retail store brand needs to ensure that new products achieve the required standards that consumers expect. Developers also need to know these standards so that products can be checked during development. Retailers issue general standards that cover all types of new products including for example wash performance or tolerances for measurements. These standards are issued in the form of manuals that may also have the test regime details.

Retailers include a standard for fit as part of the approval system. There are standard measurements for the garment, for example, for a size twelve. The supplier will initially develop new products to this set standard. The retail buyer may later want a more relaxed fit and therefore will adjust the standard for width, but not length, for the next prototype. Products are tried out on a human model at an early stage in the process and therefore whilst standards are a starting point for a development there is a type of field trial in the use of a model and retail technologists and buyers who will comment on the fit and request changes to the prototype if necessary.

The standards are part of the seal approvals system since when a product has been tested the written results are appended to the garment header form and this is then submitted to the retailer for approval.

Significantly these standards allow suppliers and developers to avoid the need for senior management meetings to approve the validation stage.

## G. Product Type

The system of standards is established before the season starts and uses previous products from earlier seasons. The supplier and retailer have standards for known garments types using known styles, existing raw materials and known colours. For example, the shape of a new garment at RetailCo used a previous 'block' to establish the new garment design. The business also used fabric for new styles had already been used before.

In general a new garment development may only have had a new trim or a new neckline shape or a new fashion colour and therefore the use of known garment basic shapes, established production routes, given garment dimensions and known types of fabric helped to speed development. However using known standards also limits the degree of innovation.

# 6.4 Implications for theory

The theoretical model presented above is specific to the UK Textile and Clothing Supply Chain. However there are potential implications of the study findings, and new model conclusions, for the developed NPD theory since the UKTCSC appears to achieve fast development without many of the recommended approaches in the literature. There are two main concepts that have been introduced in this model that highlight the differences between the clothing model and the literature lessons and these are outlined below.

1. Standards replace senior management review gates

First a main conclusion of this research is that the retail clothing case studies did not use senior management review gates. The clothing firms and their suppliers operated with the standards that have been discussed above including profit margins, consumer prices, product types and technical performance. This differs from the developed theory where

stage gates are employed in which senior managers, divorced from the day to day development activities, make judgements based, ideally, on pre-determined criteria.

The traditional stage gate model has thirteen steps that include a series of development activities and review gates (Cooper & Kleinschmidt, 1986). Prior to the actual product development, for instance, there are five activities including initial screening, preliminary market research, preliminary technical assessment, the detailed market study and the business/financial analysis each of which should have a go/kill decision taken when senior managers meet to allocate the firm's resources to the most promising projects using pre-determined selection criteria.

From the study we can see that senior managers are not involved in the project decisions and instead junior managers and development staff in both suppliers and retailers apply known standards to developments. Moreover the retail buyer generally makes a commercial decision on the aesthetic appeal of the new garments and then has the authority to commit to a new product and additionally buy the new product for the store selling season.

The implication is that, whilst senior managers may set the global parameters for the standards by, for example, demanding a 60% gross margin, the standards are easily applied by more junior staff who then signs off prototype seals.

Why then is more senior management required in the traditional stage gate type of process? And why is it not possible to delegate these tasks to more junior managers and development teams?

Certainly one could argue that the junior managers and development teams in the case studies were taking decisions on small individual projects and therefore senior managers were not concerned about these minor developments. However the clothing buyers were responsible for a high number of projects that collectively represented large commitments of the firm's resources. In the RetailCo example for instance the three category buyers were ordering over £20 million worth of clothing from the case study supplier each year.

One might worry that clothing development staff, unhindered by independent senior management reviews, would over commit the resources of the firm without senior management control and favour pet projects that were not worthy of inclusion on more rational bases. It was clear however that the buyers, in the supply chains studied here, had the responsibility to make judgements on behalf of the company with regard to the appeal that a new garment would have to the target consumer. The buyers were controlled by what they could commit by the open to buy amount that was in itself under constant review by senior managers. The selection process in clothing was also made transparent with prototype seals being signed off and kept for reference. Therefore the choices being made and who had made them are always clear to everyone. Beyond the clothing buying decisions regarding what the consumer will like, and then purchase, there were clear controls over the other important parameters that each development must comply with. In clothing retailing, quality standards were set in advance for a product category and in addition there were standards for profit. Sales were restricted by the budgets and open to buy. The clothing system therefore included the main items that would be in the pre development gates of a traditional NPD model.

The literature has suggested that the fuzzy stage gate model is the best answer to the bureaucracy of the simple stage gate model with the cumbersome reviews. Flexibility it is suggested is the answer to save time with conditional and overlapping gates and more delegation of responsibility. Cooper (1994b) was concerned about the loss of senior management control of his new flexible stage gate model and advised caution and said that flexibility be allowed only on occasions.

This study takes the opposite view regarding flexibility. To achieve a deadline launch date the NPD process was fixed and rigid rules applied to suppliers and retail decision makers. The lesson for researchers and managers is that fast development may be achieved, even in a collaborative development process, provided there are clear standards.

2. Market forecast rather than market focus

The second conclusion is the clothing supply chain is not market led in the normal sense that new products are developed through discovering what customers want through market research. At the heart of the traditional NPD models and methods suggested in

the literature is the need to balance a firm's inward looking production and technology approach with an external market and customer need focus. Rothwell (1994) considers the 3rd generation NPD coupling model to have a constant input from both the market and technology as a new product proceeds along from concept to development and validation.

In this study the market was catered for through adaptation of existing and previous private label product types to reflect the latest fashion trend forecasts. The market needs in clothing were therefore based on forecasts rather than through the use of market research, or test selling. As a consequence the development process in retail clothing supply chains was faster and in some cases very responsive to consumer needs. In the RetailCo example the firm developed new products into stores every seven weeks and therefore could respond to consumer demand by repeating popular lines and dropping poor sellers. The use of forecasts along with open to buy and agreed profit margins gave retail clothing supply chains the ability to proceed quickly with new product development and launch with the certainty of new product unit sales.

The need for less uncertainty has been highlighted previously by researchers (Craig & Hart, 1992) and it has been suggested that better information sharing is needed since marketing and R&D departments view each other with suspicion. Indeed the whole new product development process has been seen as an uncertainty reduction process (Moenaert & Souder, 1992).

In this study of clothing retail supply chains there was a high level of certainty once a buyer has selected a product from competing concepts or suppliers. Even before this stage the use of standards and procedures ensured that competing suppliers were aware of the launch date, the gross profits and technical standards required, even if the level of sales was not completely clear and this certainty therefore allowed development to proceed. Once a buyer had made an early buying commitment to the aesthetics of a garment, based on a prototype, the suppliers and retail development staff knew the launch quantities and perhaps the whole seasonal sales. The suppliers and retailers also knew the technical standards that would be required and could proceed to develop further prototypes and pre-production samples in the knowledge that if the standards were achieved the product would be approved and sales would follow.

There is a paradox in the notion that a market forecast brings certainty. Obviously there is one important uncertainty that besets the forecasting methods used in the retail clothing supply chains. The actual average price that the buyer's order will sell at in the retail stores was an unknown that depended on the consumers. If inventory had to be sold off at low prices in end of season sales, or worse during the season, then the new product ranges had not been a success. However the forecasting system did lead to more certainty about the key development issues of profit, sales and which product to develop than in the traditional NPD models and this may have helped the speed of the NPD process.

This study suggests methods by which NPD uncertainty in a supply chain may be reduced using market trend forecasts for product concepts and standards and early buying decisions from empowered retail buyers. The retail clothing forecasting system is a fast alternative to the multi-functional team approach for improving certainty that is suggested in the traditional NPD literature.

## 6.5 Implications for practice

The new clothing NPD model presented here demonstrates that managers who wish to quickly develop new private label types of products in a supply chain (whilst working to a deadline) may be able to do so by using some of the techniques illustrated in this current research. The following retailer checklist is suggested:

1. Establish enabling systems and a set of shared procedures with suppliers:
    - The development timetable and approval stages
    - Specifications and standards for product groups
    - Clear price and cost guidelines for products and materials
    - Empower buyers with authority to select products at an early stage
    - Product feature standards that stay close to existing competencies

2. Establish the current business strategy and market needs early
    - Use trend forecasts
    - Constantly scan market trends and competitor products

- Review existing product sales performance
- Involve suppliers early in the retail strategy
- Develop concept briefs for suppliers
- Allocate budget amounts and authority to purchase to buyers
- Review sales performance and inventory regularly and adjust balances of open to buy
- Forecast sales by product category and individual product

## 6.6 Limitations

This research set out to examine in detail a small sample of supply chain firms in the UK Textile and Clothing Supply Chain. The firms involved were large and had significant market shares. The research data was collected over a series of repeated visits to the companies for up to a year. The researcher was assisting in solving real world problems for the firms, acting as a facilitator. Close study of actual NPD techniques was observed with all levels of management and customers.

The study has its limitations. The sample was small. Only retail firms who sold private label products were studied. The firms involved may therefore not be representative of the entire clothing sector.

The methodology could have used the established NPD research method of identifying constructs in the literature and testing them through a survey of a larger number of firms and supply chain partnerships. This would have provided a sector wide understanding but would have been limited in rich insights.

The analysis has been of data collected for another but yet related purpose. A study aiming specifically at answering the research propositions could have had a more quantitative approach with questionnaires and interviews based on the respondents' experience of the proposition topics rather than analysis of contemporary archive material. For example respondents could have been asked if they thought that senior management was involved in gate decisions for individual development projects rather

than the researcher analyzing the archived contemporary material from the intervention projects and the researcher forming an argument and opinion. The analysis of the archive material is the researcher's and could be biased by the preconceptions of the researcher.

Nevertheless the strengths of the study were that the researcher had developed a good understanding of the management practices though the problem solving interventions and helping to solve them. The regular visits to clients in the Industry Forum's interventions provided a longitudinal aspect to the study and a variety of staffs were interviewed. The visit reports, published case studies and presentations to clients about their own business practices demanded a high standard of validity for the base material. The study offers a basis for other researchers to carry out wider and more dedicated investigation of the Textile and Clothing Supply Chain or other supply chains' NPD methods.

## 6.7 Implications for further research

This study raises some doubt about how generalisable the lessons of the NPD literature are to the UK Textile and Clothing Supply Chain sector.

The literature lessons describe the innovation funnel where a hundred new ideas are gradually reduced to ten commercial products of which one may be a success. Researchers often refer to the failings and waste of the NPD systems.

Moreover in order to speed up the NPD process the use of new methods and organisation are encouraged in the literature with multi functional product teams, conditional 'fuzzy' gates and concurrent methods. Flexibility is promoted. Senior managers meet at up to five gate reviews to make go/kill decisions about products by applying standards for market attractiveness, financial returns and technical performance. Staying in touch with market needs is a key feature of modern NPD through product field testing and market research studies. There is also an assumption

that the NPD process has to deal with a range of newness including new to the world products.

And yet this study demonstrated that fast NPD was possible without many of these key literature features. The clothing development route was by contrast rigid and controlled. The development staff tended to remain functionally separate, junior staff had clear enabling standards to apply; ranging from profit targets to quality. Senior managers entrusted product selection, validation and go decisions to development teams. The supply chain worked with partner firms each carrying out specific parts of the NPD process to a timetable. Rather than very few development ideas reaching consumers in commercial quantities, the UKCTSC cases developed new products that were limited in innovation and most concepts were approved early and then almost all were developed commercially.

Questions about the study findings and the lessons of the literature remain. Why for example, in the literature, is senior management needed to apply predetermined financial performance standards at bureaucratic stage gates when junior staff could be given targets for example for gross profit margin and selling price? Equally if most researchers agree that the majority of new products are not 'new to the world' why then may not the type of standards for technical and quality performance from previous products be applied automatically to decide if a new idea reaches the standard required without a series of technical assessment gates manned by senior managers?

Finally if the clothing supply chain can develop new products to a deadline using a fixed timetable for NPD process activities including idea development why is this critical path technique not used elsewhere to speed development time?

However the model developed here may be equally not applicable to other sectors. Further research may identify other alternatives to the study findings and the reasons why they are used.

# METHODS AND ORGANIZATION OF NEW PRODUCT DEVELOPMENT: AN INVESTIGATION IN THE UK TEXTILE AND CLOTHING SUPPLY CHAIN

Vol. II of II

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Ph.D. Thesis

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School of Art & Design

2004

**Methods And Organization of New Product Development: An Investigation In The UK Textile And Clothing Supply Chain (Volume Two of Two)**

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# Appendix

# Chapter Seven Data Collection Findings

## 7.0 Introduction

The chapter sets out the findings from the I.F. intervention projects that relate to the research questions. The chapter is organised into sections devoted to each of the case study data collection findings. Each project had a number of findings that related to the real world problem that the project team worked on during the Industry Forum intervention. A part of the findings were relevant to the research questions. In the KnitwearCo case study for example the Industry Forum intervention data findings concern mapping and description of the new product development process activities, detailing the methods used to calculate profits on new developments and the results from a supply chain needs perception survey of the management at KnitwearCo and the in house customer buyers and designers. These findings are all relevant to the research questions.

[Note: Data Collection details regarding KnitwearCo have been included in section 3.4.1 the Chapter Two Methodology.]

## 7.1 Findings for KnitwearCo

The KnitwearCo Industry Forum Intervention Project was concerned with a number of issues that the parent company wanted better information about. The issues were the performance of the New Product Development system, the reliability of the Costing system to cope with a high volume of new developments and the attitudes of the KnitwearCo and in house retail customer towards the new product and customer service needs of the supply chain. The findings of the data collection process are described below covering each of these issues.

### 7.1.1 A Description of the NPD Process at KnitwearCo

The KnitwearCo business was sent garment designs and concepts by the parent company retail division designers. The concepts were then developed into prototypes by the KnitwearCo development staff. The garments were generally fine gauge fully fashioned knitwear using cashmere or fine merino wool blends. In a typical season the KnitwearCo business would be given up to 450 new products to develop by the retail division Ladieswear and Menswear designers.

The type of knitwear garment that is produced by the manufacturing business is shown below in Figure 7.1.

Figure 7.1: KnitwearCo Garment Type.

There were a number of clear stages and gates in the KnitwearCo NPD process.

- **The Yarn Trial**
- **Concept Garment Development**
  - **Sketch and swatch**
  - **Prototype Knitting**
  - **Make Up**
  - **Fit Approval**
- **Semi-Bulk Prototype Development**
- **The Buying Decision**
- **Production and Launch**

These stages are described in detail below:

**The Yarn Trial**

Dyed yarn is important to the fully fashioned knitwear manufacture at KnitwearCo since the yarn is virtually transformed directly to garments through knitting and very little make up is required to produce the garment. Make up of the fully fashioned knitwear takes place when shaped knitted panels are joined together through the interlacing (linking) of stitches with yarn. (This contrasts with circular weft knitting or weaving where a much longer process of fabric dyeing, fabric cutting, make up and sewing takes place. The cutting and sewing process is lengthy and panel shaping takes place during the cutting out process). At KnitwearCo fully fashioned knitwear the panels are produced at knitting that are then linked together to produce a particular design and size of garment. The knitwear production at KnitwearCo used dyed yarns that are transformed into knitted panels that are then taken through a partial make up assembly process to create the parts for a coloured garment. The partial garment parts are then sent for a short scouring (washing) and softening at an external dye business before returning to KnitwearCo for final assembly and packing. Yarn is a key aspect of the NPD process and much of the aesthetic of the final garment at KnitwearCo lies in the choice of the fineness of the yarns, the fibre components used in the yarns and the colour of the yarn. There are clothing retail selling two seasons each year (Autumn/Winter and Spring/Summer) and for each season the KnitwearCo Designers (Ladies and Menswear) attend the Italian Pitti Filati Yarn Trade Fairs in Florence. The Yarn Developer from KnitwearCo manufacturing also attends the Florence shows with the retail division designers and samples are selected by the designer for trials at KnitwearCo. The yarn show is the venue for yarn businesses to show the latest trends in yarn blends, colours and textures. Garment and Fabric Designers attend the shows to discover yarn trends and to be inspired in terms of what is possible from the point of view of raw materials and to order small quantities of samples of new yarn ideas. A few weeks after the Trade Shows the small samples arrive at directly at KnitwearCo or via the retail division London Office. Yarn samples are generally of colours that are not necessarily those required by the Designer but will give an idea of the concept garment since they yarn aesthetics will

nevertheless be demonstrated in the garment. Once the samples arrive at KnitwearCo they are knitted into a small section of knitted fabric (without any shape other than a rectangle) that is appropriate to the type of yarn and this is submitted to the Designer who then can see the type of knitting stitch look that can be achieved. The sample knitting also gives the manufacturer an opportunity to discover how well the raw material will perform in the knitting operation. The success rate for yarn types that eventually proceed to the commercial launch of products is typically about one in six. However success in this case is achieving the delivery of a commercial sample to the retail division who then place an order that may be for only a few garments.

## Concept Garment Development

Concept garment development has a number of sub stages. These are broadly described below, and a more detailed explanation follows.

### Sketch and swatch

After the Designers for Ladieswear and Menswear select certain yarns for development they receive the knitted swatches produced in the yarn trail.
Sketches of concept garments are then created by the Ladieswear and Menswear Designers and then sent to KnitwearCo. The sketches have styling details, colour, garment shape and sometimes a swatch of the fabric (or sometimes simply a yarn) sent back that has been created at the Yarn Trial stage. The Designers make decisions regarding generation of new product concept designs over a period of a two months as part of a wider 'Critical Path Plan' that aims to have various ranges of new season products available for a senior management review date. The Critical Path allows the various retail ranges of Knitwear and Formalwear to be developed into a co-ordinated collection ready for launch in Autumn/Winter or Spring/Summer in the UK retail stores and department store concession outlets and the international markets including Japan and the USA. The rate of new product designs issued to KnitwearCo by Ladieswear is about 45 designs per week over this two month period. This has the effect of

KnitwearCo only having a week in some cases to develop a new garment from a concept to prototype.

## Prototype Knitting

At KnitwearCo the sketch designs from a retail division Designer are converted onto an initial specification that uses either the Designers suggested measurements or KnitwearCo standard measurements for a similar previous garment. Measurements would include for example the width of the garment at certain points and the length from shoulder to hem and the sleeve length. The garment specification is translated into a detailed set of knitting machine instructions called a knitting statement using a computer program that takes the specification dimensions, the yarn type used and converts these details into detailed stitch by stitch instructions for the knitting machine of the appropriate gauge. Each knitting statement takes up to 4 hours for one technician to complete. The knitting statement is then converted to a computer disk by another technician and this disk can then be loaded into the knitting machine so that the appropriate stitches are produced.

A typical garment panel dimensions diagram is shown below in Figure 7.2.

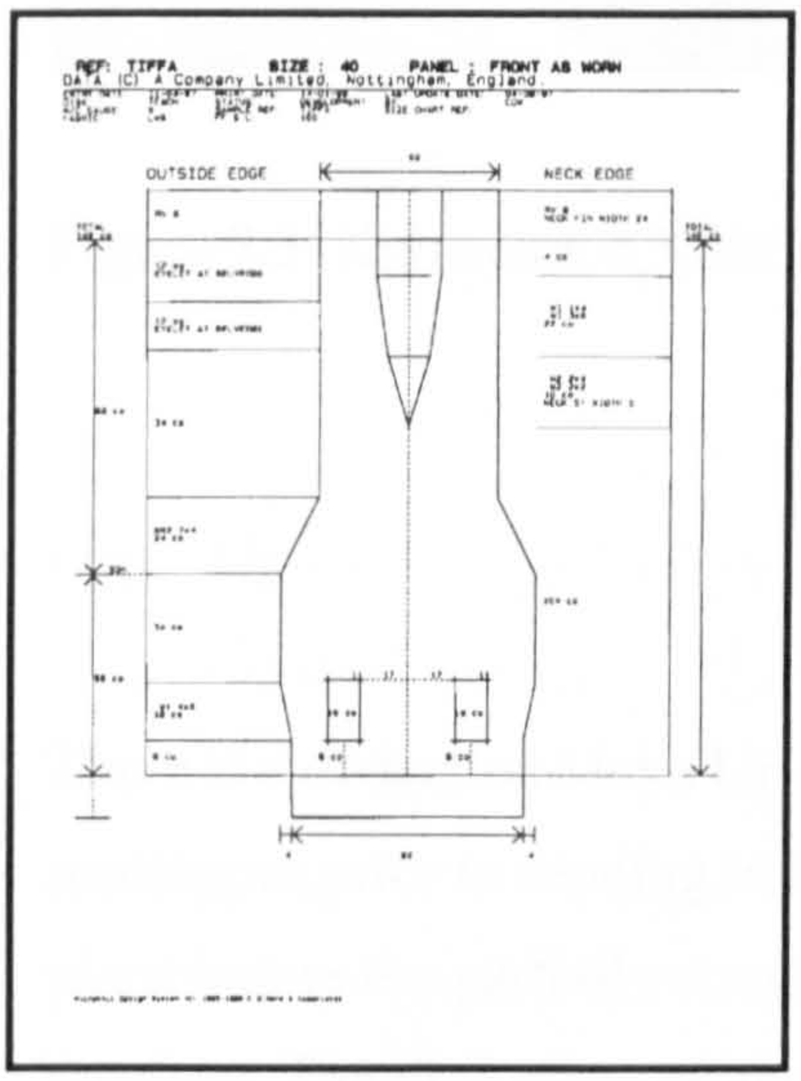



Figure 7.2: Garment Dimensions specification. Source: Microknit, 2001.

Details from the knitting statement on yarn usage and number of rows of stitches are passed to the Costing department for use in the manufacturing costing build up. Once the sketch and swatch and desired garment colour has been received samples of dyed yarn can be ordered and once it arrives and the knitting statement is ready the prototype knitted panels can be knitted. The prototypes knitted panels are knitted on standard production machinery when the right gauge machine is available at a change of production type. The knitting machine has first to be set up with the correct yarn and the knitting computer design pattern disk.

The knitting machine room can be seen in the photograph in Figure 7.3 below.

Figure 7.3: KnitwearCo Knitting Room.

There is a dedicated Make Up sample line that is used exclusively for assembling the prototypes prior to sending to the dyer for processing. Part of the Make Up process takes place before the partially completed garments are sent out to be scoured and softened at the dyer. Detailed notes on the method of assembly at Make Up are made by the specialist development sample line staff for use when the product goes into full production. These notes regarding production method are also sent to the Costing department for inclusion in the costing. Upon return from the dyer the balance of the

garment Make Up can be completed and garments checked by the development against the desired design, size, colour, handle of the fabric and specification prior to despatch to the retail product group Designer concerned. The scour and softening dyer's costs are recorded for inclusion in the costing. A price for the garment is also sent to the Designer using the costing information that has been built up during the prototype production, standard overheads, processing times for each step in manufacture, pay rates, machine speeds and standard profit margins. The sample line make up department is shown in the photograph (Figure 7.4) below.

Figure 7.4: KnitwearCo Sample Line.

The retail product group Designer will assess the finished garment, its fit, handle, styling details, colour and price and make a decision about inclusion in the range. Fit is tested on a size 12 model. Even if the garment is acceptable for fit the designer will usually want some change to the interpretation of the concept and suggest some changes to the prototype design and request a second prototype. The second prototype goes through all the stages described above since even a small change in garment dimensions or garment shade means that the garment has to be knitted all over again from new yarn.

Once the buyer is satisfied with the prototype it will be used as part of a range presentation to senior management who have to decide on the mix of products for the next season's collections. However the Designer is most likely to put the prototype forward for review with some small changes still needing to be carried out. There are two more opportunities for these changes. Firstly the semi-bulk prototype stage provides an opportunity for changes and secondly at the full order production stage. The senior management meeting will then approve a garment for the range and agree an order quantity. An order for some of the season's expected sales will be sent by the retail buyer to KnitwearCo along with a supplemental order for an immediate small semi-bulk production batch. The semi-bulk batch (Travellers Samples) will be used by sales staff at the retail division to try and generate more sales amongst concession stores. The level of success in developments is fair with half prototypes then adopted for commercial sales purposes.

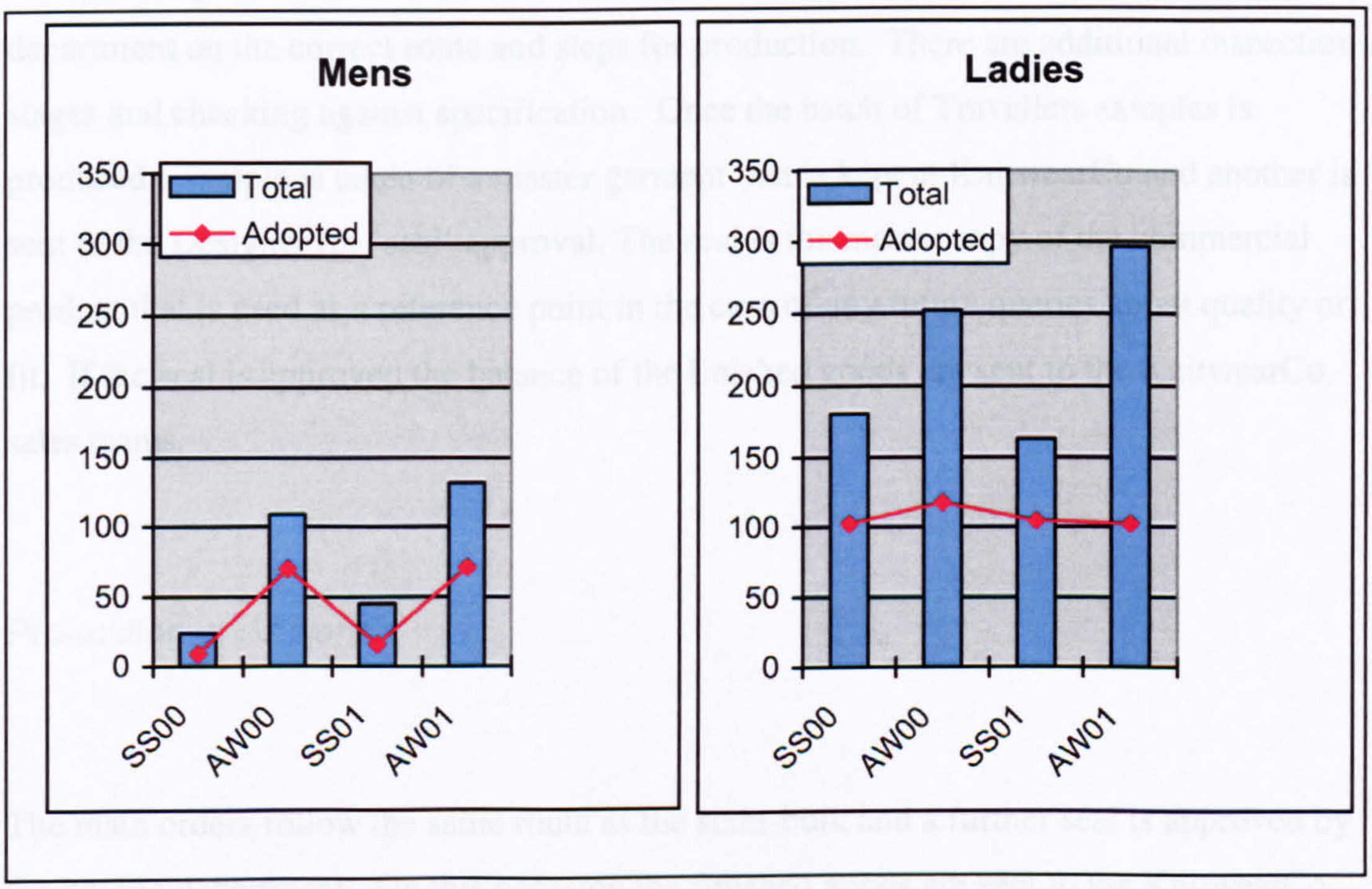



Figure 7.5: KnitwearCo New Product Adoption Rate

The charts (Figure 7.5) show the level of demand for prototypes and the success rate each season.

In Autumn/Winter 01 season KnitwearCo Ladies had 300 samples made and adopted about a third of them. KnitwearCo Menswear had 135 samples made and adopted 75. Adoption meant that an order was placed. This order could however be for only a few dozen garments.

## Semi-bulk Prototype Development

The semi-bulk Travellers Sample batch tends to go through the same stages described above for the prototype although the main production route, equipment and staff will be used at all stages. More yarn is required to be ordered and any further design changes are taken care of with a new knitting specification design and computer disk. A Bill of Materials is produced and a works order is generated that instructs each production department on the correct route and steps for production. There are additional inspection stages and checking against specification. Once the batch of Travellers samples is produced a sample is taken of a master garment that is kept at KnitwearCo and another is sent to the Designer for 'seal' approval. The seal is the master copy of the commercial product that is used as a reference point in the case of any future queries about quality or fit. If the seal is approved the balance of the finished goods are sent to the KnitwearCo sales teams.

## Production and Launch

The main orders follow the same route as the semi-bulk and a further seal is approved by the buying department. On this occasion the finished goods are sent to the KnitwearCo warehouse for distribution to the stores. A main production department is shown in the photograph (Figure 7.6) below.

Figure 7.6: KnitwearCo Make Up Department.

Detailed Process Stages Chart

Part of the Case Study intervention was designed to seek improvements in the NPD process and a more detailed process chart and stage descriptions were produced with suggestions about areas for improvement. A total process chart (Figure 7.7) is shown below. A part of the detailed mapping and analysis chart for the I.F. intervention project as then shown in Figure 7.8).

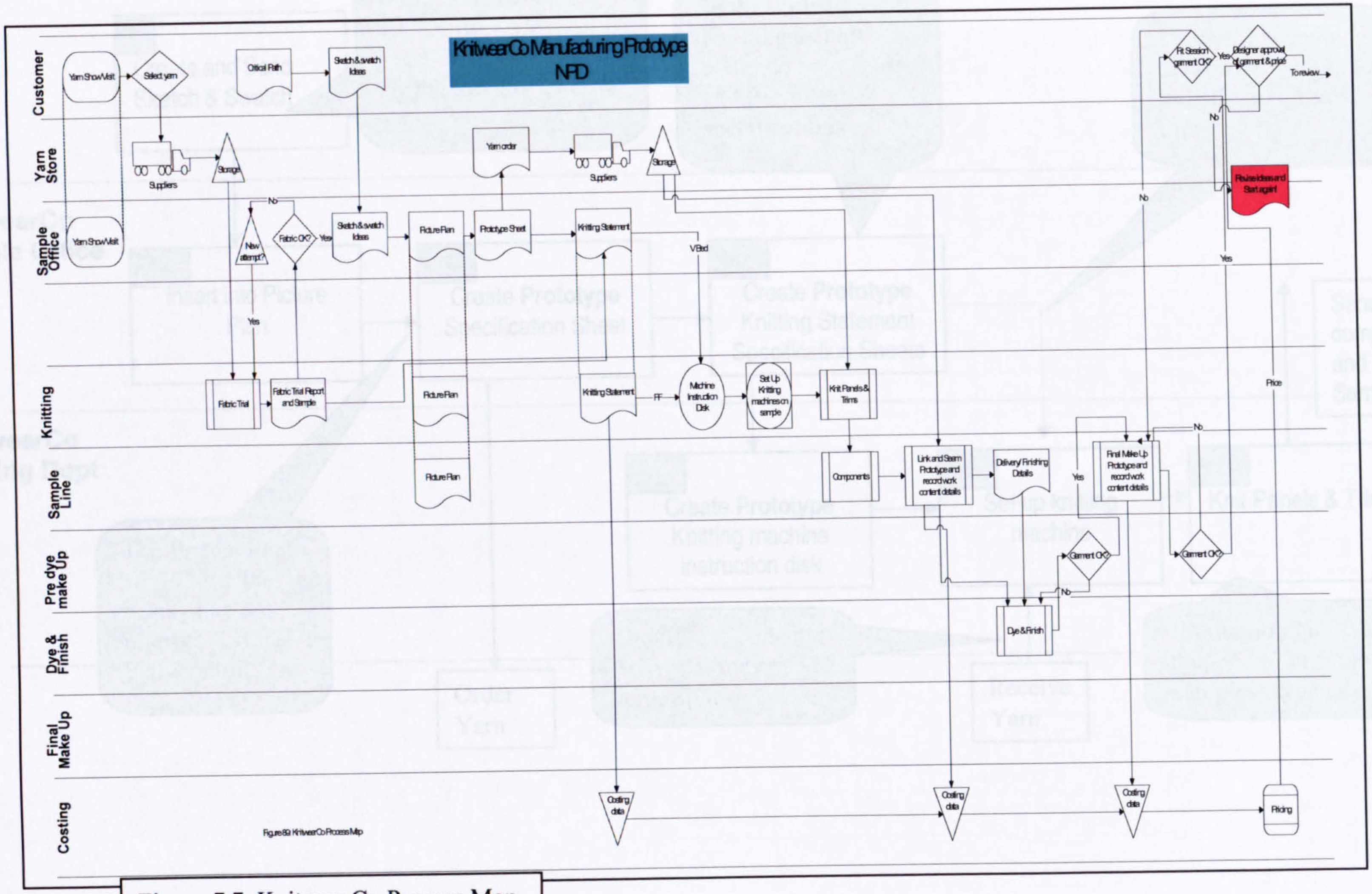
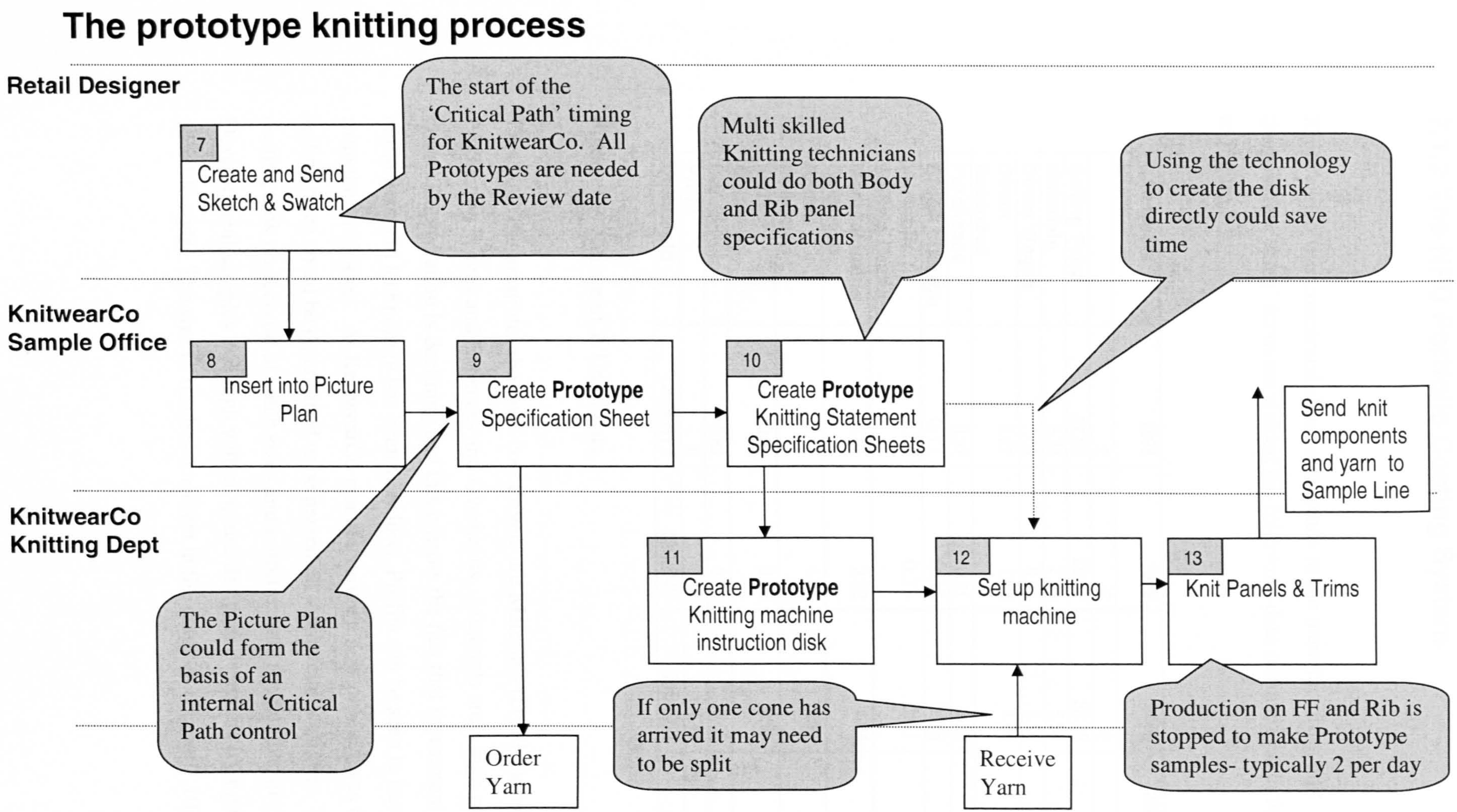



Figure 7.7: KnitwearCo Process Map

*Figure 7.8: KnitwearCo Detailed Process mapping*



## 7.1.2 The NPD Portfolio Costing System

KnitwearCo was concerned about cost trends in the manufacturing unit. An analysis of the past few years' accounts yielded the following data summarised in the table below in Figure 7.9.

| Unit Costs £/Unit | 1998 | 1999 | 2000 | 2001 Q2L.E. |
|---|---|---|---|---|
| | £ | £ | £ | £ |
| Selling Price | 27.29 | 25.02 | 23.88 | 27.26 |
| Materials | 8.24 | 7.74 | 5.54 | 10.20 |
| Direct Wages | 7.69 | 6.94 | 6.86 | 7.21 |
| Direct Expenses | 2.21 | 1.83 | 1.90 | 1.96 |
| Purchases | 0.37 | 0.31 | 0.53 | 0.22 |
| Stock change | 0.11 | 0.38 | 0.88 | -0.14 |
| Variable selling Costs | 0.86 | 0.73 | 0.41 | 0.78 |
| Manufacturing Overhead | 4.61 | 3.92 | 4.04 | 4.14 |
| Admin Overhead | 1.58 | 1.06 | 0.91 | 0.80 |
| Selling Overhead | 0.80 | 0.86 | 0.65 | 0.69 |
| Depreciation | 0.82 | 0.76 | 0.69 | 0.65 |
| Profit | 0 | 0.48 | 1.47 | 1.37 |
| Units Sold | 408,017 | 420,899 | 440,364 | 438,537 |

Figure 7.9: KnitwearCo Unit Costs.

This table demonstrates the main cost drivers are Materials (Dyed Yarns), Direct Production Wages and Expenses and Overheads. Materials are a high proportion of the costs. Depreciation is declining and this mirrors the fact that investment in new equipment and technology has been very low. Profits can be seen to have improved from the 1998 level. At KnitwearCo manufacturing a new product was costed so that a selling price could be determined to be passed on to the retail designer. However the costing took no account of batch sizes and unfortunately the number of New Product Development samples was high with in house designer designers trying to back every possible style. The size of batches is shown in the diagram (Figure 7.10) below.

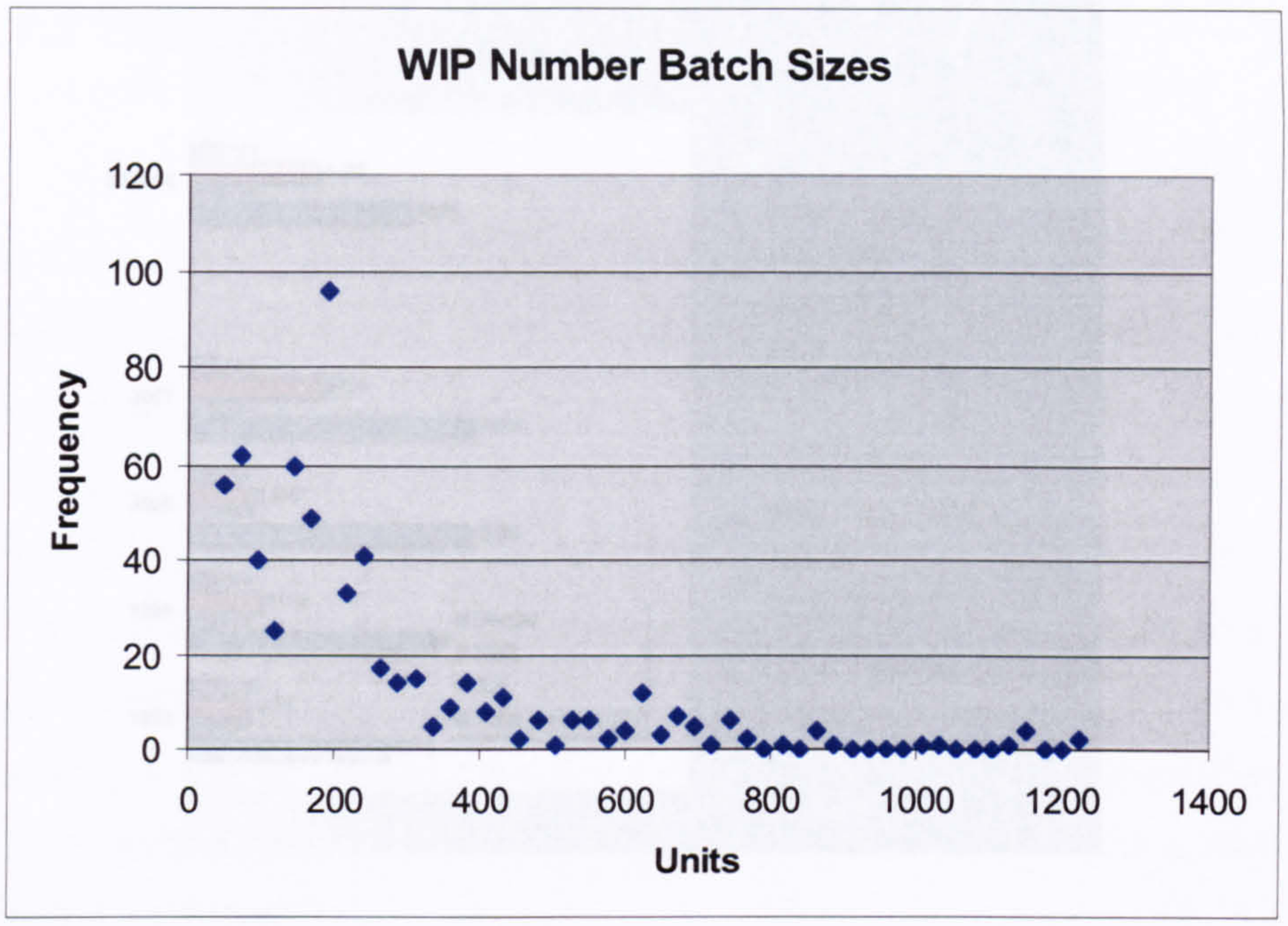



Figure 7.10: KnitwearCo Batch Sizes

The diagram shows that only a few of the batches were large (1000). These large orders came from outside the KnitwearCo organisation from Marks and Spencer and the concern in the business was that the existing cost structure did not give any benefit to the large order where long production runs would benefit the business. In fact the profit margins using the current costing for the M&S business were quite low compared to the in house business. The existing costing system took no account of the size of the development orders. On the existing costing system the larger orders for Marks & Spencer showed a low margin. These larger orders were very sparing in terms of using the product development resources. With the average cost of a new development of £258, this then means that an M&S batch of 1080 garments costs 24p per garment. With an in house Designer garment where the order size was 148 garments the cost was 174p per garment. The system in use charged all orders the same rate. KnitwearCo manufacturing was nevertheless trying to grow the M&S business as the chart below (Figure 7.11) shows since it was felt that the margins were not accurate with the existing apportioning of development costs.

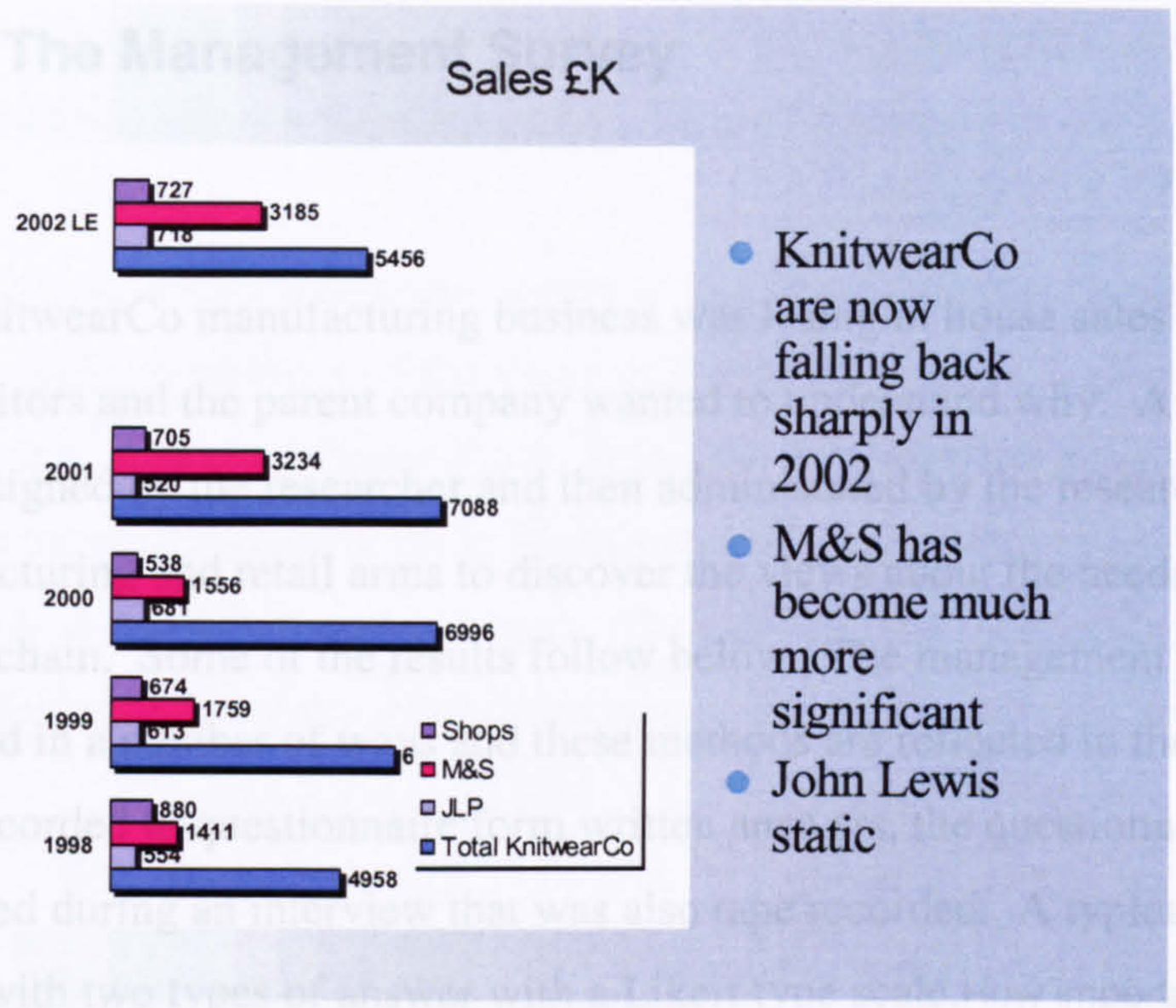



Figure 7.11: KnitwearCo markets.

A revised costing system was required that took account of the likely batch sizes of new products. A new costing method was developed and presented by the researcher and the effect of this was to make the M&S and in house profit margins more comparable. This is shown in the table below (Figure 7.12).

| Batch Size | 148 | 148 | 1080 |
|---|---|---|---|
| | **KnitwearCo Ladies** | **KnitwearCo Men's** | **M&S** |
| | £ | £ | £ |
| Selling Price | 28.24 | 27.48 | 43.00 |
| Contribution | 9.32 | 9.07 | 9.89 |
| % Contribution | 33 | 33 | 23 |
| Business Cost | 18.92 | 18.41 | 33.11 |
| Reduction to Base Cost without Developments | -1.22 | -1.22 | -1.22 |
| Addition for batch of £258.34 | 1.75 | 1.75 | 0.24 |
| New Business Cost | 19.45 | 18.94 | 32.13 |
| **Contribution** | **8.79** | **8.54** | **10.87** |
| **New Margin %** | **31%** | **31%** | **25.2%** |

Figure 7.12: KnitwearCo Margins

### 7.1.3 The Management Survey

The KnitwearCo manufacturing business was losing in house sales to Italian competitors and the parent company wanted to understand why. A perception survey was designed by the researcher and then administered by the research team at both the manufacturing and retail arms to discover the views about the needs of a knitwear retail supply chain. Some of the results follow below. The management perceptions were recorded in a number of ways and these methods are reflected in the findings. Views were recorded in questionnaire form written answers, the questionnaire answers were discussed during an interview that was also tape recorded. A typical question is shown below with two types of answer with a Likert type scale.How important is it that customers can order small quantities?

**Importance**

[ ] 1 very unimportant

[ ] 2

[ ] 3

[ ] 4

[ ] 5 very important

Comments.....

.....

How do you rate KnitwearCo in this respect?

**Rating**

[ ] 1 very poor

[ ] 2

[ ] 3

[ ] 4

[ ] 5 very good

The first part of the question asks about the importance of a particular customer service issue whereas the second part asks about the level of performance of KnitwearCo. Respondents were asked to fill in the questionnaire and then their responses were discussed in an interview when they were asked to elaborate about the thinking behind their scores. Comments were taped and notes taken during the interview. For each

question in the survey the views were taken of the managers in the manufacturing business and also for the managers in the retail business.

An analysis of the results was presented to the KnitwearCo managers as a series of charts and comparisons of the views of the manufacturing managers and the retail managers. The chart below shows the views in terms of average ratings of manufacturing managers about the importance and performance of a cluster of several associated customer service factors. The views of the retail teams were presented to the manufacturing team at a workshop presentation by the Industry Forum project team.

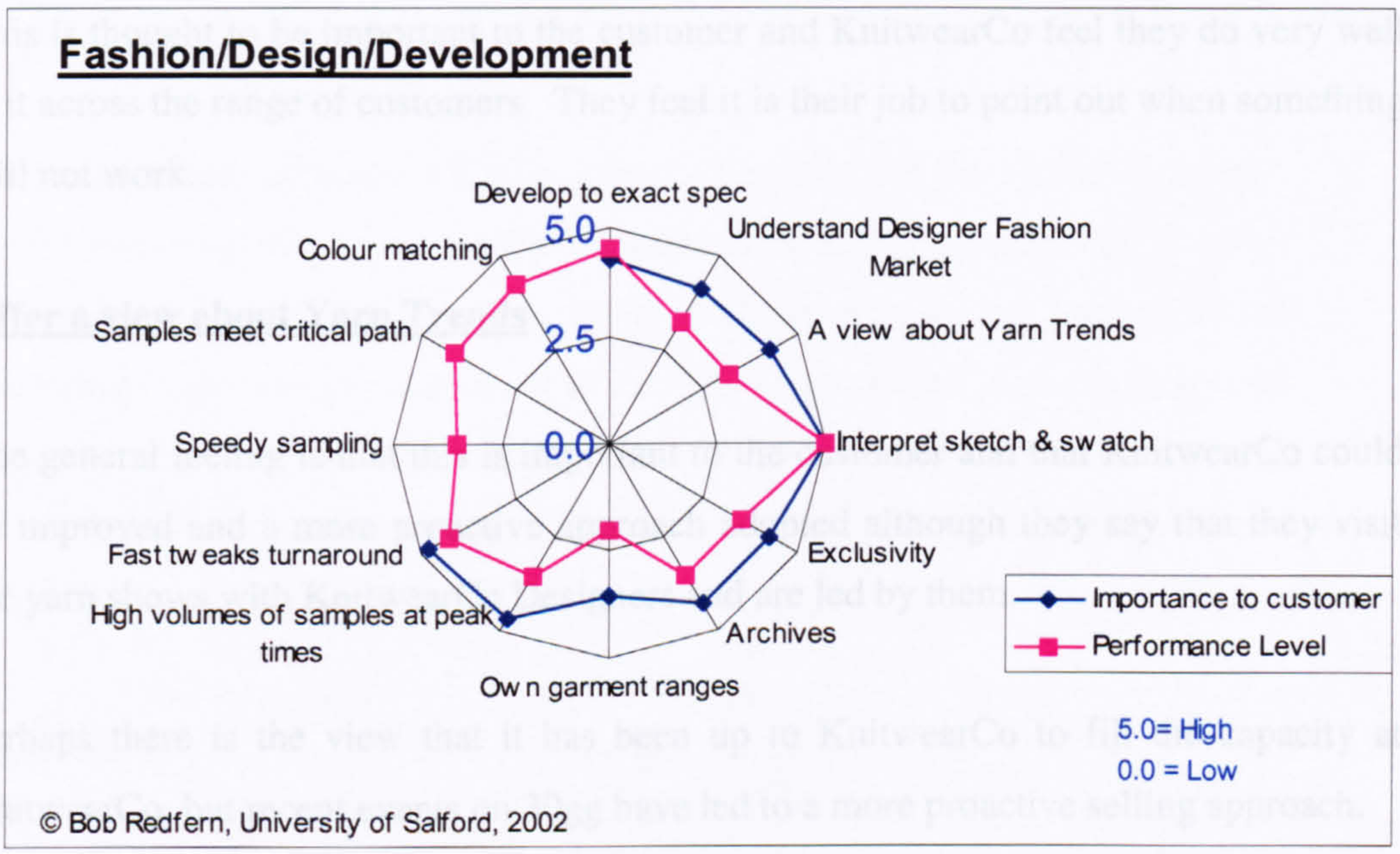



Figure 7.13: KnitwearCo Customer Perceptions

In the chart (Figure 7.13) above we can deduce that the manufacturing managers consider that developing their own garment ranges was of low interest to customers and that KnitwearCo was poor in their performance of this aspect. This aspect of the study was quantitative. The interview comments added some qualitative data. The interview comments from managers allowed a view to be built up of management attitudes that were behind the average results shown in the charts. These attitudes and views are

discussed below for the area of fashion/design/development with some key quotes in bold.

**Understanding the Designer Fashion market**

This was felt to be important to the customer but not something KnitwearCo feel confident about across the team, although they believe Karen has a good appreciation.

**Develop to customers exact specification**

This is thought to be important to the customer and KnitwearCo feel they do very well at it across the range of customers. They feel it is their job to point out when something will not work.

**Offer a view about Yarn Trends**

The general feeling is that this is important to the customer and that KnitwearCo could be improved and a more proactive approach adopted although they say that they visit the yarn shows with KnitwearCo Designers and are led by them.

Perhaps there is the view that it has been up to KnitwearCo to fill the capacity at KnitwearCo, but recent events on 30gg have led to a more proactive selling approach.

> **"Designers know what they want and we are happy to leave it to them. Where we need to we are developing our own range of yarns now on 30gg."**
>
> **KnitwearCo survey respondent**

**Interpret Sketch & Swatch**

This is thought to be very important for customers and KnitwearCo feel they are very good at it. This is their strongest suit.

## Own garment ranges

By contrast the development of own ranges is not thought to fit in with the present way the business with KnitwearCo is structured. This is rated as not wanted by the customer and not done by KnitwearCo.

> **"We are too busy doing samples and we have no sample machines. If it was my business I would do it."**
>
> **"This does not apply to our KnitwearCo business."**
>
> **KnitwearCo survey respondent**

## Use of Product Archives

KnitwearCo have archives of a wide variety of fabrics that show stitch and yarn combinations but they are generally commented on as a major asset that gives an advantage wanted by customers. However archives are considered important to customers in the ratings but those at KnitwearCo are not seen as anything special although they may give confidence of the ability to do certain knit structures. Garments are not kept due to space reasons. They are not photographed with images stored on CD with a swatch in the archives.

## Exclusivity

Similar comments to archives. Comments that this does not really apply since Designers have their own ideas which are co-developed.

## Speed of response on sampling

Customers are thought to be only moderately happy with the speed from KnitwearCo since they tend to quote offshore response times as being quicker. This is thought to be due to offshore suppliers having hand flat sampling machines, whereas KnitwearCo have to wait for automatic production machines to become available. KnitwearCo feel they try very hard but are not appreciated.

**"They ought to be satisfied."**
**KnitwearCo survey respondent**

**High volumes of samples at peak times**

This is assessed as being very important to customers and KnitwearCo think that customers are moderately happy with the service.

**Samples meet critical path**

KnitwearCo think they do a very good job but that the customers may not appreciate it.

**"We do get there. Karen jumps through absolute hoops and gets them there on time."**

**"They should be satisfied, since we generally meet the targets."**

**KnitwearCo survey respondent**

**Fast tweaks**

There is a feeling at KnitwearCo that the development process is an iterative process to and fro with the designers often to alter the fit with every sample garment needing some further work to get it just right. This is rated as very important for customers but KnitwearCo feel that in spite of fast turnaround they are told they are not as good as Asia Pacific suppliers, possibly due to the lack of dedicated development machines. Knitting is more difficult to change than make up.

**"We can tweak at the make up stage quickly (in24hrs) but knitting is longer since we do not have development machines."**

**KnitwearCo survey respondent**

## Colour matching

This is not thought to be a problem area and KnitwearCo think that they perform well, although acknowledge they are in the hands of the spinners and that the problem is not helped by going off the standard spinner shade card.

## KnitwearCo Findings Conclusions

At KnitwearCo the Industry Forum intervention project was designed to independently collect facts for the business managers and suggest improvements rather than implement them. The areas of investigation included the methods use in NPD, the costing arrangements for New Products that were used in decisions about the future of development projects by retail customers and the perceptions of managers in the manufacturing and retail arms of the business about the needs of the supply chain. All these aspects gave findings that could help to answer the research questions about how a clothing manufacturer part of the supply chain works with retailers on developing new products.

## 7.2 Findings for RetailCo

### 7.2.1 Data collection

As discussed in the section above regarding methodology the data collected for each case study base case from the Industry Forum intervention projects gave rise to findings that were relevant for the analysis of the research propositions. The section below deals with the data collection methods used at RetailCo. The following discussion concerns:

- the organizational situation encountered during the research
- the real world problem the organization client wished to improve
- the problem solving intervention
- an account of the data gathering for the problem solving intervention

The I.F. project intervention took place at the Planning Office of a leading UK retailer and was primarily concerned with improving the performance of the retail supply chain that involved the retailer's UK Midlands based Planning Office, a nearby Cut/Make/Trim (CMT) manufacturer and the buying teams at the retail Head Office some 200 miles away.

RetailCo had a real world problem of the speed of the new product development cycle in casualwear via the Planning Office and independent CMT manufacturer. The real world problem required development of a process map of the supply chain NPD system, measurement of the development cycle time and work to improve the quality and cycle time of the new products developed. Again this case offers the opportunity to investigate NPD methods in a retail supply chain with a garment maker involved. The Planning Office staff included a manager, a garment designer, two sample machinists, and a pattern grader and administration staff. The manufacturing factory across the street from the Planning Office employed 180 machinists and was run by the owner and his wife who also employed two quality assurance supervisors. The Head Office housed a large distribution centre and the buying teams for various categories of garments serving 380 UK stores.

The RetailCo Head Office Supply Chain Executive and Technical Manager had asked the Industry Forum to work with the Planning Office and the CMT plant to try and improve the speed of product development and the level of garment quality.

An initial meeting took place in November 2001 at the RetailCo Production Office involving the following staff from the Industry Forum and the RetailCo project team:

| RetailCo | Industry Forum |
| --- | --- |
| Supply Chain Executive<br>Technical Manager<br>Production Manager<br>Project Co-ordinator | Director<br>Research Fellow<br>Consultant LCP |

The discussion focussed on the key issues facing the supply chain with CMT Manufacturer. These are summarised in the box (Figure 7.14) below.

- Buy in from the buying teams at RetailCo Head Office
- Difficulty of loading the CMT Manufacturer factory in quiet periods
- Perception by RetailCo Buying Departments that the CMT Manufacturer factory delivers inconsistent quality
- Cost of the Planning Office staff operation (excepting design which is allocated to the design department in Head Office) is not currently allocated specifically into the CMT manufacturing costs
- Cultural difficulties of team building across cultural and language barriers
- Difficulties of obtaining 'buy in' from the CMT Manufacturer management
- The CMT Manufacturing operation needs to reduce costs to maintain competitiveness
- Reluctance of CMT Manufacturer to make complex garments

Figure 7.14: Key RetailCo Issues

There were therefore two main areas that needed to be investigated and improved. These were quality (with complexity) and total NPD cycle time. Two objectives were developed for the intervention project:

1. Introduction of an Effective Quality Assurance system which will support consistent quality in the production of a cost-competitive garment
2. Development of an effective quick response manufacturing facility to improve flexibility and reduce product lead times.

### 7.2.2 Planning the problem solving activity

An Industry Forum project formal proposal was presented to RetailCo and included the process by which the project would be organised including gathering data, agreement over the problems and objectives, measuring current performance, trying an improvement action, measuring the results, providing feedback to management and writing up the story as a industry Case Study. Extracts from the formal proposal are shown in the boxes (Figures 7.15-7.17) below:

- **Problem statement definition**

Either through a joint workshop with the parties involved or through individual interviews and data gathering at RetailCo and the CMT plant, build a detailed picture of the particular issues behind the current concerns and the aspirations of those involved at RetailCo and the CMT plant.

Develop and agreed specific and measurable target objectives relating to the issues of quick response and competence with more complex products.

Agree the project objective statement, timings, resources, the project team and their responsibilities in the project.

Figure 7.15: RetailCo Industry Forum Proposal Box I

- **Fact Finding**

Either at a joint workshop or through individual interviews and data gathering at RetailCo and CMT Manufacturer build a detailed database of the sources of information on current performance level in terms of 'manufacturing lead time' or 'time to market' and product complexity. Agree the responsibilities for providing the required information and meeting timings.

- **Process Mapping and ' As Is' Performance Measurement**

Mapping - Through meetings at RetailCo and factory observations gather information about the current processes from concept, design, prototyping, ordering fabric and processing capacity, production and delivery from the factory gate. Mapping and process timing Information will include key activities, activity timings and variability of timings, key decision points and identification of process critical activities.

Performance – Through information gathering at RetailCo and CMT supplier determine the 'As is' performance of the business partnership in lead-time across a representative selection of garment lines and recent history.

Figure 7.16: RetailCo Industry Forum Proposal Box II

- **Analysis and Improvements**

The Industry Forum to propose, agree with all the parties and then implement an improved and cost effective process model that will significantly reduce time to market. We will undertake a trial project that can be rolled out across the business. In particular the improved process will have the ability to react positively to changing demand and allow the re-buy of fast selling lines within the season.

The proposed process to take account of the potential up-skilling of trainers and operatives to enable more complex styles to be manufactured and the need to increase multiple product capability.

- **Performance Measurement of the Improved Process**

Put in place and monitor the effectiveness of the improved methods and the achievement of the project objectives.

- **Feedback session to RetailCo/CMT MANUFACTURER**

Give account of the project and its results to the senior management.

- **Write up the case study**

Figure 7.17: RetailCo Industry Forum Proposal Box III

The client formally signed the proposal and agreed to the timescale, action steps and the resources that would be made available. The proposal also included the detailed steps and resources needed from the Industry Forum researcher personnel and the RetailCo/CMT Manufacturer organizations.

Gathering data regarding the current NPD practices and quality performance in the company involved the following methods

- Site Visits
- Interviews
- Observation
- Artefact examination

- Documentation collection
- Archival analysis

In building up a picture of the NPD process it has been possible to use the information gleaned from the original interviews, conversations, observations and documents. As the project progressed the following additional steps allowed a notional model of the NPD process to be built and presented to management.

- Evaluation and analysis of NPD process and building of NPD Process Map
- Measuring the current NPD cycle time
- Jointly developing a revised NPD process
- Experimenting with the revised NPD process
- Measuring the revised NPD cycle time
- Documenting the intervention process

The model process map (see Figure 7.18 below) was presented to management and then the time to reach twenty three points of the various NPD stages was measured over a three month period for 67 new products covering 100,000 units that were then manufactured. The ability of the notional model to allow accurate measurement provided further validity of the understanding of the NPD process.

Additionally by introducing changes to the actual system of new product development process that were then used by the company to improve the performance provided further 'triangulation' and added validity to the original process model that had been developed and shown to the company.

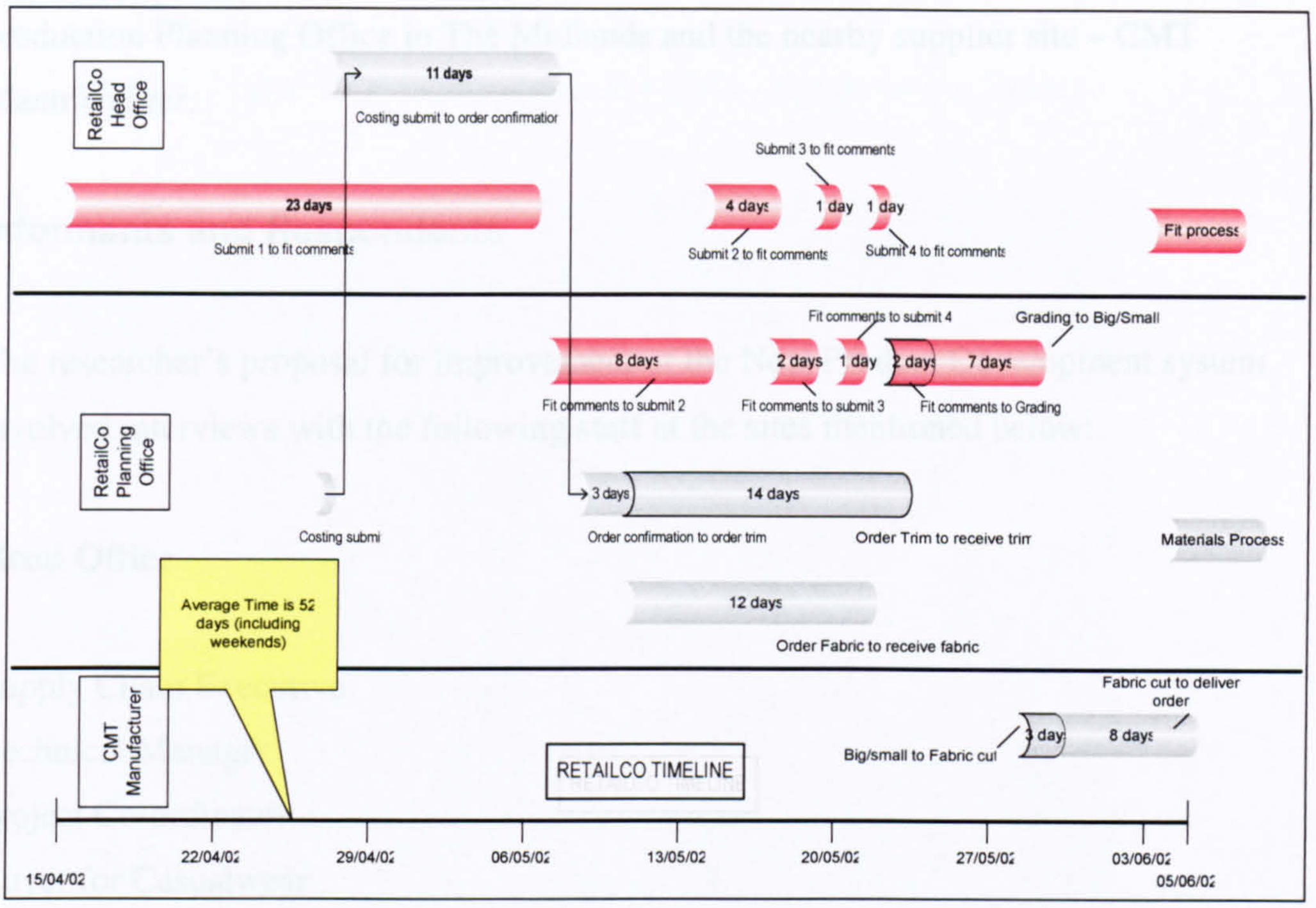



Figure 7.18: RetailCo Process Map

### 7.2.3 Data Collection Methods in Practice

This section discusses how various data collection aspects were addressed including site access, informants and respondents, detailed data collection types and methods and summaries of the data collected.

#### Site Visits

As discussed above the researchers presented a formal proposal document to RetailCo Supply Chain management that was then agreed by RetailCo.

This proposal for working on the RetailCo NPD problem solving project allowed access to the sites and staff involved, including RetailCo Head Office, RetailCo

production Planning Office in The Midlands and the nearby supplier site – CMT Manufacturer.

## Informants and Respondents

The researcher's proposal for improvement of the New Product Development system involved interviews with the following staff at the sites mentioned below:

**Head Office**

Supply Chain Executive
Technical Manager
Project Co-ordinator
Buyer for Casualwear
Buyer for Girls Range
Buyer for Outsize (Sizes 16+) Range
Technologist for Girls
Technologist for Outsize
Fabric Technologist
Distribution Centre QC Supervisor

**Planning Office**

Production Manager
Assistant Designer
Pattern Designer
Sample machinists

**CMT Manufacturer**

Owner
Fabric Supervisor
Quality Assurance Supervisors

The picture (Figure 7.19) below shows the CMT manufacturing facility.

Figure 7.19: RetailCo CMT Manufacturer

It was important to interview all the different departmental staff involved in the New Product Development system at RetailCo and its CMT supplier in order to build a comprehensive and valid view.

**Data Collection Types and Methods**

Site visits to the production Planning Office and the CMT factory were made almost every week for four months. The data collection took place over this period using informal interviews and open ended conversations, observations, document and archive collection plus artefact examination. The result was a gradual building up and cross checking of the ways that NPD was carried out and development of a process model that is shown below. The conversations were recorded with note taking by the

researcher. A summary copy of these notes was submitted to the project team members for checking after each visit. The NPD process model was also submitted to the project team. The observations were recorded through note taking and digital photography. Data from documentation and archives was recorded through note taking, photocopying and through emailing and computer disk storage of the documents. The site visits to the Head Office were not as intensive as those at the Planning Office or at the CMT plant, since the NPD project was based at the Planning Office and plant where methods were being changed, and moreover the Head Office took ten hours to get to from the University. Obtaining the buyers' time for interviews had to be planned carefully at the Head Office where access to buyers was difficult since they travelled much of the time. To make best use of the time available the data collection method used at Head Office was formal, semi-structured focussed interviews with the buyers and technologists. This was supplemented with observation, document and artefact examination in the Buying Office, QA department and the Distribution Centre (DC). The interviews with the buyers and technologists were tape-recorded. Other conversations were recorded through note taking.

### Gathering Data for the NPD Mapping Process

The NPD Process was mapped through collecting data through a variety of methods. The aim was to gather information from various sources along the new product development chain from the Design studio to the Distribution Centre.
Interviews were typically open ended and informal, and were guided conversations rather than structured interviews. The researcher was trying to build a picture from a variety of data sources about the way that NPD is carried out within the RetailCo supply organisation. Whilst interviews were unstructured they were nevertheless not general conversations but aimed at finding out what each participant did in their part of the NPD process.

The interviews at the Head Office took place in a more formal setting and were semi-structured interviews since the discussions were centred on an initial model of the process with timings. The conversations with the buying department staff were taped and to an extent the differences between different buying departments were more

evident. The interviews were recorded through the use of notes in the main although the interviews at the Head Office were tape-recorded and this gave the opportunity to analyse them repeatedly to ensure the correct interpretation of conversations. These site visits were all written up and these visit reports sent back to the sites for checking within two weeks of each visit.

A total of fifteen site visits were carried out between April 2002 and September 2002 covering the three sites. Seventy seven respondent interviews and discussions took place. There were thirteen site visits to Planning Office and CMT plant and two site visits to Head Office.

Site visit reports were circulated to the RetailCo project team. The following site visit report (Figure 7.20) demonstrates the type of information gathered from the Head Office.

Figure 7.20: Example of RetailCo site visit report

Industry Forum

Improving the textile & clothing supply chain from concept to customer

| **IF Collaborator Meeting**<br>**RetailCo**<br>**Prepared by RR on 15/11/02** | |
|---|---|
| Meetings with | Production Manager<br>Supply Base Manager<br>DC Quality Control Supervisor<br>Fabric Technologist<br>Girls Jerseywear Buyer<br>Girls Garment Technologist<br>Girls Assistant Garment Technologist<br>Formal Jersey Buyer<br>Outsize Buyer |
| Date: | 15th September 2002 |
| IF Team Members | Bob Redfern – Project Leader, Industry Forum |
| Location: | RetailCo Head Office |
| Focus of Meeting | Discussions with Buying Departments |

## Distribution Centre and Quality Checks

Anita, the Supply Chain manager showed me round the Distribution Centre (DC).

The DC is part of the RetailCo Head Office. Here deliveries arrive from the suppliers at home and abroad either hanging (20%) or flat packed in two sizes of carton. The goods are stored in warehouse locations. The hanging garments are held on a rail system that allows automatic transfer to the loading bays for delivery to each store every other day. The flat pack cartons are stored in bays of racking and have perforated ends that allow the pickers to access individual packed garments that are then put into plastic boxes for the stores.

The DC is moving gradually to the more modern automated rail hanging systems which are very much less labour intensive and leave the garments in a better condition for going directly to the stores.

## Quality Control (QC) checks

Pat the DC Quality Supervisor explained the system that is designed to randomly check incoming batches according to a statistically based AQL method that has further checks if the initial check is out of the limits.

In practice the QC has a limited amount of staff and time and can manage 20 checks a day since the move on to a single day shift operation. Each check covers between 30 and 60 garments depending on the batch size.

The check involves measuring some of the specification measurements and is carried out by hand. [There are automated measuring systems and databases on the market that use a computer system with a mouse like instrument).

From the 20 or so measurements on the specification the QC check about 5 to 8 of the main ones. The checks that are within specification are not recorded and if the first 5 garments in a size are Ok then the remaining 5 will not be measured. Those that are coming off spec will be recorded on a sheet.

Beyond measurements there is no specific check protocol laid out. The staffs are experienced and it is up to them to check for the sort of problems that can arise on a wide variety of garment types. They usually have a sample garment to compare against and are then looking out for poor sewing, incorrect fibre composition or care labels and poor or make up. The AQL has limits for Major faults and Minor faults but in practice the checkers do not count or record the actual numbers of Major or Minor faults but make comments on the general appearance and make up standard on a form. Those that are rejected will be notified to the buying department technologist who will make a decision about the batch. Stitching and buttonholes are the main things looked at.

Once a garment sample has been checked it is packed up again and returned to stock.

The batches that are due in each day are listed from the computer system. The specific batches that need to be checked are allocated by the Buying Departments. This means that with 200,000 garments arriving each day the QC can perform checks on about 1200 or 0.6%.

The number of hanging garments on the daily intake sheet was just under half the intake at 94,000 with flat packed at 100,000. Pat gets copies of collection notes from suppliers so she knows what has arrived.

The fact that the buying departments decide on what to check with no co-ordination means that some days there are too many to do and some days too few. When there are too many, Pat adds what she considers to be checks on the priority styles. The level of priority of a style is indicated on the incoming goods list. Those that are destined for store window displays and Best Buys are top priorities. New styles may also be checked or styles that the buying department technologist
is concerned about.

If there are too few styles selected by the buying departments the QC then make up the difference to 20 checks per day by selecting some randomly themselves. Checks take various amounts of time since it takes longer to check a coat than a casual top. Sometimes the order that is out of spec will be permitted on the understanding that the next batch will be to specification.

The records are kept in files and we were able to check the UK CMT Manufacturer files for the past few weeks. There were very few major problems recently with any out of specification being 'Permitted' by the technologists. The CMT Manufacturer was not seen as a poor supplier.

[It is worth noting that the Actual Quality Level batch check sheets that are carried out at the CMT plant are sent to the Head Office DC QC department but they do not do anything with the information since they find it hard to work out which order it relates to.]

**Fabric Checks**

Lynn is in charge of fabric checking. I did not see the department but was given a brief summary by Lynn.

Fabric checks comprise the sending away of samples of base fabrics to testing houses. Once a base fabric has been checked the individual dyed or printed batches are checked by the suppliers themselves who provides test certificates. Having all suppliers with accredited test facilities of their own is the ultimate aim. I get the impression that base fabrics that have been used before are checked fairly infrequently and they are assumed to be ok.

I enquired about the method for finding out about the quality of fabric that is being received by CMT suppliers like the one in the Case Study. Lynn expects Stephen (Production Manager) to let her know if there are any problems, but there are no routine methods of letting the fabric manager know what the ongoing quality is like.

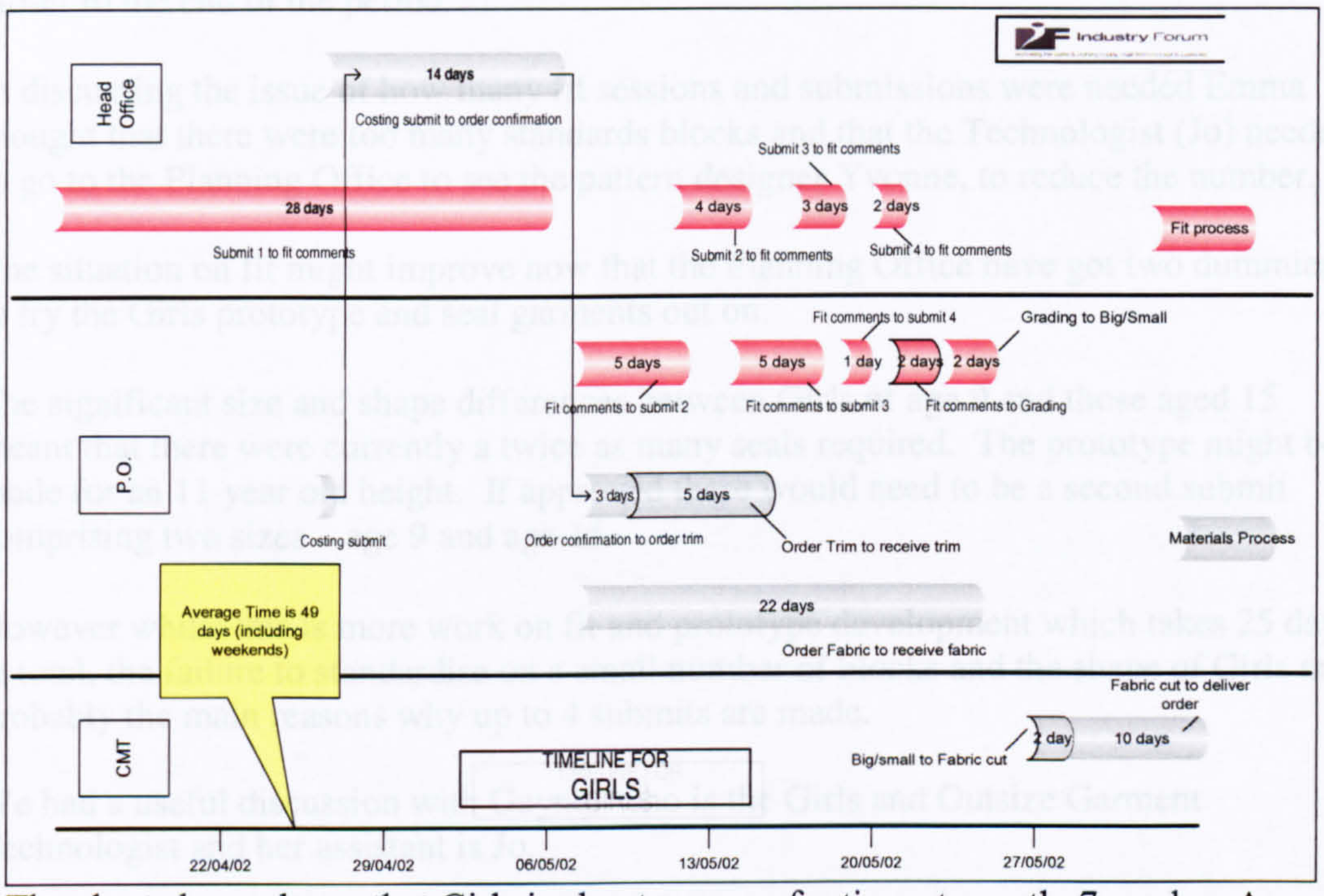
**Buying Departments**

The main reason for the visit was to find out what happens to the prototype development samples and sealer fit samples that Buying departments get from the Designer and Pattern Designer at Planning Office.

The discussions centred round the Timeline for each department.

**Girls Jerseywear**

Emma was the buyer.




The chart above shows that Girls is about average for time at exactly 7 weeks. As we see below this timing is not a co-incidence but a result of the review cycle. Girls is characterised by the high number of seal attempts before a fit is agreed and the short time to get trims.

Emma is working to a 7 week cycle. If it is now week 29 Emma is planning week 36. Emma gets the prototypes each week during this period from Karen the Designer at the Planning Office. The effect of this cycle is that in effect the prototypes are arriving each week from the Designer and there is no real reason for Emma to choose any particular styles from the many sent in since she has 7 weeks to think about it.

During that period unless Emma is keen to get a particular style that she has discussed with Karen to fill a perceived gap (competitors may have a better offer) then is to her advantage to wait and see if Karen comes up with anything better than her attempts earlier in the period. The prototypes are also useful to put in the mock shop to see if there is range coherence with other styles and submits from other suppliers.

There are PR (Profit Review)/ range selection meetings at the end of each cycle to review with the other buyers the look of the overall collections and how sales are going. Karen, the Designer attends these meetings too.

With many different suppliers and various buying departments there is an evolution of which garments fit into the range of a department and the overall ranges proposed for the next cycle period.

Emma thought that nevertheless the time to give an order to the Planning Office could be reduced from the present 28 days. This would speed up fabric and trim orders.

However her ability to place orders was also affected by the 'open to buy' amount that the department had left to be able to commit to new styles and she was generally booking closer to the end of the period.

In discussing the issue of how many fit sessions and submissions were needed Emma thought that there were too many standards blocks and that the Technologist (Jo) needed to go to the Planning Office to see the pattern designer Yvonne, to reduce the number.

The situation on fit might improve now that the Planning Office have got two dummies to try the Girls prototype and seal garments out on.

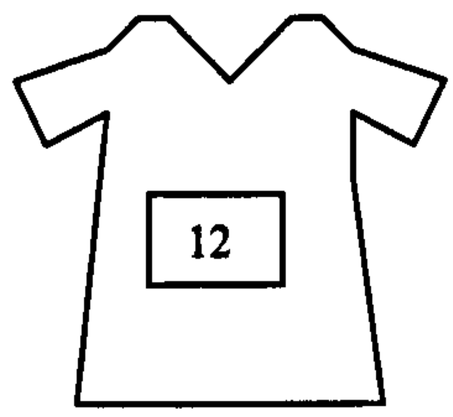
The significant size and shape differences between Girls of age 9 and those aged 15 meant that there were currently a twice as many seals required. The prototype might be made for an 11 year old height. If approved there would need to be a second submit comprising two sizes – age 9 and age 15.

However whilst this is more work on fit and prototype development which takes 25 days in total, the failure to standardise on a small number of blocks and the shape of Girls are probably the main reasons why up to 4 submits are made.

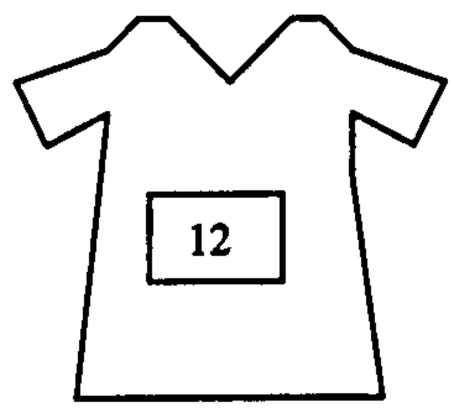
We had a useful discussion with Gaynor who is the Girls and Outsize Garment Technologist and her assistant is Jo.

Once the buyer has decided that a prototype has been selected or is needed for checking urgently Gaynor or Jo get involved in agreeing that wash care label instructions are correct for fabric that is bought in by the Planning Office who sends samples of core fabric to Lynn for external laboratory wash tests. Gaynor or Jo organise fit checks on models or dummies to check how well the garment looks in general. (Buyers like to attend the first fit sessions). Technologists also measure each of the 20 specified measurements against those on the standard block initially on the mid size height (152-158cm) prototype on a style that the buyer has selected. The technologists fill in the specification forms with any comments in the amendments column about changes in measurements that are needed, possibly with sketches to illustrate so that Yvonne can

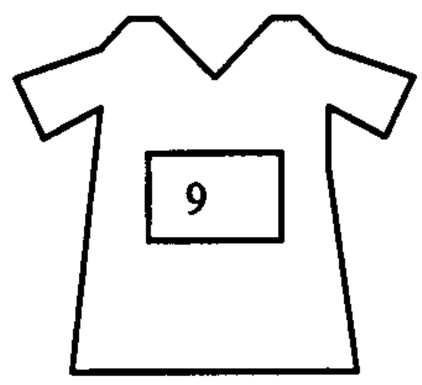
produce a new submit that meets the requirements of the buying team

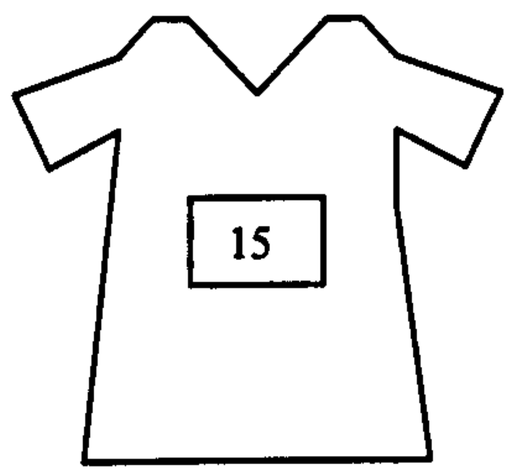



First Prototype from Designer

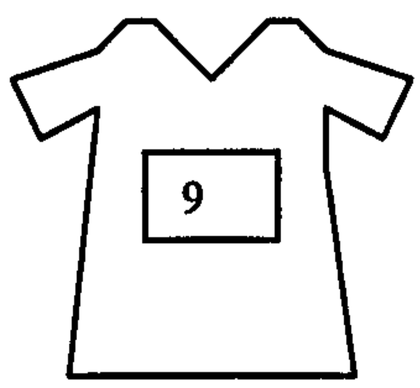


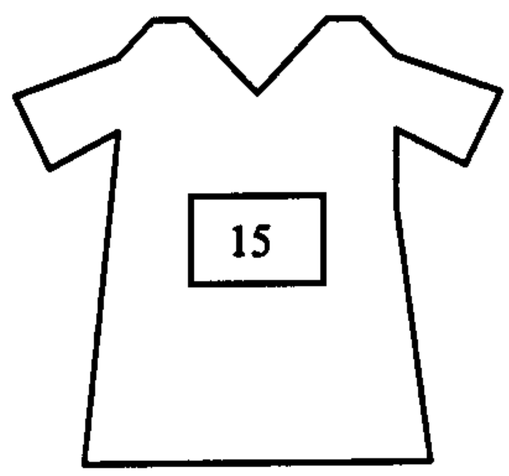

Second submit – getting the style right



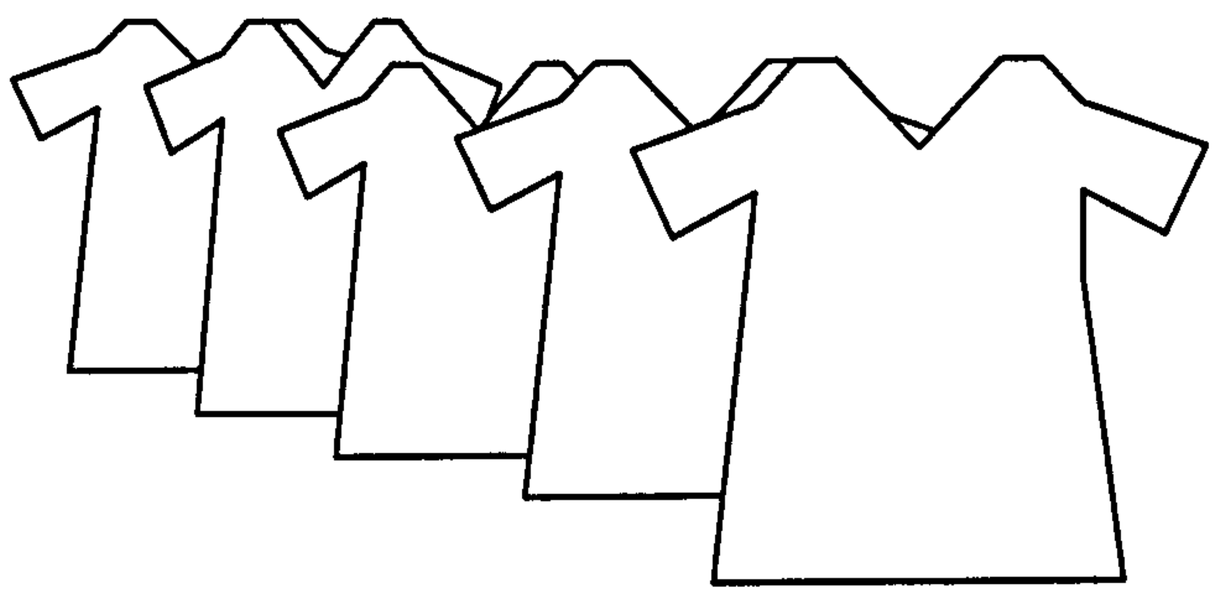




Third submit – getting the fit right at both ends of the size scale




Fourth submit - getting the fit right at both ends of the size scale



Grading – rules for getting the fit right for every size

Sometimes the buyer thinks the prototype is not quite right in terms of style and changes may be requested in terms of sleeve lengths or neck shape, so this will extend the time. Having new printed designs also adds to the time. The specification amendment sheets are then sent to the buyer for checking, then it is sent to administration to enter it on the computer 'critical path' system with the dates that is has been first fitted. In theory this could be used to chase the next submit but rarely is.

Shape seems to be an issue in this range of Girls that has an impact on the number of submits and fit checks that are needed. A first prototype will be aimed at say a 12 year old. If this is accepted then a second submit is made with garments for both 9 and 15 year olds. It sounds as if the difficulty is that grading from one end of the size range to the other does not really happen in a straight line as it does on core Womenswear for example. So whereas in women's casualwear there are clear grading scales that will see the specification of say the measurement around the waist go up and down in 1.5 cm steps from the size 12, this is harder to do for girls who change shape dramatically between age 9 and 15. Fit checking takes place on a variety of girl models who seem to vary in shape and arm lengths in spite of being the same height. Using the dummies may help but the technologists do not have faith in the dummies reflecting the true shape of children. This issue of getting the rules for fit is shown in the Figure above.

One way around the issue might be for the Planning Office to submit the garment in a small and big size at the outset and then these can be fitted and comments obtained on the first fit for both ends of the size range. It was generally agreed that more contact between the Girls Technologists and the Planning Office pattern maker with discussions about the best way to move from the mid size to every size via the big and small.

Stephen suggested that he would bring Yvonne down to the Head Office so that there could be some work with the technologists to reduce the number of standard blocks and look at the size/gradings issues.

The selection of garment deliveries for checking by the DC for quality tended to stem from how well the fit had gone. If there were problems with fit sessions then Gaynor would ask for the DC to check the incoming delivery. If a certain supplier had a lot of problems then they would be checked more. Jo though that particular styles where trims were problems would be checked more at the DC.

There had been few problems with the UK CMT Manufacturer. Stephen usually notifies the technologists if there is a problem (with say a measurement being slightly out of specification) to get agreement on the action, before it leaves the factory. One recent problem in the last few months was with the cowl neck Lucci garment with problems with the arm holes on a stretch fabric (+2) where Yvonne had been off and someone else did the patterns and although Yvonne did the Big/Small the production then was off spec. Trish the CMT QA had spoken to Head Office before the delivery.

The Head Office technologists did not see the Actual Quality Level sheets that were filled in before delivery by the QA at the CMT plant although Jo thought they only got them from some suppliers. Whilst Pat gets them faxed through she does not take any action. It was agreed that they could be copied to the technologists in future from the UK CMT plant.

The main role of the technologists was to get the fit right. They also sort out the care labels because the fabric technologist does not see garments, but sees rolls of fabric. If a garment has a lace tie then the care label may be changed to say the tie needs to be untied prior to wash. There are standard care labels. Gaynor asked for copies of these from Stephen.

Delays were sometimes due to the need for lab tests on new printed fabrics. Base fabrics such as Viscose were only tested every six months. The care labels cannot be done without the test results. It is difficult to chase up what is late since there are so many tests. They are chased up every week.

The new fit forms could have a date on them by the Planning Office to say that this garment has to be sealed by a particular date if the factory is going to make the due delivery date. This was then agreed as a procedure where Stephen would in future get Yvonne to put on the fit form when the target seal was needed by. This could always be a conditional approval subject to small changes in the production.

Jo had a lot of problems due to the developments not always being based on the right block. Stephen thought that if Yvonne and Jo got together to sort out the main standard blocks and bin the rest. Stephen though that the constant changing of girl models led to a proliferation of blocks. There should be that some standards should be agreed and the aim be then to stick to them. This would give confidence to the buyers. Child models who had very long arms or hollow backs should not lead to a new block.

Gaynor did not think that the new dummies were a good approximation to real girls, particularly for the 'bottoms' garments since the dummies had no legs. Jo thought the dummies were good for necks but not so good for shoulders so that a garment that looked fine on a dummy then could look bad on a live girl model.

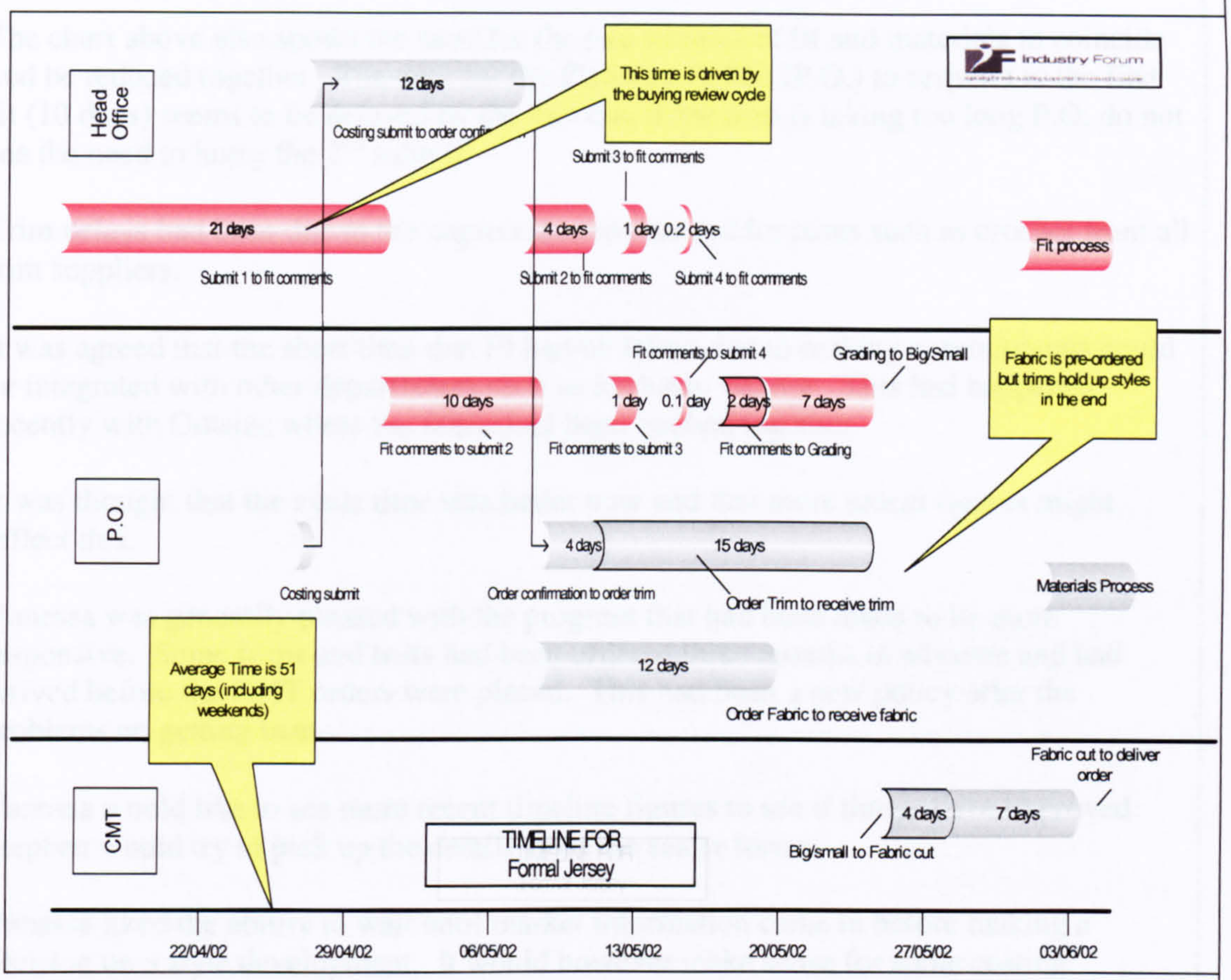
The technologists did not feel they had personal control over the level of quality that came out of the CMT plant, but they did have targets to improve although when pressed there were no specific details of what the levels were for rejects at D&R or at the DC or returns from the consumers to stores.

**Formal Jersey**

Vanessa is the Buyer. Discussion centred around the cycle time chart shown below.

Vanessa thought that the reason it took two weeks for the formal order to get to the Planning Office was partly due to orders always being signed on Tuesdays by the buyers. This means that a sample that arrives on a Wednesday will not get signed until the following Tuesday. The internal order had then to go to the merchandisers to do the ratios and then to admin who put it on the system before the order went to Stephen.

Costings from Stephen might not get back to Vanessa in time for her to make the decision and put the order in for signing by the Tuesday. Vanessa argued that if she was on a quick turnaround department that the order should be delivered within 4 weeks of placing the order. The effect was that Vanessa would present her range to a P&R meeting 10 weeks before the garments are due in the stores.




This meant that she feels that she does not have to make a decision for six weeks on garment development submits before presenting to the board. Karen will send in 10 samples per week for six weeks and Vanessa is getting samples from other suppliers and market trends are changing. Therefore so long as Vanessa has the samples she can leave the decisions. In any case the fabric has been booked and so the decision can be left.

The current system in Vanessa's view gives her the flexibility to make changes as late as possible.

The general feeling was that the total time depended on the need to meet the needs of the reviews.

It remains the case that the capability to reduce the time to market for Formal Jersey (FJ) seems to depend less on the fit process but more on the time to make a decision about which style to go with and get the costing and order through the system. This reflects the time that has been spent getting FJ basic blocks agreed.

The chart above also shows the need for the two streams of fit and materials to coincide and be reduced together. The time for the Planning Office (P.O.) to respond to the first fit (10 days) seems to be delayed by the fact that if the trim is taking too long P.O. do not see the need to hurry the 2nd submit.

Trim delays had been due to the unprecedented demand for trims such as crochet from all trim suppliers.

It was agreed that the short time that FJ had on fabric due to making commitments could be integrated with other departments such as for basic viscose. This had happened recently with Outsize where the fabric had been booked together.

It was thought that the cycle time was better now and that more recent figures might reflect this.

Vanessa was generally pleased with the progress that had been made to be more responsive. Some trims and belts had been ordered three months in advance and had arrived before the CMT orders were placed. This had been a new policy after the problems on getting trim.

Vanessa would like to see more recent timeline figures to see if things have improved. Stephen would try to pick up the details from the sealer forms.

Vanessa liked the ability to wait until market information came in before making a decision on a style development. It would however make sense for some costing requests to be put through early and even fit sessions carried out on developments that were more likely to be picked.

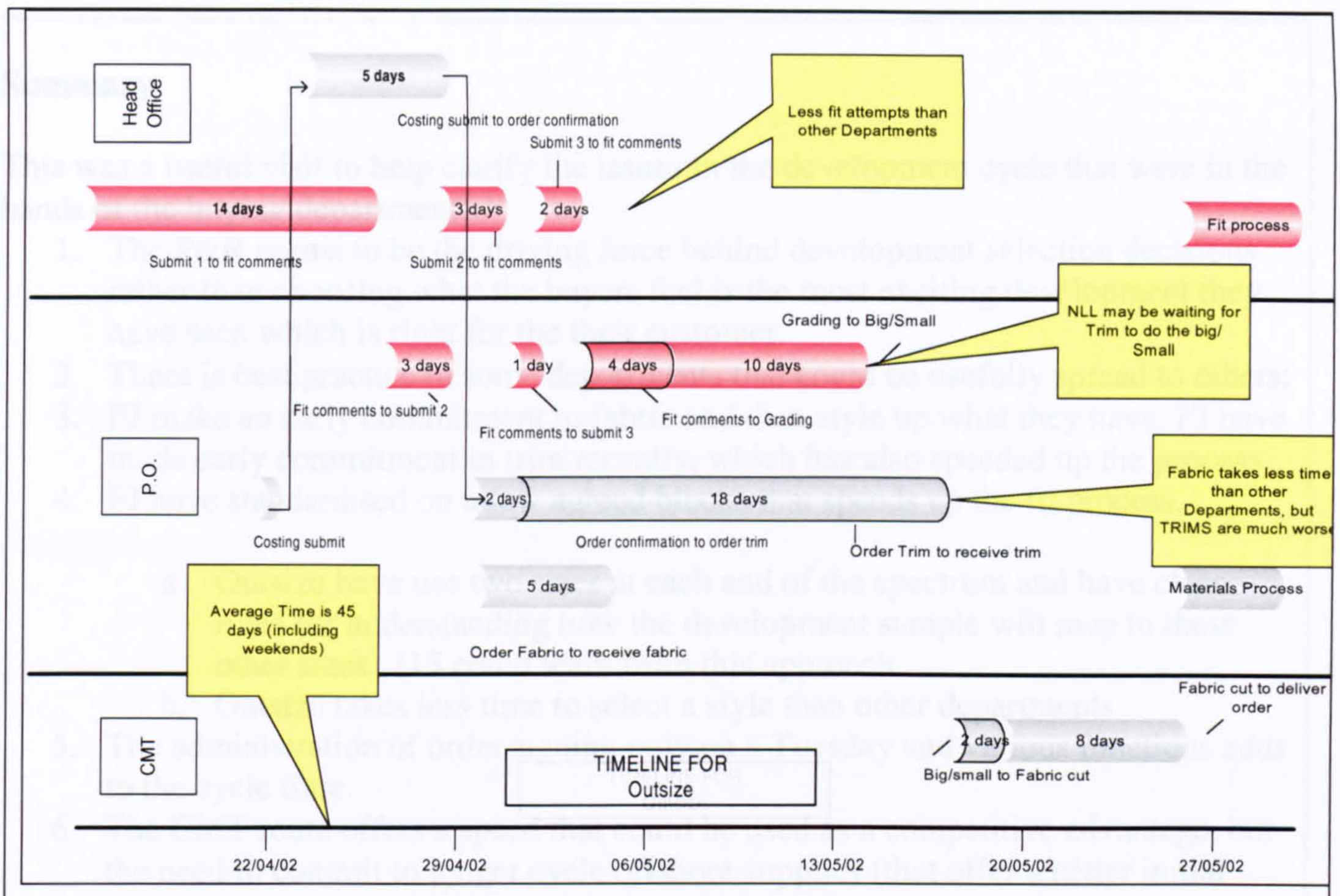
**Outsize**

Anna was the buyer, but was new to the role and had yet to have any experience of the CMT plant orders.

Anna gets together with Karen at the P.O. and then gets samples well in advance of the date for delivery. She felt there was no need to make a decision on early samples in the period since there would always be more that might be better from Karen or other suppliers. Also a commitment meant that there was less 'open to buy' money left.

The shorter lead times on UK jersey meant that the decisions could be made as late as possible. Once everything was in the decision about what fits in to the range and is the best on offer can be made. [Comment by RR: Does this mean that the 'open to buy' is in effect already spent on the long lead time items].

Having agreed basic blocks mean in Outsize that there is less time needed on fit and then once the styling detail was agreed the product was ready to go.




Outsize did have two fit models according to Anna, but they know what the main differences are and take this into account when fitting. [Comment by RR: having these type of rules could help on the Girls situation above].

The timeline above showed a long time for trim but Stephen thought this was down to two styles where the cotton crochet needed to be dyed to match the body fabric. The Big/small cannot made until the trim is available.

Commitment to trim as per Formal Jersey recently might have helped.

It does not seem to take Inspire as long to make a decision to select a development, but Anna thought that they might be getting their development samples later because the large sizes take longer to develop and so there was in effect less time to make the decision in during the cycle.

**Summary**

This was a useful visit to help clarify the issues in the development cycle that were in the hands of the buying departments.

1. The P&R seems to be the driving force behind development selection decisions rather than choosing what the buyers feel is the most exciting development they have seen which is right for the their customer.
2. There is best practice in some departments that could be usefully spread to others:
3. FJ make an early commitment to fabric and then style up what they have. FJ have made early commitment to trim recently, which has also speeded up the process.
4. FJ have standardised on a few agreed blocks that speeds up the fit process.

    a. Outsize have use two sizes at each end of the spectrum and have clear rules for understanding how the development sample will map to these other sizes. (15 could learn from this approach.
    b. Outsize takes less time to select a style than other departments.
5. The administration of order signing only on a Tuesday and various functions adds to the cycle time.
6. The CMT route offers a speed that could be used as a competitive advantage, but the need to commit to longer cycle offshore supplies (that offer a better initial margin?) may well mean there is less 'open to buy' left for the UK CMT.
7. The system has about two weeks of slack in it whilst the development samples are mulled over by the buyers before the P&R reviews. Most buyers did not feel under any pressure to make a decision on development samples.
8. The Quality system can be improved by using the data supplied by the CMT plant on AQL checks at the factory.
9. The fabric quality manager at Head Office and the buyers needs to be made aware of the level of quality being received each week by manufacturers like CMT once the 'base' fabric has been tested.
10. Staffing cuts at the DC QA have reduce the level of real checking of incoming quality to below the published agreed levels.
11. Where there is more confidence in an early submit of a development a costing should be requested. This will reduce the lead time.

What has been agreed:

1) Girls will meet with Yvonne and try to reduce the number of blocks.
2) Stephen will put dates on the sealer forms saying when the seal needs to be approved by to meet the due date for requested. This will reduce the lead time for delivery.
3) Stephen would try to update the timing figures so that FJ could see if they were any better.
4) The AQL sheets would be faxed to the technologists as well as the DC QA. Stephen would send Gaynor the care label standards for main fabrics.
5) FJ would try to integrate fabric buying with other departments.

**Bob Redfern**

After each site visit a summary report was produced by the researcher and forwarded to the project team members.

## Documentation

Documentation was also collected at the Planning Office and at the CMT site.

Documents examined and details collected included:

Order Book Spreadsheet

Ordered but not complete Spreadsheet

Production Output report

Cutting Confirmation Record

Order Stage dates spreadsheet

Fabric colour continuity record sheet

Supplier complaint form

Fabric Control Procedure

Order Confirmation Summary Spreadsheet

Key Performance Indicators summary

- On time delivery
- Quality Assurance results – failure rates, permitted, returns

Head Office Quality Report Summary

Costs

Prices

Margins

Reject rates

Quality Assurance Procedures at both the factory and DC

Quality Assurance Reports – Final Inspection report AQL (Actual Quality Level) sheets at the CMT factory

AQL test results at the DC

Seconds summary charts

Distribution Centre QC summary report

Prototype Specifications

Sealer Prototype Approvals

Delivery Promises Spreadsheet

Delivery Actual summary

Seasonal Trend Pack

Wash Care details

Labelling details

Timing of process steps spreadsheet

### Archive Material

The main archive material examined was quality records over the past six months at both the factory and the Distribution Centre. The factory sheets AQL for the past ten weeks were photocopied. In addition the RetailCo corporate Suppliers Quality Manual was examined and certain relevant data sheets and specifications copied.

**Observations** also took place at the Planning Office, Head Office Distribution Centre and the CMT manufacturing facility. Some of the observations were also recorded with digital photographs. The sample prototype and production ramp up and manufacturing processes were observed on most visits to the CMT plant and the Planning Office. Methods of fabric inspection, fabric cutting, garment assembly and quality inspections were observed. Quality checking routines at the CMT factory and Distribution Centre were also observed.

### Artefact Examination

The raw materials, trims, fabric faults, concept products, new product prototypes and versions, patterns, correct and faulty garments, markers, gradings, get up (labels, hangars, etc), manufacturing machinery and equipment were examined. When the new quality checking systems were introduced (designed by the researcher) the fabric colour continuity and samples for stability were examined.

### Management Reports and Presentations

In addition to the site visit reports that provided feedback to RetailCo on the project data gathering activity there were a number of management workshops where the researcher presented the conclusions of the data gathering and analysis of the data along with proposals for improvements for discussion and approval. All presentations were also distributed to management as a formal document. Again this provided a sense check that the data being collected was valid and reliable.

The data collected provided sufficient information to form a view regarding the methods used by RetailCo on new products though the Planning Office and CMT supply chain organizations.

## 7.2.4 Relevance of the Data Collection to the research questions

The RetailCo Case Study offered good levels of data collection that was also extremely relevant to answering the research propositions. There were two main elements to the findings:

## The NPD Process

The analysis of the NPD process at RetailCo was considered from the viewpoint of the Planning Office and that way that it interacted both with the Head Office and the garment CMT manufacturer. The Planning Office designed garments for manufacture by both the UK CMT manufacturer and sometimes offshore suppliers. The ranges involved were those that used certain types of mostly knitted jersey fabrics that had been ordered by the Head Office. The ranges were for specific Buying Teams in RetailCo including Casual Jersey, Formal Jersey, Outsize (sizes 16 upwards) and Girls. There were a number of clear stages and gates in the RetailCo NPD process.

- **Trend Analysis**
- **Concept Garment Development**
- **The Buying Decision**
- **Product Development**
- **Production and Launch**

These stages are described in detail below:

- **Trend Analysis**

The first stage in the process involving the Planning Office was the collection of trend information about fashion influences. This could take place in two ways. Firstly the Design Studio in the Planning Office would receive the seasonal brief pack of trend information from the Head Office. This booklet showed the sort of international couture designer influences that were key for this seasons 'Looks' and the phasing (in weeks) of the launch of various looks along the season for each buying department so that for example the Girls wear range did not always have the same 'looks' as the main Women's wear Casual Jersey range .

The seasonal trend pack contains typical designer catwalk images from for example Dolce & Gabanna and these trends were also then interpreted in the booklet into details

for colours, silhouettes, garment shapes, looks and styling tips. The pack provided inspiration for the Planning Office based designer to work on concept garments for the coming season. Secondly the designer would carry out her own research by looking at magazines, carry out competitor shopping and obtain ideas from fabric and trim suppliers for using their latest products.

There are some limitations to the range of product concepts that the designer can develop:

- Each of the product area Buying Departments at Head Office such as Casual Jersey, Formal Jersey, Girls and Outsize have purchased their own fabric for the ranges to be developed from at the start of the season. Whilst base fabric is purchased it will be later coloured up into the shade needed. With fabric taking up to 16 weeks to obtain from the Asia Pacific region, this early purchasing of undyed fabric gained valuable response time for the group.

- There are clear price points used include entry prices such as £9.99 and fixed higher retail prices such as £14.99 and £18.99. Garments have to be designed to fit in these price ranges and therefore this limits the complexity of the garment at the lower price levels.

- Margins at RetailCo are fixed so that the selling price by the Planning Office into the Head Office Distribution Centre is a fixed percentage of the final retail selling price. This affects the cost that a garment can bear and still fit into the price point.

- As mentioned above the Buying Departments do not all feature the same looks so that for example 'Military Girl' or 'Mafia Widow' might be two looks that could be developed for Casual Jersey women's but not for Girls. The 'look's' take into consideration the consumer.

- Each Buying department has a set of basic garment shapes called blocks. Whilst some departments have hundreds of blocks the basic idea is to have a

limited fixed set of basic garment shapes that can be adapted. So to make for example a ladies casual top the Designer begins with garment panels paper patterns for a top and changes the sleeves or neckline to suit the latest 'mafia widow' look and perhaps adds some lace and uses the shade black.

- Concept garments are always produced in a particular size for example size 12. This means that the paper block patterns used are for a size 12 and the garment can then be given a set of size specifications for the various dimensions of the garment including length and width and the garment can then be tried out by a size 12 model at the Head Office.

The concept trend input ideas are not then fixed for the 26 week seasonal Spring/Summer or Autumn/Winter period. At the regular seven week cycle meetings in Head Office there is a dialogue about the sales of the recent period, new fabric and trim ideas from suppliers, the latest competitor offerings and what is happening in the media and press. There is a constant dialogue between the category Buyer and the Planning Office based Designer.

- **Concept Garment Development**

The Designer will cut out fabric and produce a mock up concept garment. This garment is then sewn up using sample lengths of fabric, thread and trims (in any colour available) by the Planning Office based sample machinists and the prototype is then sent to the Buyer in Head Office for whom it is intended. The Designer in the Planning Office produced about 30 to 40 new concept garments per week. At the Head Office the buyer gets a number of new garment ideas from both the Planning Office based designer and offshore manufacturers and the prototypes are mulled over for a period by the buyer. There is a mock up of a RetailCo shop at the Head Office and the Category Buyer will place the new concept developments in the shop along side existing products (perhaps matching a concept casual top with a pair of trousers or shorts) and other competing manufacturers' product ideas in order to try and judge how well the product fits in to the range and portrays the desired 'look'. The concept garment is also tried

for fit. This takes place at a 'fit' session with an exact size 12 model for example and the Buying Department Technologist and Buyer attend in order to decide if the garment suits the customer type, fits the model and is correct in its appearance. If the 'look' for example is casual and baggy then the garment must feel baggy and not fit too tightly. They may decide that the sleeves are too short or the trim or neckline is wrong. At the end of the process of deciding if the concept garment is of interest the Buyer will initiate an enquiry about the manufacturing cost if she likes the concept. The costing is produced by the Production manager at the Planning Office. He basically works out the cost of the fabric, trims and 'get up' (the buttons, zips, neck labels, coat hangers). The cost of manufacture is discussed with the owner of the CMT manufacturer, although at this stage he has not had an opportunity to see the garment.

- **The Buying Decision**

If the Department Buyer is happy with the garment style, fit and costing and if the Buyer has enough money left in the budget for the season, she will decide on a colour and place an order with the Planning Office for a quantity of garments to be delivered into the Head Office Distribution Centre by a specific date. At this stage the order is conditional on the garment being exactly what the Buyer wants from the point of view of quality, size fit, delivered on time and there will generally be some changes that are required from the first prototype to the styling or the size measurements. These 'comments' are fed back to the Planning Office.

- **Product Development**

Now that there is an order with a specification and quantities required for a particular date the real work begins on developing the product. Some sample fabric is ordered so that some more samples can be made to get the fit and styling right. The bulk fabric needed for the order is worked out by the Production Manager and is 'called off' from the supplier and the shade specified. The trims quantities are ordered. Garment neck and side labels plus swing tickets can be ordered. Sometimes the bulk fabric is the only

fabric available say for a small order of only 300 garments as a trial sell. In this case work on the new samples has to wait for the bulk fabric and trims to arrive. The 'comments' from the prototype feedback are also acted upon. This generally entails the production of another sample for submission to the Buyer who will then concentrate on deciding if the fit is right and if the styling details are what are wanted. This process of 'fit' goes through a number of cycles. Some departments are better than others in the time the development cycle takes. Children's was an area that struggled with fit. Eventually the development garment sample version is correct in every respect and the 'seal' is signed by the technologist and the buyer. The seal is in effect the 'master' version of the garment. This is the exact version of the garment that must then be produced in bulk and sent in to the Distribution Centre to satisfy the order.
The process can be illustrated in the flow charts shown below in Figures 7.21, 7.22 and 7.23.

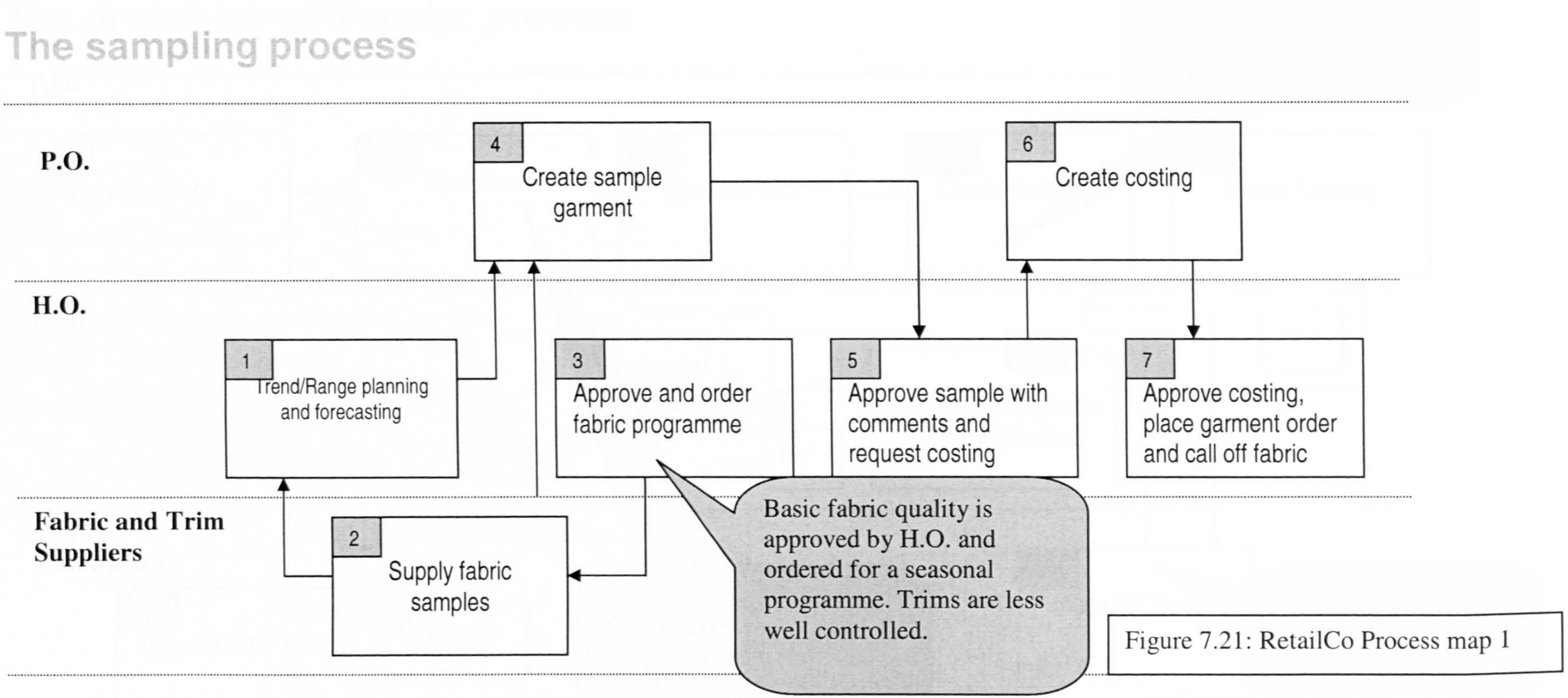



Figure 7.21: RetailCo Process map 1

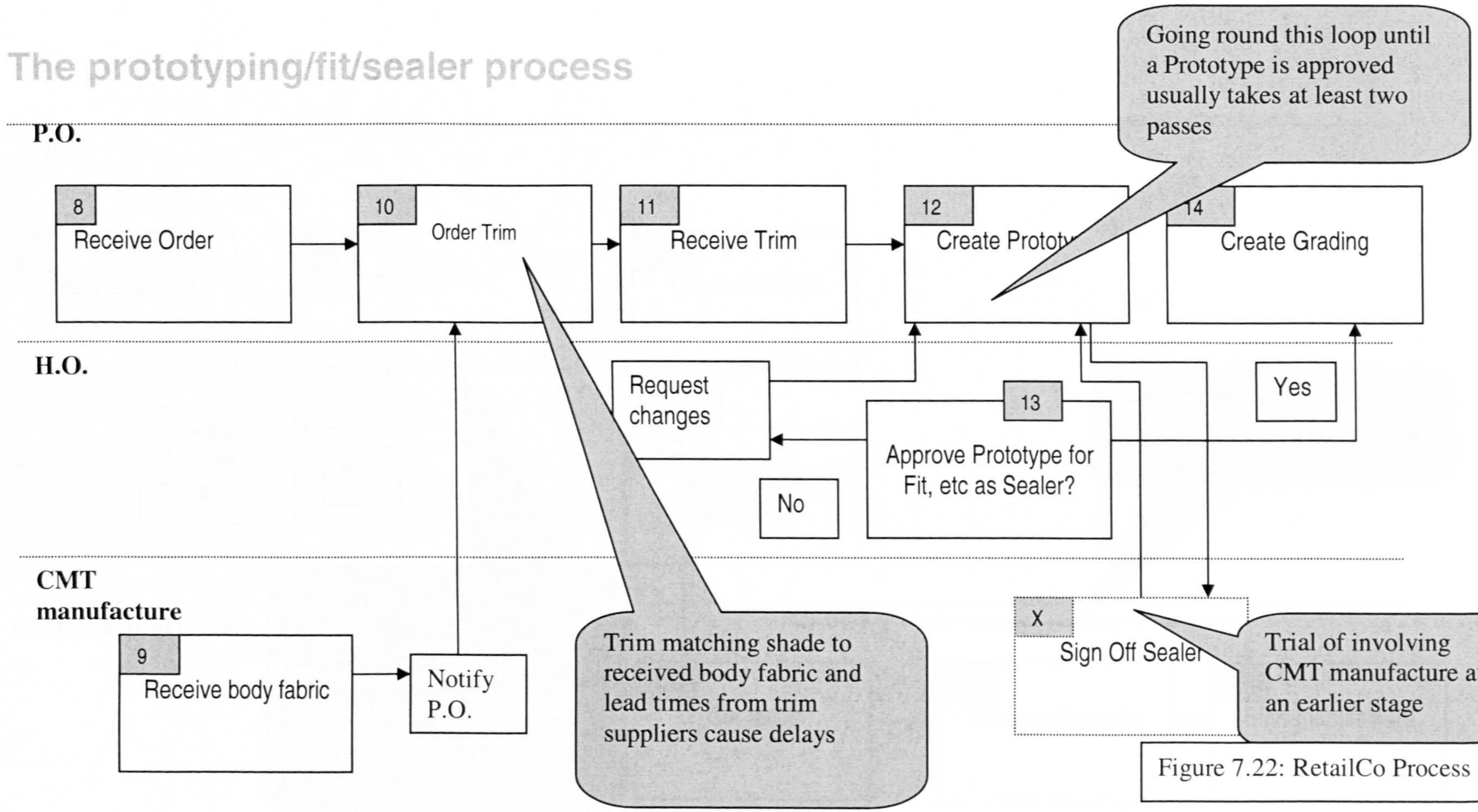



Figure 7.22: RetailCo Process map 2

## Set up to manufacture

**P.O.**

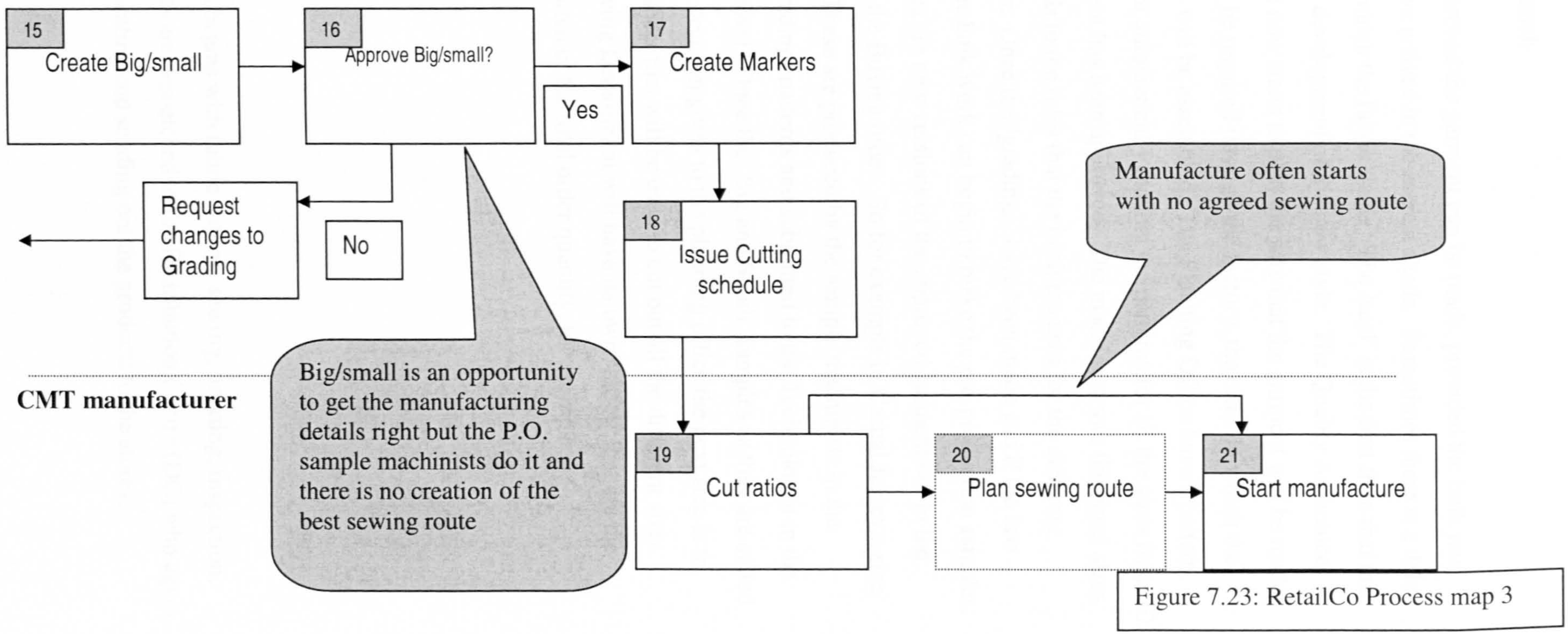



Figure 7.23: RetailCo Process map 3

- **Production and Launch**

Once the 'seal' has been approved the garment can be made, provided the bulk raw material fabric and trims have arrived in the correct shade. Sometimes there is a delay while the trims are dyed to match the fabric shade. The 'seal' is the first time that the CMT factory gets to see the development of the new style. The Quality Assurance supervisor in the CMT plant now starts to plan the way that the garment will be made, which production route will be required through the factory, the order in which the component panels and trims will be assembled. The Planning Office have a pattern drawing computer system for automatically making the patterns for all the sizes from 10 to 16 once the size 12 garment has been approved. The machine draws the panel sizes out on paper that corresponds to the rules that the business uses for the different measurements between sizes. Once the 'gradings' have been made and if the raw materials have arrived for the bulk work can begin to make the pre-production samples. The 'pre-production' samples are new versions of the approved garment but in the smallest and largest sizes in the Buying order. So for example in Casual Jersey a size 10 and a size 16 are made. These are produced by the sample machinists in the Planning Office using the gradings patterns and submitted to the Technologist in the Buying Department for approval. Once the 'Big and Small' samples as they are called have been approved and the decision given to the planning office the next step is to make up a pattern 'marker' sheet that will be used to cut out all the different sizes required in the order. A Buying Department will have its own 'ratios' that are the percentage of each size required of the total order quantity, for example:

| | |
|---|---|
| Size 10 | 15% |
| Size 12 | 35% |
| Size 14 | 40% |
| Size 16 | 20% |

The production process then begins with fabric cutting, sewing, pressing, inspection, and hanging, before garments are despatched to the Distribution Centre (DC) who again check the quality before allocating and sending out the products to the stores.

The whole NPD development process from the first concept garment being sent in to the Buyer to the delivery into the DC takes on average 52 days.

### 7.2.5 The Development Cycle Time Improvement Project

The process of NPD was investigated at RetailCo to try and improve the time it took for the cycle to be completed. This real world problem intervention was concerned with the detailed timing of the development cycle and in particular where the delays were. This then required that not only was the NPD process investigated, described and mapped in detail for presentation to the RetailCo project team, but that ways be sought to measure the current process timings if it was to be improved and the improvement could then be measured as well. The chart (Figure 7.24) below shows how long each step in the cycle was taking at the start of the intervention. The new products that were developed over a period of three months were tracked to give the information for each step on 37 orders for 101,000 garments.

**The NPD Process Timings Chart**

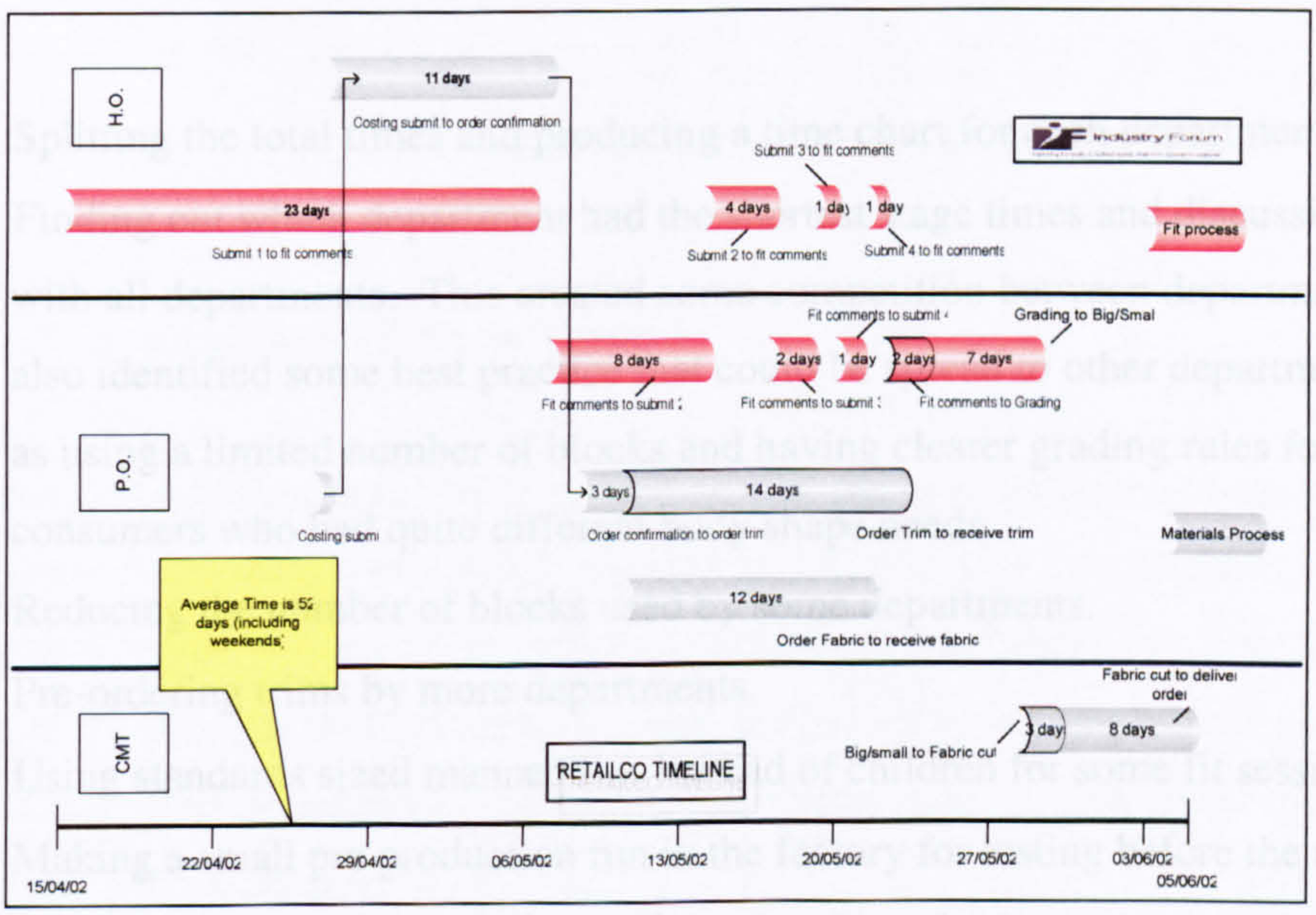



Figure 7.24 RetailCo NPD Process Timeline

The process development cycle for each new development was tracked from March until June 2002. The various steps in the process shown in the chart above had been carried out in the shortest time of 31 days and the longest time it had taken was 88 days. The detailed data showed that the process could be carried out in only 16 days if each stage was optimised and co-ordinated. The chart shows that there are various reasons why the process is delayed. The time between the concept products submits and the decision to buy being made was 25 days, half the total cycle time. What is noticeable about the chart results and what was surprising to RetailCo was the fact that the manufacture was not the main reason for the delays. The chart also illustrates the fact that there is a need for the co-ordination of the fit process and the materials procurement process since each one could then hold up the other if not completed.

## Intervention and Process Cycle Improvement

The real world problem was the development cycle time and how it could be reduced. Once the data was tracked about detailed step times it was possible to start to discuss and identify areas of best practice and ideas for improvement.
A number of changes were suggested to improve the cycle time:

- Splitting the total times and producing a time chart for each department.
- Finding out which department had the shortest stage times and discussing why with all departments. This created some competition between departments and also identified some best practice that could be spread to other departments such as using a limited number of blocks and having clearer grading rules for consumers who had quite different body shape needs.
- Reducing the number of blocks used by some departments.
- Pre-ordering trims by more departments.
- Using standards sized mannequins instead of children for some fit sessions
- Making a small pre production run in the factory for testing before the main volume started up. This had the effect of making the factory try out the production route before commitment to bulk and then fewer mistakes were made ramping up the production.

The researcher was involved at the manufacturing facility and planning office and in particular in working on trying to get a small pre production run introduced. A few months later another tracking of the NPD cycle times was carried out. There were some clear improvements in the timings. Even though no formal attempt had been made to change the way the Buyers made decisions about the concept garments there was a clear reduction in the time it now took to get to the order stage. The chart (Figure 7.25) below shows the trend for the Formal Jersey Department who was the largest user of the Planning Office CMT NPD route. The period covered was June 2002 onwards.

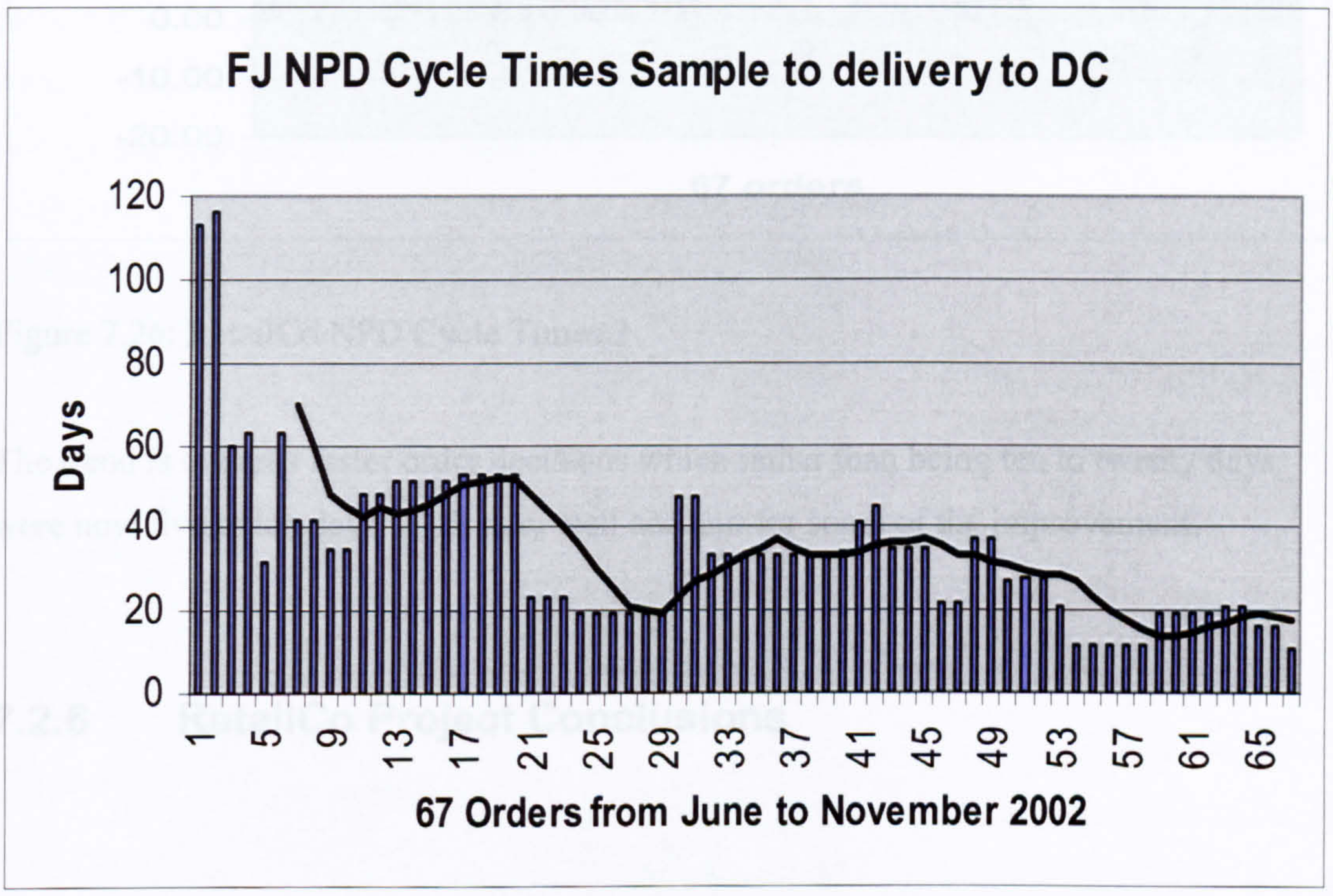



Figure 7.25: RetailCo NPD Cycle Times 1

The trend is towards a faster NPD cycle time with the time for Formal Jersey to move from the concept sample to the delivery into the DC now less than 20 days.
More work would be required to explore exactly what was behind this improvement and which of the changes was having an impact. It does seem that the decisions are being made faster. The chart below (Figure 7.26) shows an improving trend for the time for the buyer to place an order.

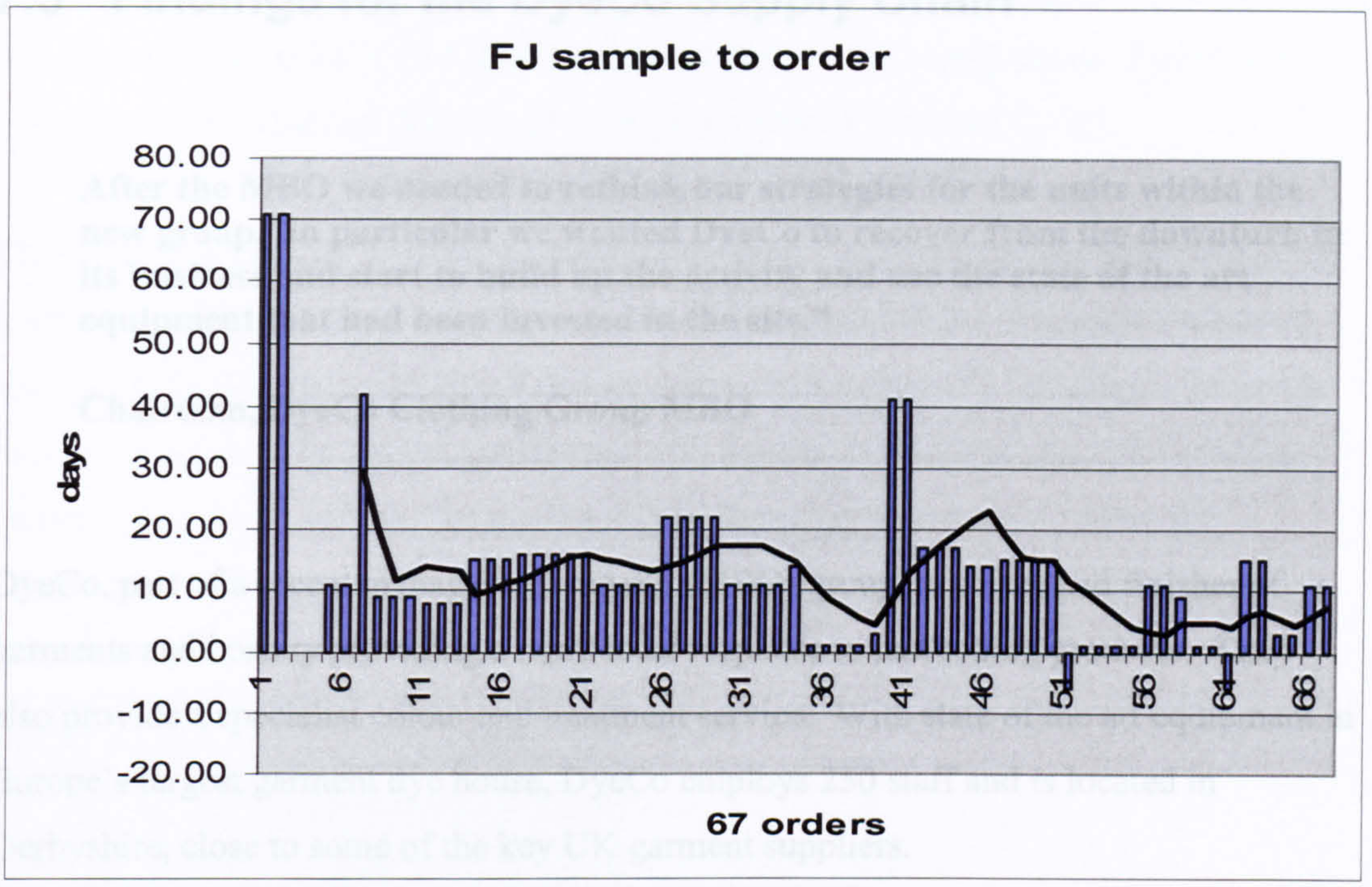



Figure 7.26: RetailCo NPD Cycle Times 2

The trend is towards faster order decisions which rather than being ten to twenty days were now five to ten days. This may well account for some of the improvement.

### 7.2.6 RetailCo Project Conclusions

The RetailCo management wanted to develop an effective quick response manufacturing facility to improve flexibility and reduce product lead times. The intervention discovered that the main causes of delay were the buying decisions and the technology department fit sessions. The manufacturer did have problems of quality consistency and this was tackled by involving the manufacturer earlier in the product validation process.

## 7.3 Findings for the DyeCo Supply Chain

**After the MBO we needed to rethink our strategies for the units within the new group. In particular we wanted DyeCo to recover from the downturn in its business and start to build up the activity and use the state of the art equipment that had been invested in the site."**

**Chairman, DyeCo Clothing Group MBO**

DyeCo, part of a recent management buyout (MBO) group, is a dyer and finisher of garments and hosiery providing a rapid local response to fast selling products. They also provide a specialist colour and treatment service. With state of the art equipment in Europe's largest garment dye house, DyeCo employs 250 staff and is located in Derbyshire, close to some of the key UK garment suppliers.

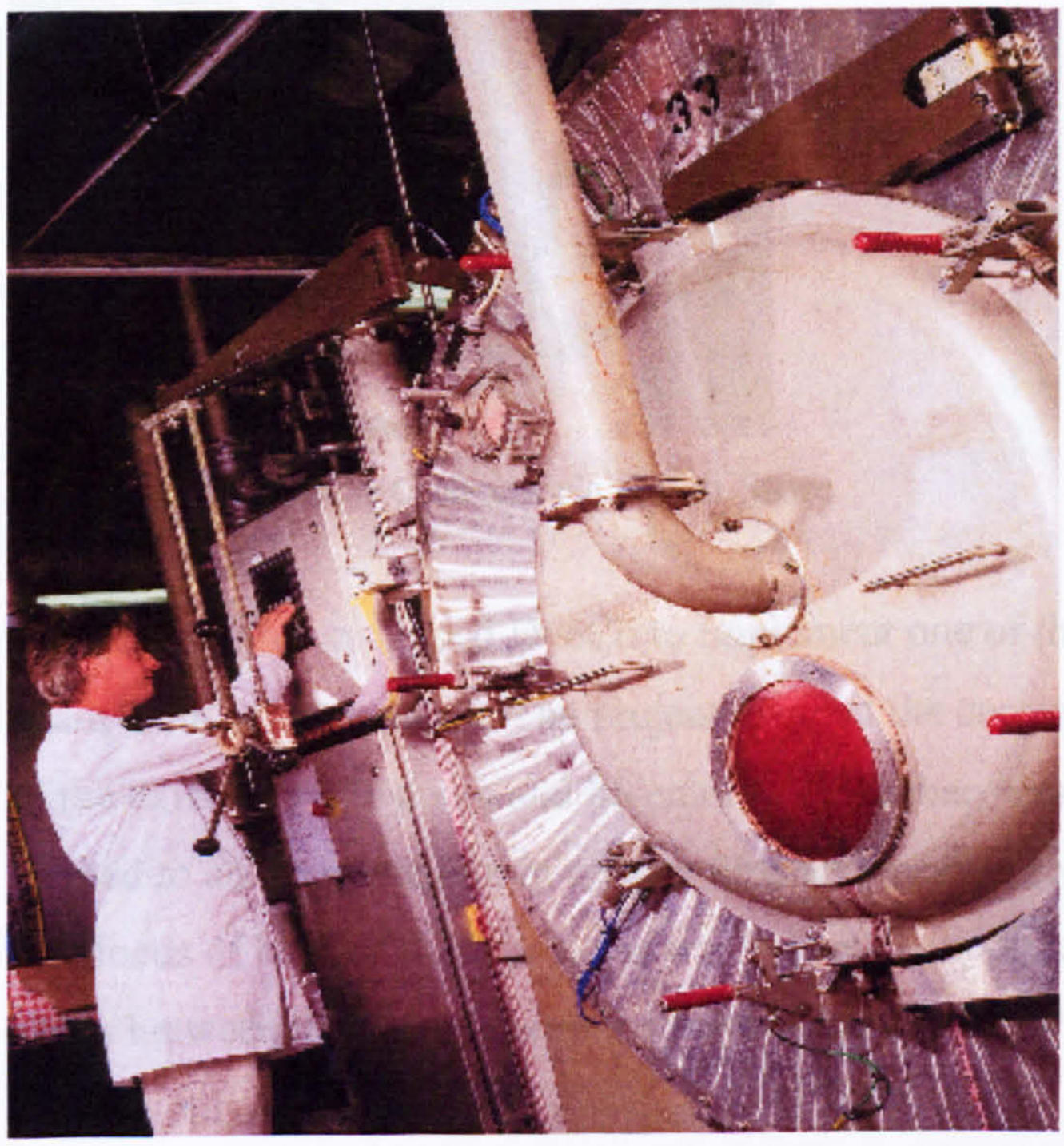


Figure 7.27: A dyeing machine at DyeCo

DyeCo's challenge was to move away from the previous culture of being part of an integrated group, develop a more market focussed approach and aim to help downstream retail customers understand the benefits of using a local quick response route and an added value processor.

The management at DyeCo enlisted the support of the Industry Forum in two projects that related to the risks of new product development in the supply chain. Fashion is a volatile area with sales difficult to predict (Warburton & Stratton, 2002).

The first project helped DyeCo managers to develop a problem definition regarding the marketing of DyeCo services, carry out a retail store inventory and markdown survey and then to build a cost model that demonstrated the benefits of a local quick response route to retailers. The project culminated with a presentation of the benefits of quick response to a major UK retailer's (Figure 7.28) category management team, the development of a new added value service and the generation of significant new business opportunities for DyeCo.

Figure 7.28: DyeCo Customer's Retail Store

The second project helped DyeCo to implement one of the key features of a lean supply chain – a Kanban system. The project mapped the current process and provided details of the existing cycle times and inventory. A Kanban was designed and implemented and led to an improvement in service time and marked reduction in inventory.
The focus of both of these projects was the retail supply chain and the trade off that exists between the use of cheaper slower offshore supply and local more expensive and faster supply.

**"DyeCo is convinced that both the Industry Forum projects have delivered real benefits. They have transformed the business in areas of quick response, flexibility and service to our customers. This has made a positive impact on our bottom line."**

**Managing Director, DyeCo, I.F. Case Study Report, 2003**

The Industry Forum was involved initially with the senior DyeCo Parent Group management at a meeting in 2001. The following people attended the meeting.

| DyeCo Parent Group | Industry Forum |
|---|---|
| Chairman | Senior Research Fellow - Salford |
| Chief Executive | Senior Research Fellow - Cranfield |
| Product Development Manager | |
| Project Co-ordinator | |

The discussion focussed on the key issues facing the new company. These are summarised in the box below.

- DyeCo
  - What ancillary new product services could be added to the DyeCo product portfolio to make best use of the investment in equipment?
  - How can the system be improved to improve throughput time?
  - How can the capabilities be marketed better?
  - How can the profile of DyeCo be raised?
  - How can customer focus be improved?

These were the views of senior management. The project would be carried out at the DyeCo factory and the views of the local management team were important if they were to participate actively in the project.

It was agreed that a workshop Creative Problem Solving meeting at DyeCo's factory in Derbyshire would be the start of the intervention process. The Industry Forum would then present back to the company a formal project proposal that focussed on the issues raised in the Workshop.

### 7.3.1 DyeCo Industry Forum Projects Definition

The projects started with a workshop meeting of the project team at DyeCo. The Creative Problem Solving Workshop involved the following staff:

| | |
|---|---|
| Managing Director | Production Director |
| Financial Controller | Sales Manager |

| | |
|---|---|
| Dye House Manager | Quality Manager |
| Planning Manager | Personnel Manager |

The process of Creative Problem Solving uses a technique of progressive divergent and convergent thinking (Van Gundy, 1988) where managers are encouraged to first widen the scope of their thinking in a divergent brainstorming session by listing personal thoughts and concerns about the business prompted by the following statements:

**Wouldn't it be nice if?**

And

**Wouldn't it be awful if?**

This activity generated approximately 150 concern statements from the small project team. The next step in Creative Problem Solving was the convergent phase of finding themes amongst the concern statements. The themes led to the development of several problem statements:

1. How to encourage team working
2. How to help customers to understand the benefits of using DyeCo and offshore undyed garments on profit margins
3. How to improve morale and job security
4. How to reduce costs and improve profits
5. How to maintain the current level of business
6. How to improve service to customers
7. How to improve planning
8. How to improve quality and delivery on time

These problem statements were prioritised and a leading candidate problem statement was developed that would be the focus of the local management project activity, helped by the research team. Examination of these problem statements above led to a vote that the second (No 2) was considered a top priority and the solution of which might help many of the other problems.

The real world problem that needed to be solved initially is set out below:

**Problem statement definition**

*The objective of this work is for DyeCo to help their customers to understand the benefits of using DyeCo to process their product in order to achieve quality, flexibility and competitive net margins.*

A further project team Workshop facilitated by the researchers helped the project team to identify a list of data that would need to be collected to better understand the issues surrounding this objective.

The data required was:

Retail Sales lost due to non-availability of products

Costs of offshore competitor dyers

Details of UK competitors

Details of offshore competitors

Growth areas

Benefits of using DyeCo including Lead Time, Flexibility and Actual Margin

Sales possible with Quick Response

Offshore Lead times

It was therefore agreed to collect the data listed above to help in the problem solving process. The likely areas for sourcing each data element were discussed amongst the project team and researchers. It was felt that the best way to convince retailers and their suppliers about the economic benefits of using DyeCo was to try and build a picture of the costs and incomes that the customers had relative to the supply and sales of coloured garments. The underlying rationale was to establish the benefits of a Quick Response supply chain. The management at DyeCo felt that retailers were losing sales and profits through the existing use of offshore yarn dyed garments with long lead times. For example a retailer might order some fashion colours with a sixteen week lead-time from an offshore supplier. However if the market changed in the sixteen weeks before the

products arrived in the UK and the choice of fashion colours did not match consumer buying habits then the retailer might be left with stocks of poorly selling colours. What DyeCo did not know and could only guess at was the exact accuracy of the colour forecasts and the impact of low sales on the selling prices to consumers. It was thought that a trade off might exist where a local dye house could give a Quick Response service that allowed colour decisions to be made later. This might lead to better colour forecasts, lower stocks of poor selling colours and better selling prices for retailers. What was needed was an accurate and credible cost model of the competing offshore supply long lead-time and local Quick Response situations. One main link in the cost model was the rate at which garment forecasting was missing the level of interest by consumers in the colours that buyers had ordered. One way to assess this was to discover the level of stock outs by colour and the availability of colours in retail stores. The research team could, as an independent industry sponsored third party, examine store inventories and discover how well stocks of garment colours were matching consumer demand. It was also accepted that DyeCo would need to offer more services to retailers since at present the company was more focussed on an historic supply method that produced garments that had in the past been sent back to the garment maker for final processing including pressing, labelling and packing. If DyeCo were to offer a Quick Response service based on undyed offshore garments that would be sent directly to the retail distribution centre they would also need to offer these added value services.

A formal proposal for collecting the data, establishing the performance at DyeCo, developing a retailer's cost model and carrying out a store survey was presented by the Industry Forum researchers to DyeCo management.

The proposal included the following steps for the Project One intervention.

1. Store survey to investigate stock levels by colour.
2. Development of cost model
3. Development of retailer presentation of survey and cost model results
4. Organisation and presentation of results to a leading retailer

Project Two activities involved the following steps.

1. Process route modelling
2. Development of improvement proposals to improve customer service
3. Implementation of a Kanban

The Project Two proposal objective was summarised as:

*To provide a detailed map of product development, production and associated order enquiry, costing, quotation, planning and delivery processes within DyeCo. The mapping exercise will then lead to a critical examination of the systems with the aim of improving them to better meet customer needs*

### 7.3.2 DyeCo Data Gathering Process

Gathering data regarding the customer cost model, the store survey, current product development and mapping and improving processing practices involved the following methods:

- Site Visits
- Store visits
- Interviews
- Management Workshops
- Experiments
- Observation
- Computer system interrogation and file transfer
- Artefact examination
- Documentation collection
- Archival analysis

This section discusses how various data collection aspects were addressed including site access, informants and respondents, detailed data collection types and methods.

## Site Visits

Regular site visits were paid to the DyeCo factory in Derbyshire. For all Phases a total of twenty visits were made to the factory. In addition five visits were made to the Retailer Head Office in London and visits to ten retail stores.

## Informants and Respondents

The phases involved interviews and meetings with the following managers:

### *DyeCo*

Managing Director
Technical Director
Dye House Manager
Factory Accountant
Human Resources Manager
Development Manager
Dye house I.T. Supervisors
Project Manager
Production Director
Planning and Special Projects Executive
Quality Executive
I.T. Manager
Customer Services Manager
Costing Manager
Planning Supervisor
Preparation Supervisor

### *DyeCo Partner Retailer - Head Office London*

Industry Specialist Managers

Knitwear & Hosiery
Footwear
Knitted Garments
Tailoring
Cotton
Lingerie

Category Manager - Knitwear

Industry Manager - Dyeing & Finishing

Specialist Technologist - Dyeing & Finishing

Costing Manager

Component Procurement Manager

## Data Collection Types and Methods

Site visits to the DyeCo site in Derbyshire were carried out over a twelve month period in 2001 and 2002. The data collection took place over this period using workshop presentations, group creative problem solving exercises, discussions, informal interviews, open ended conversations, observations, document and archive collection plus artefact examination. The meetings at the Retailer Head Office in London were individual interviews, group presentations and discussions. Each of the projects had a different focus. The initial project examined the attitudes of managers to the issues facing the business and also involved a series of workshop discussions on a broad model of the business stages, a retail store survey and a group discussion about a model of the likely costs to the customer of poor forecasting. This project also involved discussions of the cost model with the retailer's buying management in a workshop presentation and discussion.

The second project involved building a detailed picture of the process model and collecting details about the performance of the existing process. A feedback of results was made to management and discussions of methods to improve performance. The project later involved some training of managers in Just in Time techniques, agreement on a trial proposal and a large scale experiment of a new Kanban method with monitoring and adjustments.

The observations were recorded through note taking and digital photography. Data from documentation and archives was recorded through note taking, photocopying and through emailing and computer disk storage of the documents. Data about cycle times and delivery performance was acquired from the company computer system through

interrogation of the database and printing out of records or through direct transfer of database data.

The detailed DyeCo NPD Process was mapped through collecting data through a variety of methods, including interviews, observations, document examination and artefact examination. The DyeCo NPD process was supported by data regarding the Retailer and Garment maker NPD systems from unpublished research data from Salford University.

**Interviews** were typically open ended and informal, and were guided conversations rather than structured interviews. The researcher was trying to build a picture from a variety of data sources about the way that NPD is carried out within the DyeCo business. Whilst interviews were unstructured they were nevertheless not general conversations but aimed at finding out what each participant did in their part of the NPD process. The interviews were recorded through the use of notes. These site visit findings were all written up and these typed formal visit reports sent back to the sites for checking within two weeks of each visit. Workshops with the project team members were also sources of data concerning the management of New Product Development. Flip Charts and Post It Notes were collected from each workshop and written up as a report and submitted to the management.

**Documentation**

Documentation was also collected at the DyeCo factory.

Documents examined and details collected included:

New Quality Notification Sheet

Hosiery Turn Round report

Work In Progress Lots List

Dye Setup Batch Report

Van Delivery Sheet

Recipe Sheet

Work In Progress Lot Enquiry Printout

Organization Charts

Lot Enquiry Printout

Cost Matrix Sheet

Knitwear Finishing Cost Matrix Sheet

Weekly Departmental Labour Analysis

Customer Flow Requirement Summary

Customer Packaging List

Weekly Labour Hours report

Employees Report

Manned Capacity Forecast

Plan Loading Forecast

Style Loadings Forecast

Machine Loadings Forecast

Customer Order Summary

Business Process Model

New business areas email

Additional information collected from the Internet that helped in the construction of the Cost Model included:

Piece Dye v Garment Dye Cost Analysis

Undyed Yarn Prices in China and India

Dyed Yarn Prices in Turkey, India and Germany

**Archive Material**

The main source of archive material was the Sales Order Processing Computer Database at DyeCo. Further unpublished archive material from the University was used to build an understanding of the retail and garment NPD methods.

**Observations** took place at the DyeCo Derbyshire factory. Some of the observations were also recorded with digital photographs. The sample and bulk processing methods were observed during most of the visits to DyeCo. Methods of garment receipt, storage, preparation, and dyeing, drying, testing, packing and quality inspections were observed.

### Artefact Examination

The undyed garments, dye machinery, drying machinery, new product prototypes and versions, patterns, correct and faulty garments, and testing equipment were examined.

When the new Just in Time processing method was introduced the control cards and reports were examined.

### Store Visits

The researcher visited the Retailers stores in three towns and observed, inspected and counted the garments on display and the prices of garments over a three month period. Further store garment counting checks were carried out by RetailCo staff and also by researchers at Cranfield University. The summary information of the stock in store by size and by colour was obtained from these additional sources.

### Management Reports and Presentations

In addition to the site visit reports that provided feedback to DyeCo on the project data gathering activity there were a number of management workshops where the researcher carried out exercises designed to capture management ideas and attitudes.

The results of the process mapping, process performance and Creative Problem Solving Workshops were presented in management workshops to DyeCo and the parent company. All presentations were also distributed to management as a formal document. This provided a sense check that the data being collected was valid and reliable. The data collected provided sufficient information to form a view regarding the methods used by DyeCo and the supply chain to develop and process new products.

### 7.3.3 Example Site Visit Report for DyeCo

Industry Forum

Improving the textile & clothing supply chain from concept to customer

| **IF Collaborator Meeting**<br>**DyeCo**<br>**Prepared by RR 21/06/01** | |
|---|---|
| Workshop with | Operations Director, Accountant, Planning & Projects Executive, Quality & Process Executive, Customer Services Manager, [HR Manager, Development Manager, Dyehouse Manager, Technical Director, Management Trainee. |
| Date: | 20/06/01 |
| IF Team Members | Senior Research Fellow - Cranfield University, Bob Redfern – The Salford University |
| Location: | DyeCo, Derbyshire |
| Focus of Workshop | Development of Customer Development Project Presentation |

This Workshop followed on from the Creative Problem Solving Workshop and the development of a list of data that would help the project team to solve the problem statement that had been developed as the project focus:

- **In what ways might we help customers understand the benefits of using DyeCo to process their product; embracing lower cost offshore manufacturing and yet achieving quality, flexibility and competitive net margins?**

Some of the DyeCo project team had attended the Business Link presentation in Rochdale or the Industry Forum Steering Group Meeting in London. At these presentations Professor Roger Warburton, from Griffin Manufacturing in the USA had put forward a powerful case for combining low cost offshore manufacturing with domestic Quick Response processing to give customers superior performance. Roger is a Professor in the University of Massachusetts in the Department of Textile Sciences and is the principle investigator on a National Textile Center funded project entitled " When is Domestic Manufacturing Competitive?"

Many of the points raised by Roger seemed to echo the same issues that the DyeCo Project Team felt could be made to their own customers:

- Domestic garment dyers were seen as more expensive than an offshore manufacturing route due to lower labour costs offshore.
- Domestic garment dyers were used by the supply chain to put right mistakes in offshore production, often saving retailers from very expensive mistakes and range or collection shortages.
- Retailers engage in forecasting and those using offshore manufacturing place orders many months in advance of the selling season. If the ordered styles and colours do not sell well they have to be disposed of at reduced prices.
- On the other hand if sales take off the retailer runs out of stock and is left with unsatisfied customer demand and unhappy customers.
- A model can be developed that shows the effects of different levels of forecasting errors on the net margins of retailers.
- A Domestic garment dyer could not survive on the 'serendipity' of mistakes by offshore manufacturers and needed to have a more steady level of work to stay in business.
- If Domestic garment dyers did not survive then key technical skills would be lost to the Industry.
- In the USA retailers are aiming to get forecasting error down below 30%.

The team looked in detail at how it might use the 'bones' of Roger's presentation as the basis for the case for using DyeCo to be presented to customers in order to answer the defined problem statement above.

## An Offshore Garment Example

A formula for calculating the retail margin loss in the event of a forecasting error was agreed:

Actual Sales S = (F-E) x SP+E x L
Cost C = F x W
Target Margin M = (S-W) /W

Where F = forecast sales level
E = error in forecast
SP = full retail price (excluding VAT)
L = liquidation price (excluding VAT)
W = cost of garment to the retailer

An example of 50,000 dozen Ladies Wool Knitwear Jumpers Retailing at £40 including VAT. The Retailers gross margin is thought to be 55%. The liquidation price is assumed to be half the normal retail price.

The calculation of a 30% error in forecasting is used as an example:

Putting the example figures in:

Forecast Volume F = 600,000
Error in Sales Volume E = 600,000 x 30/100 = 180,000
Full Retail Price per garment SP = 40/1.175 = £34.04
Margin per garment = 34.04 x 55/100 = £18.72
Cost of Garment to retailer W = 34.04 x 45/100 = £15.32

Liquidation Price L = 0.5 x (40/1.175) = £17.02

Target Sales (without Vat) are then £34.04 x 600,000 = £20.424 Million

Target Margin at 55% is then £20.424 Million x 55/100 = £11.223 Million

Target Cost = 600,000 x 15.32 = £9.192 Million

Actual Sales S = (600,000 – 180,000) x 34.04 + 17.02 x 180,000 = £17.360 Million

The cost W remains 600,000 x 15.32 = £9.192 Million

The actual margin has thus become 17.360 – 9.192 = £8.168 Million

The loss of profit for the Retailer is 11.233 – 8.168 = £3.065 Million

Thus if forecasting error is typically 30%, the net retailer margin is now only 40% not the 55% expected.

## The Domestic Route

Rough figures were discussed during the Workshop. These are set out more precisely below:

Comparing this offshore route with a DyeCo dyed route.

We assume that the sales are now correctly supplied at the actual level and a new forecast is targeted at the 420,000 level with a total sales target of:

420,000 x £34.04 = £14.297 Million.

These 420,000 garments are purchased at 80% offshore (i.e. 336,000) with a margin still of £18.72.

Then 20% is purchased in the domestic market with an assumed £1 more expensive route. The margin on these 84,000 garments is now £17.72.

The total margin is now 336,000 x £18.72 + 84,000 x £17.72 = £7.778 Million.

The margin is now therefore 54.4%.

Clearly there is a strong case for the use of domestic supply not only to improve the level of reducing the downside but for reacting to better sales.

Advantages for retailer include:

- Restoration of margins.
- No Cannibalisation of sales caused by consumers expecting 30% of garments to be sold at liquidated prices.
- Opportunity to react to increased demand through quick response via the domestic route

## Next Steps

- The level of stock inaccuracy would now be investigated in the stores through monitoring by the project team.

  - Stroke number of a knitwear garment would be supplied. **Action: Mike**
  - Project team will visit target retailer stores and check size and colour availability. **Action: All.**

- The Next plc Order was already using the DyeCo route. Illustrative garments and orders lead-time information would be tracked to provide a case study for the eventual presentation to customers and the target retailer. **Action: DyeCo.**

- The Gross Margins, Selling Prices, Liquidation Prices and volumes of a Knitwear order using both offshore yarn dyed and domestic garment dyed would be estimated and the details fed into a calculation similar to the above. **Action: DyeCo.**

- A check on industry liquidation levels would be made in Drapers Record. **Action: Bob.**

- Richard (Retailer Procurement) had been contacted by Graham and was interested in Roger Warburton doing his presentation to staff in the target retailer. **Action: Bob Redfern would follow this up with Ken and Richard.**

- DyeCo to prepare a presentation by the next meeting ready for customers that would answer the statement:

*In what ways might we help customers understand the benefits of using DyeCo to process their product; embracing lower cost offshore manufacturing and yet achieving quality, flexibility and competitive net margins?*

- Industry Forum to look at potential garment making partners such as Desmonds or Courtaulds who would need to be convinced of the route's benefits too. **Action: Tracy.**
- Gordon was asked to consider helping Tencel in its project to get a garment dyed route. Two garments were left with Gordon who was going to see David of Tencel the next day. **Action: Gordon.**

Next Meeting Date: Tuesday 17th July 1pm start. **Action: All.**

### 7.3.4 Relevance of the Data Collection to the research questions

In this case study report we see that DyeCo management are interested in influencing the retailers in the supply chain and recognize that retailers are driven by a number of possible success factors in developing the new season's ranges. Gross margin is driving UK retailers to source more from offshore sources. On the other hand there are risks of the long offshore supply chain in that margins will be eroded by slow sales of some garments and the eventual reduction in prices needed to quit the inventory.
DyeCo need to really understand the needs of the downstream customer in detail and develop an understanding of the margin calculations of the customer. The Case Study offers good levels of data collection that was also extremely relevant to answering the research propositions. For example there is an indication in the visit report that the managers believe there is a pull model of new product demand in place since the company are thinking in terms of influencing not their direct garment making customer but the downstream retail supply chain customer in the fundamental choice of the structure of the supply chain for new products.

### 7.3.5 The Retail Product Development Process

The projects concern a retail supply chain and the decision process that governs the structure of the supply for new products. In particular the retailer manages the development of a range of garments for the stores from a clothing supply chain with stages that are shown in the diagram below, Figure 7.29.

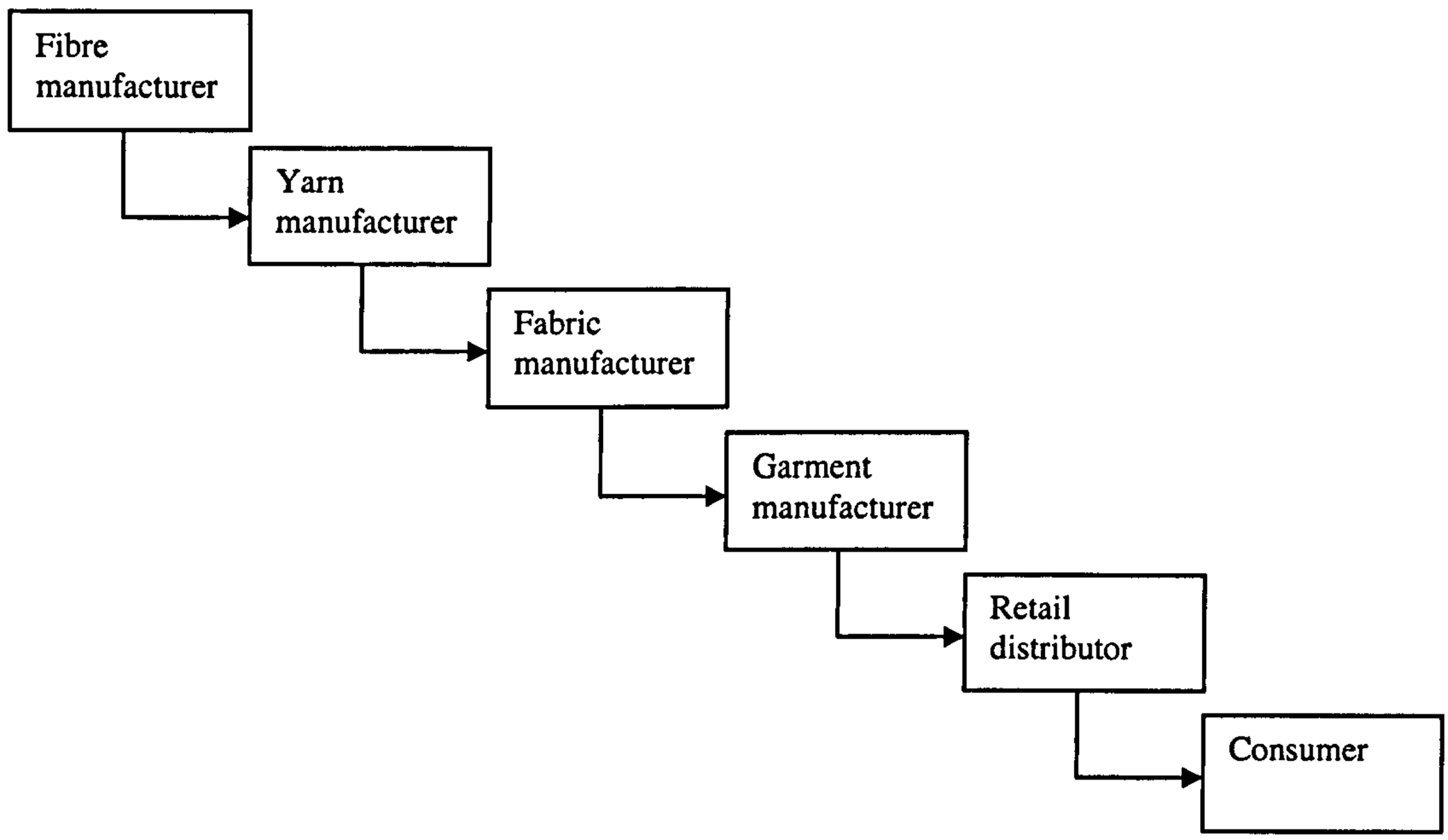



Figure 7.29– Stages in the apparel supply chain

The development of these ranges for the DyeCo target retailer is managed through a series of planned steps each season that involve the supply chain manufacturers and processors starting with a strategy review presentation to suppliers by a particular retail garment category department.

For example the items covered in a target retailer 2000 Ladies Casualwear Category review were:

*Last Season's Performance*

*Financial performance* comparing the budget and actual sales and the range of stores where ranges are offered for example being restricted to the top 170 stores rather than all 370 stores. Major price action to cut prices in order to reduce pipeline stocks.

*Buying performance* and the outcome of where the department may have bought by fabric rather than silhouette and may have committed early to fabrics such as velour where lead times were long. The proportion of the buy at the start and later in the season and how this worked.

*Launch performance* where dates and the impact of availability of garments for the launch date across stores are considered.

*Products performance* and what worked well or not. For example what was driving sales including styling details such as neck shapes, prices and perceived values, fashion looks such as velour, competition with other Ladieswear departments offers.

*Colours performance* including what had been successful and what had not sold well.

*Store Layout performance* including the impact of how stores had classified products and related them to other garment areas, for example selling casual tops close to suits as an undersuit garment.

*Missed opportunities* including poor sellers (over-forecasting) and a lack of inventory to support sales in some areas due to under-forecasting or over zealous cutting back of programmes.

*Market share estimates*

Competitor performance and departmental performance are evaluated and compared in specific garment areas and growth or decline in market share reported.

*A Comparative Shop*

The recent season offerings of competitors are compared with the products in the previous range and any differences in value and gaps or strengths in the range compared.

*Forward Strategy*

The buying teams visit all the trade fairs for yarns and fabrics and take account of the catwalk fashion trends and the offerings of retailers in New York, Paris and Milan. The strategy starts with the plans regarding the garment types that will be built up. In the 1999/2000 season for example this included for Ladies Tops Department the following commitments:

- Continue to buy ranges by fabrics
- Build on the casualwear range
- Offer true casual fabrics in authentic shapes
- Build on the success of the undersuit range

- Offer two ranges for undersuit
    - Classic
    - Seasonal newness
- Re-establish tunics
- Offer an ultimate occasionwear range, exploiting newness and embellishment
- Introduce garments with luxury yarns for Top stores e.g. wool/cashmere

The departments also focus on Trend directions which seem to be important to the range. The selectors' ideas are shared with suppliers in the briefing including:

- Core garment key Fabrics, Fibres and Yarns across the various garment types such as viscose jersey and cotton jersey for undersuit tops or velour for occasionwear

- Directional styling including neck shapes, sleeve length and key styling details such as prints, darts, hoods and colour blocking

- Silhouettes for specific garments – easy fit or more slim fit and tailored

- Fabric Strategy for growth areas – seeking newness in fabric as the key for example sueding, marl mixes, high fashion wool blends and washed down casual looks. Critical path and the importance of focussing on new fabric developments early in the critical path timetable to ensure that validation of product suitability is carried out early

- Garment Strategy – in 2000 in Ladies Tops this included:

    - Workshops to identify opportunities built in to the Critical Path
    - Stronger links with Designers and machinery suppliers
    - Maintain quality by distributing standards garment shapes books to garment makers
    - Review the fit process
    - Build on individual supplier strengths e.g. embroidery
    - Develop more offshore supply
    - Target a 3 week from concept to prototype cycle time

- Reduce the initial buy to increase flexibility
- React to sales within the season
- Plan store layout with tops next to knitwear and undersuit next to suits
- Exploit Store Magazine

Garment makers are expected to take this strategy review information and with the addition of their own fashion trend assessments develop new products for the exclusive review and selection by the target retailer buying teams.

*Retailer Seasonal Development Activities*

There are a total of nineteen steps in the departmental retailer seasonal development activity. The table in Figure 7.30 below shows the timings for the Autumn/Winter 2001 ranges.

| **Date** | **Key Activity** |
|---|---|
| November | Initial Thoughts |
| November | Supplier Strategy Briefing |
| December 2000 | Initial Design |
| January 2001 | Design Brief/Buying Brief |
| February | Executive Strategy |
| February | Suppliers Concepts |
| February | Concept Plan/Review |
| March | Executive Concept Review |
| March | Senior Selectors Meeting |
| April | Final Garments |
| May | Departmental Review |
| May | Executive Review |
| June | Phase 1 White Seals |
| June | Phase 1 Green Seals |
| July | Phase 1 Production |
| July | Phase 1 Store Launch |
| August | Phase 2 Department Review |
| September | Phase 2 Executive Update |
| September | Phase 1 White Seals |
| September | Phase 1 Green Seals |
| October | Phase 2 Production |
| December 2001 | Phase 2 Store Launch |

Figure 7.33: Seasonal Development Activities

The stages in the Retailer plan include a design brief although the main design effort then takes place in the various supplying garment making businesses. Much of what then follows at the retailer is a series of selection and review processes where garments that have been designed by the garment manufacturers are considered by the selectors and department management teams and subsequently selected garments are included in the ranges by the retailer. Once ranges are put together they are set before successive departmental and management review meetings. The White Seals and Green Seals are garment validation stages where a master copy of the prototype developed by the garment maker and first manufactured production are signed off as meeting the agreed quality and technical standards by the retailer. The seals are signed off by the retailer technologists for fit and colour standards if acceptable. It can be seen that launch takes place in two phases with a chance to review sales reaction.

Much of the work of developing products is in the hands of the garment makers who have their own New Product Development systems. Garment makers and others in the supply chain are working to enable the submission of sample fabrics and garments to fit in with the seasonal timing plans of the retail store group. The timing is designed to enable the various ranges to be selected and assembled and then developed, tested and approved in time to be sent to the stores for the launch of the new fashion season. The retail timing 'critical path' leads to each supplier in the chain having their own timing for submissions to the store group. The retail critical path timings are set out in the Figure 7.31 below.

The Critical Path has the following timings, activity stages and people involved at the retailer. The table below shows the Critical Path for a Ladieswear Department in the first seven months of the run up to the launch of the Autumn/Winter 2000 ranges in the stores. Work begins almost a year ahead of the selling season to consumers.

| Month | Meeting/Visit/Information | Personnel Attending |
|---|---|---|
| September | Development of departmental strategy | Senior selectors<br>Merchandise managers<br>Technology managers<br>Merchandisers<br>Range selectors<br>Selectors<br>Technologists |
| | Brief suppliers on process | Senior selectors<br>Merchandise managers<br>Merchandisers<br>Selectors<br>Technologists |
| | Individual supply base meetings<br><br>Discussions on the process by area | Selectors<br>Merchandisers<br>Technologists |
| | Introduction to Key Performance Indicators (KPI's) | Senior selectors<br>Merchandise managers<br>Merchandisers<br>Selectors<br>Technologists |
| October | Agree Fabric workshop structure and fabric trigger dates (i.e. Core/Planned/Unplanned) | Selectors<br>Merchandisers<br>Technologists |
| | Core Health Check ( re Product life cycle growth/decline<br>– Market share<br>Consumer profile<br>Price positioning<br>Fabric Flow Plan<br>Agree Core Strategy | Selectors<br>Merchandisers<br>Technologists |
| | Review and Feedback KPI's to supply base | Senior selectors<br>Merchandise managers<br>Merchandisers<br>Selectors<br>Technologists |
| | Internal planning<br>Ways plan<br>Initial budget estimates<br>Target pricing | Merchandisers<br>Selectors<br>Technologists |
| December | Supplier workshops<br>Discuss product brief | Selectors<br>Merchandisers<br>Technologists<br>Suppliers |
| January | Issue individual garment briefs<br>Supplier Story Boards Presentations<br>CAD/Storyboards<br>Fabric Swatches<br>Costings<br>Country of origin | Selectors |
| March | Final Range Construction<br>Pre-contract Seal meetings | Selectors<br>Merchandisers<br>Technologists |
| | Sign off range<br>Contract seal | Senior selectors<br>Merchandise Managers<br>Selectors<br>Merchandisers<br>Technologists |

Figure 7.31: Retailer Critical Path

It can be seen that there is the use of a development team who are all involved at various stages in the range development. For DyeCo the key dates are the September individual supplier briefings. It is at this stage that a potential supply chain and manufacturing route is planned. It is this stage that crucially decides whether a new product will be dyed at the fibre, yarn, fabric or garment stage. For DyeCo, a garment dyer, the best opportunity to be involved in the new range development is to ensure that the retailer is aware of the benefits of local garment dyeing. DyeCo therefore needed to market their services to the retailer and fit in with the garment manufacturer's product development and launch process.

## 7.3.6 The Garment Manufacturer NPD Process

A detailed analysis of the previous (Pre Management Buyout) company knitwear seasonal design development programme has been recently mapped by an earlier research programme at Salford University.

These stages are described below:

*Market Trends Analysis*

This stage concerns yarn and design strategy, market trend research and the customer (Retailer) brief. The process begins with visits to the Yarns Shows that are held in Paris and Florence where ideas about yarn and colour fashion trends are collected by visiting the Stands of spinners who show their latest developments including new fibre blends and colour choices. Samples of yarns that are of interest are ordered or asked for from the spinners. Directional shopping also takes place where garments are purchased for inspiration regarding styling and silhouette trends. Designers collect trend information and using the information about yarns and from the directional shopping trips make up 'Story Boards' that illustrate the direction of fashion trends including yarns, colours and styling details. The retailer briefing described above is attended and the information added to the data being collected. The key garment styles for the product range are decided and core colours selected at a series of planning and project meetings.

*Design Development*

At this stage some validation of materials is carried out with some sample knitting followed by tests including colourfastness and wash tests. Designers and sales staff work on the development of the garment styles into coherent ranges of garments. Work continues to develop the Story Boards, colour palettes are confirmed and sketch and swatch ideas are developed. Any lab reports on the colourfastness and wash tests impact on the range selection since a failure will halt any development until the matter is resolved. The sketch and swatch ideas are transformed into specifications for prototype knitting of garments using Computer Aided Design. Sample prototypes are then produced and costs estimated. An assessment of the potential and risks of each range is made. An internal review meeting is held to finalize the range ideas.

*Present Ideas to Customers*

The stage in the retailer seasonal development activity timetable called Supplier Concepts is represented by the activity for the garment maker of presenting ideas to customers. The meetings are concerned with the way that the manufacturer has interpreted the retail brief. A range of garments, fabric samples and the associated 'Story Board' inspirations are presented to the retailer buying department. Discussions ensue regarding possible adoption of specific ranges, potential purchase volumes, manufacturing capacity and price bargaining begins. Once the retailer has absorbed the ideas from a number of competing suppliers the purchase intentions are finalised with order indications given to the selected supplier who may also request minor changes in the product.

*Final Sampling and Costing*

Any changes that have been requested are implemented and samples submitted to the retail buying departments for approval. Once the complete range in a line has been completed there is a final presentation of the definitive products to the retailer buying teams. By this stage all the details of laboratory test results; lab dye submissions (to the standard shades selected by the retailer) and successful wearer trial results are available

for approval by the retail technologist. Final buying decisions are made by the retailer in selecting garment ranges.

### 7.3.7 Supply Chain Product Development and Colour

As we can see above the retailer supply chain is a complex and often integrated development process. DyeCo are involved in this development process when part of the garment range has been selected to contain a garment dyed part to help manage the range and variety of shades needed. The garment development processes described above concern the majority of garments where the colour range of the garments sold is determined early in the garment manufacturing process when the yarn or fabric is dyed. A small proportion of garments are garment dyed and in this situation development will concern the dye house such as DyeCo. The proportion of garment dyeing has traditionally depended on the established supply route and the type of effect desired in the colour of the garment affected by fashion trends. For example a mixture look could be a new fashion trend and this was only available using a yarn coloured route since the garment dye route had limited mixture effects available. Garment (piece) dyeing was generally used for solid shaded.

Knitwear for the retailer had traditionally used a UK supply route where garment dyeing was an important part of the supply process and the option to decide on the mix of colours being sold at a later opportunity existed. The UK supply route had a good level of garment dyeing capacity that made this possible. In other countries there is less garment dye capacity and more yarn dyeing capacity. The move to more overseas (and cheaper) knitwear had led to a lower proportion of garment dyeing and more yarn dyeing. An unpublished study of part of the pre MBO knitwear business demonstrates the type of situation and trends that had adversely affected DyeCo. In 1998 the parent company provided the retailer with 500,000 men's Lambswool garments in two styles V-neck and Crewe Neck. The garment was made in 17 yarn dyed colours and they were available all the year round. The colour range was increased to 35 colours with the use of garment dyeing. Only 20% of colours were classic yarn dyed shades such as Black and Navy that continued from year to year. In the previous year 80% of production was garment dyed with 20% yarn dyed. In 1998 through a combination of more offshore supply and fashion trends left only 10% of the requirement was for garment dye. In 1999 only 5% of product was garment dyed.

We can see that DyeCo had been badly affected by the move to offshore sourcing by the retailer over the past few years when it was part of the pre MBO group. When a range is to be garment dyed then DyeCo are involved in the process development for the new seasons fashion colours. Existing classic shades have of course been developed in earlier years.

Having described the supply chain development process at the retailer and garment maker we can now turn to the Case Study intervention and the process mapping at DyeCo where the objective was to understand how the process worked and performed.

## 7.3.8 DyeCo Product Development Process

There are a number of broad stages in the DyeCo development process.

*Shade Sampling*

The DyeCo involvement in the development of new shades begins with contact with the garment making customer by a Customer Services Manager. Regular visits are made by Customer Services Managers to the garment makers to ensure that shade palette information and garment samples are obtained during the garment maker's critical path process. When the garment maker knows the palette of colours that are selected by the retailer a request for a sample shade matching is made to DyeCo who will dye a sample undyed garment for the customer that matches each shade. The colour mixing system at DyeCo is shown in Figure7.32 below.

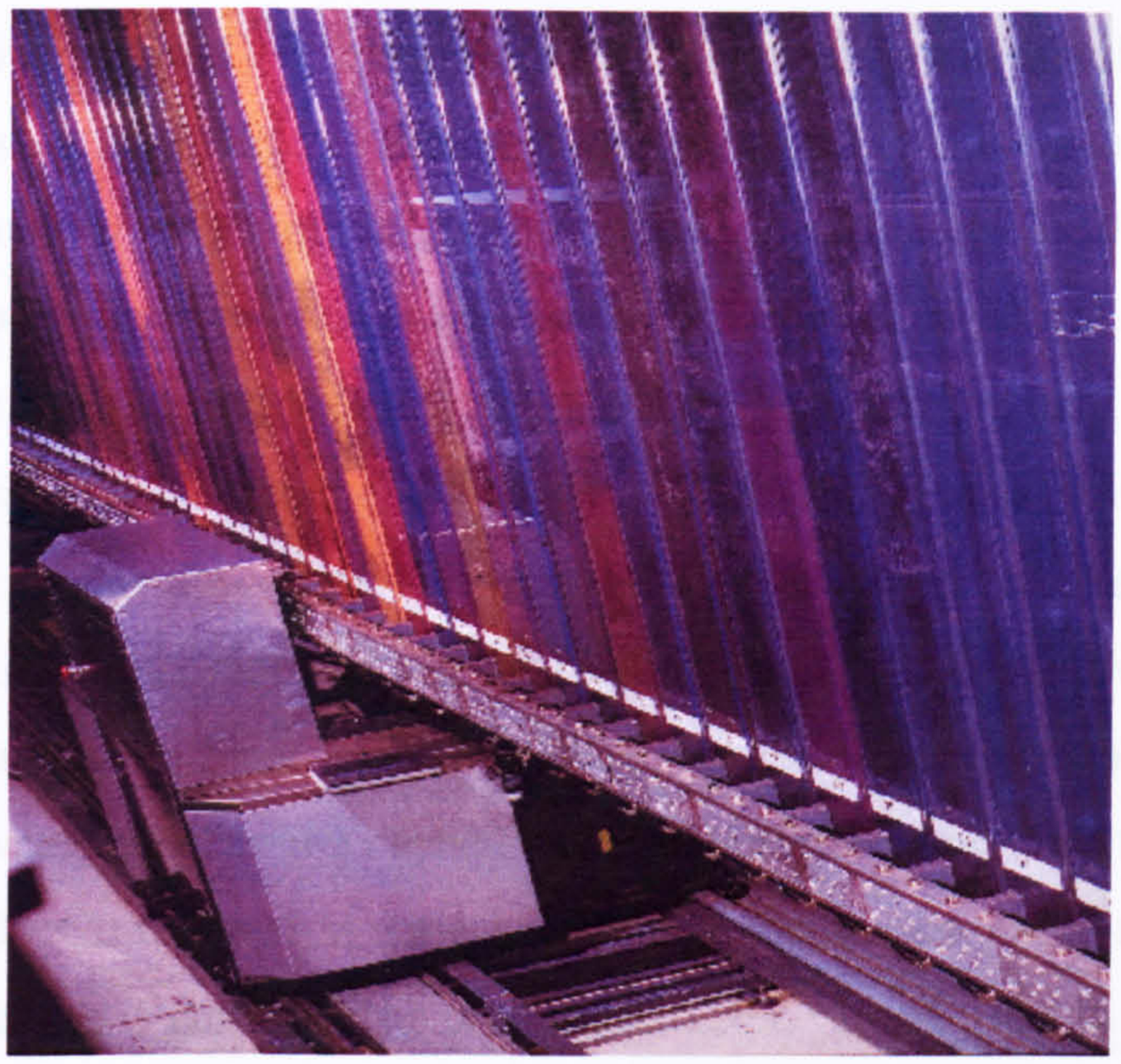


Figure 7.32: DyeCo Colour Mixing.

The shade is normally dyed (using a computer shade matching system) to match an original master colour from the customer. The computer programme calculates the required dye recipe which is then used to strike a shade in a sample dye machine. The recipe may require some minor manual adjustments. Eventually the shade is a good match as measured by the computer and this is checked by the human eye in a colour cabinet that has the required lighting that can simulate the retailer's store lighting. Colour can be different under natural lighting compared to store artificial lighting. The dye recipe will include any additional finishing steps such as softening or shrink resistance treatments. The cost of dyeing and finishing plus any framing (shaping with steam) and pressing stages is estimated.

Samples are then tested for wash fastness by putting them through a washing programme that is similar to a domestic laundry wash. Colour fastness to rubbing, perspiration and contact with other fabrics is checked. Fabric shrinkage is also measured after washing. The tests vary dependent on the retailer with some retailers having published their own test comprehensive regimes. The test laboratory services at DyeCo have to be certified by a retailer appointed assessor each year. DyeCo have a range of possible fabric types and shades to dye. Often the garment is constructed using the kind of materials such as Lambs wool or Cotton from an existing customer that DyeCo have a great deal of previous experience with. The shade may be a classic such as Black or Navy where the recipe is already known. On the other hand the material may be a new mixture of fibres such as Wool/Tencel or the customer may be a new

business to DyeCo and the shade may well be a new fashion colour. In this case more work is required to establish the process route and contact and feedback of information and samples with the customer is required to ascertain the exact customer requirements both technically and aesthetically. Cost is an important consideration and whilst DyeCo have a standards cost matrix for light, medium and dark shades negotiations take place with the customer about likely programme volumes, delivery dates and prices. DyeCo examine the capacity requirements of each order relative to the amount of machinery and labour required week by week of the programmes that are required by all the customers for a season. However the forward order book is quite short at only a few weeks so planning capacity of labour normally requires the use of overtime. The DyeCo factory has a great deal of dye equipment capacity of various types and so labour is generally the bottleneck factor. If overtime is required this affects the costing. If all goes well an order is normally forthcoming from the customer and the next phase of the critical path will eventually start where the garment maker has started production of the first commercial quantities of undyed garments – the pre-production stage.

***Pre- Production***

Here small quantities are put through the main dyeing and finishing process rather than through the small lab dye sample machines. At this stage a full range of garment sizes are put through. Changes in the dye recipe or process route timings may become necessary as the ramp up to bulk takes place. Testing again takes place and samples are again submitted to the customer. Costs may change as the route or recipe changes. The real capacity requirements begin to be appreciated and any processing problems that occur that require additional process steps or chemical additions are noted so that the process route can be established.

***First Bulk***

Depending on the amount of previous experience with the garment type and customer the first bulk orders are either put through immediately or a small pilot lot is tried where there is little prior experience.

*Programme Deliveries and Production*

If all goes well the programme of dyeing then moves into a bulk stage where the mix of shades dyed will change each week depending on the actual sales in the retail stores. Output is ramped up and more dye machines and staff are devoted to the programme. The undyed garments arrive from the garment maker and then move into the dye process once the shade mix is established. Any new shades go through a sample and approval process.

### 7.3.9 Supply Chain Development Summary

The findings above show a variety of views and timings of the Retailer UK garment supply chain seen from both the retailer and supplier perspectives.
The process of new product development contains elements of concept generation, strategy reviews, new product development, and validation and range decisions. These process activities take place in a timed sequence that suits the retail calendar and the activities are shared between the retailer and suppliers. The retailer makes the concept and buying decisions and the supplier carries out the design, development and testing operations.

### 7.3.10 Cost Modelling and Store Inventory Project

The management of the DyeCo business judged that an opportunity existed to grow the business. The expansion depended on developing a new product offering and selling the idea to the downstream customer base and in particular the influential retail buyers. The knitwear supply chain to the retailer had changed in the past two years and more knitwear was now being sourced from offshore suppliers as a result of the efforts of the retailer to reduce costs and improve margins. DyeCo had been part of a vertical garment supply business and had processed garments for another part of the company in the UK and then returned the garments in an unfinished form. The sequence of the flow is shown in Figure 7.33 below.

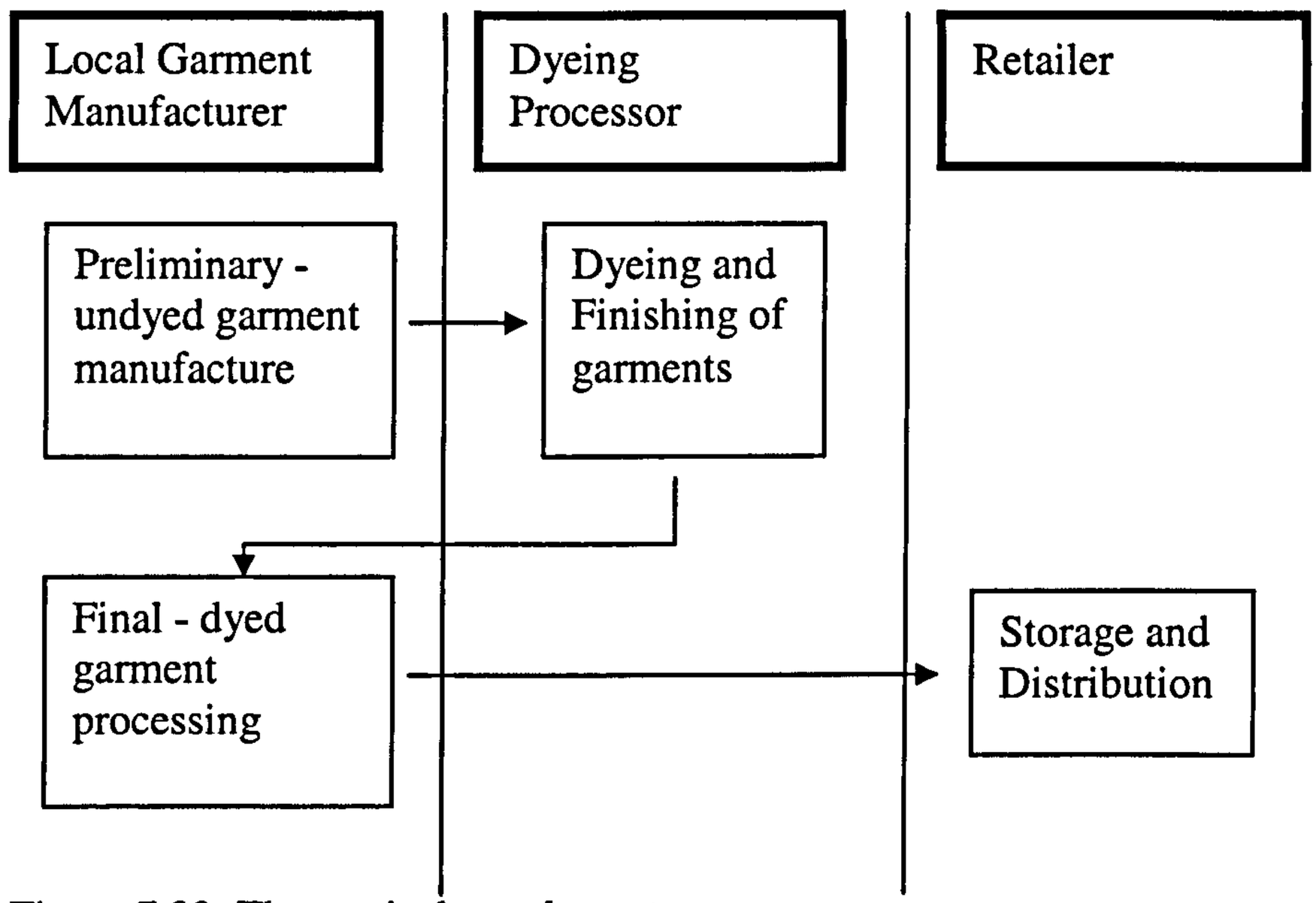



Figure 7.33: The vertical supply route

The new offshore garment suppliers had more of the Retailer business and if DyeCo could be more involved with this new supply chain then the service offering would have to have some added components whereby the garments from an offshore supplier could be completely processed at DyeCo and then sent direct to the retail Distribution Centres. The new route is shown in the Figure 7.34 below:

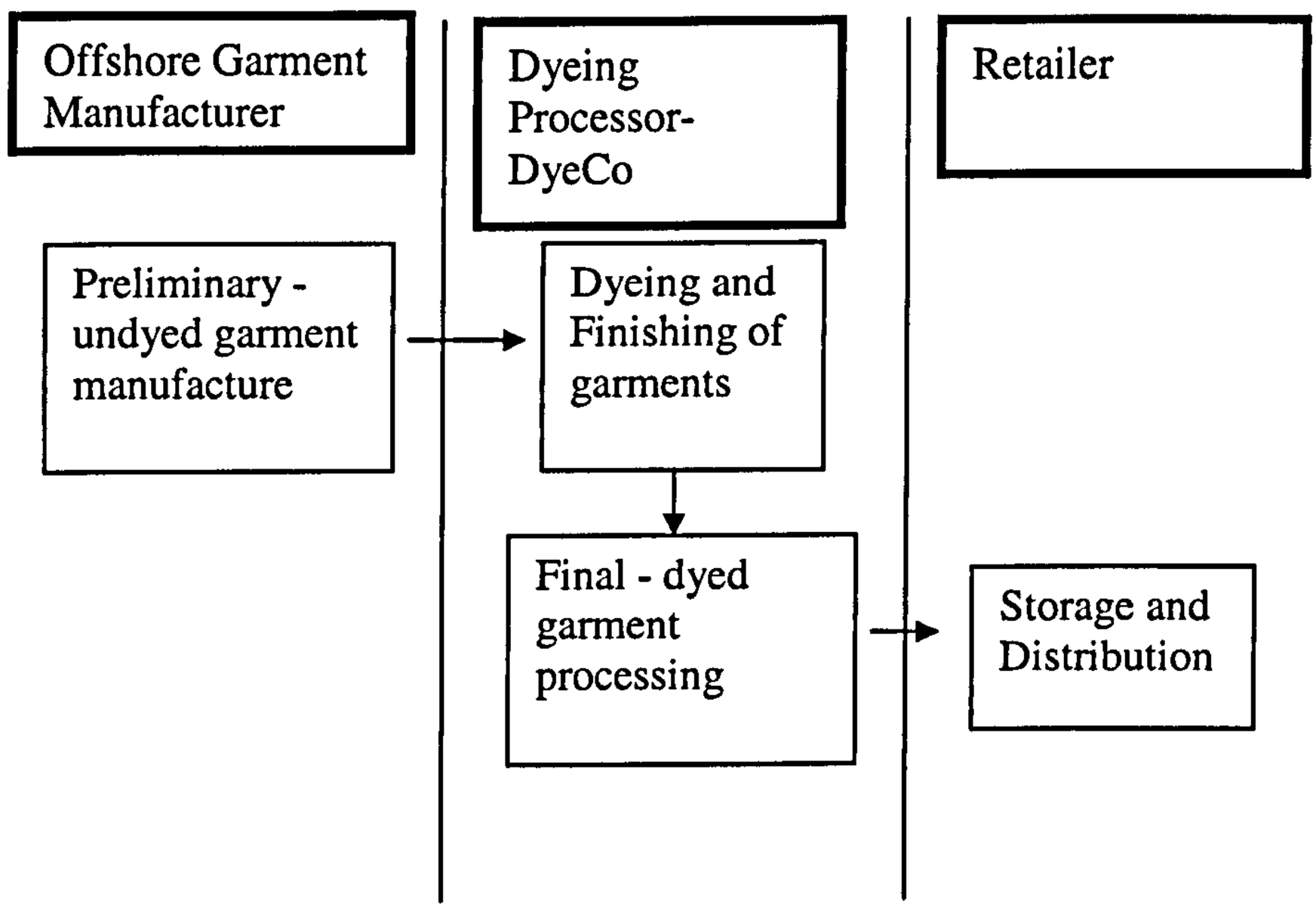



Figure 7.34: The new offshore supplier route

The new route would offer retailers the chance to combine low cost offshore supply with local fast response dyeing, provided the retailers could be persuaded that there were benefits from switching from largely yarn dyed offshore supplies to undyed offshore supplies that were the dyed at DyeCo. The Industry Forum project workshop outcomes had suggested that DyeCo needed to gather information about the costs for the retailer of offshore yarn dyed supply and the inventory risk inherent with it.

### 7.3.11 Development of Retail Cost Model

The project team had decided that the best way forward was to try and establish exactly how the DyeCo garment dye route compared in cost with a yarn dyed route. One of the issues involved was the level of forecast sales accuracy by retailers and the subsequent level of stocks that had to be written down and sold off at lower prices.

*The Warburton Model*

A model of the impact of retailer sales accuracy had recently been presented to industry managers at a local conference. Professor Roger Warburton had developed a model of the impact of retail forecasting errors. This was later published as a journal paper (Warburton & Stratton, 2002). The generic model used the fact that retail sales forecasts were inaccurate to predict the effect on margins. This model was then used as a basis for preparing a cost model for DyeCo to present to the retailer. In fact Professor Roger Warburton joined the DyeCo presentation team and gave his paper to the retailer buying managers. The chart below shows the simple Warburton Model. According to Warburton fashion retailers admit to getting forecasts on sales levels wrong by a factor of +/- 25% over a season on at least 70% of the styles. Roger thought that on the other 30% of styles the forecasts were even more inaccurate. The implications of this are that on a garment forecast of 1000 garments either sales to consumer could be only 750 garments or they might have been 1250 garments (if there had been more purchases to replenish as the store shelves as stock ran out). If the sales could have been 1250, this implies a shortage of stock and then customers might go to a competitor store to get the style in the size and colour that the wanted to buy. If the sales are on the other hand only 750 then the retailer is left with the 250 garments at the end of the season and has then to reduce the price from the full selling price in order to quit the stock. Whilst the overall margin can be calculated from the reduced margin, it is Warburton's view that

retailers do not admit to the full impact of the effect of the lost sales or the scale of the margin loss.

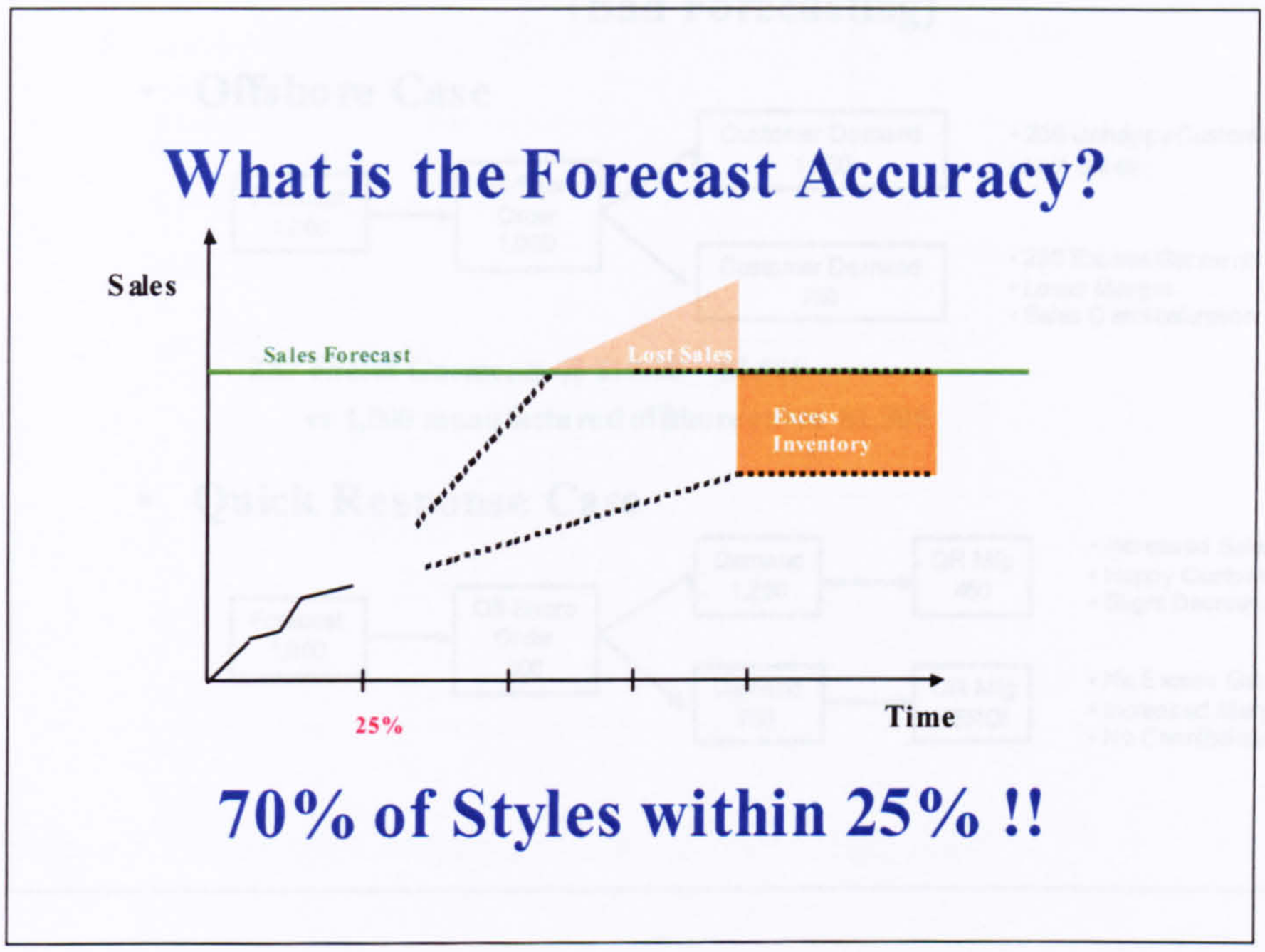



Figure 7.35: Store Sales Forecast Accuracy. Source: Warburton, 2001

The Figure 7.35 above shows how the lost sales or excess inventory arise with sales trends either above or below forecast. Part of the problem is that retailers have moved more and more purchases to cheaper offshore suppliers where the lead times are up to 16 weeks long. So whilst it may become apparent early in the selling season that sales are going to be higher than forecast the opportunity to replenish stock in the short window of the season (that is perhaps only 24 weeks long) may be limited. So whilst offshore producers may be cheaper in terms of gross margin, when the lost sales and stock write downs are taken into account the picture may be different at the net margin level. The alternative according to Warburton is to use a mix of some more expensive local garment supply that he terms Quick Response (QR) plus a higher proportion of offshore cheaper supply.

The comparison of offshore and QR is shown in Warburton's chart below in Figure 7.36.

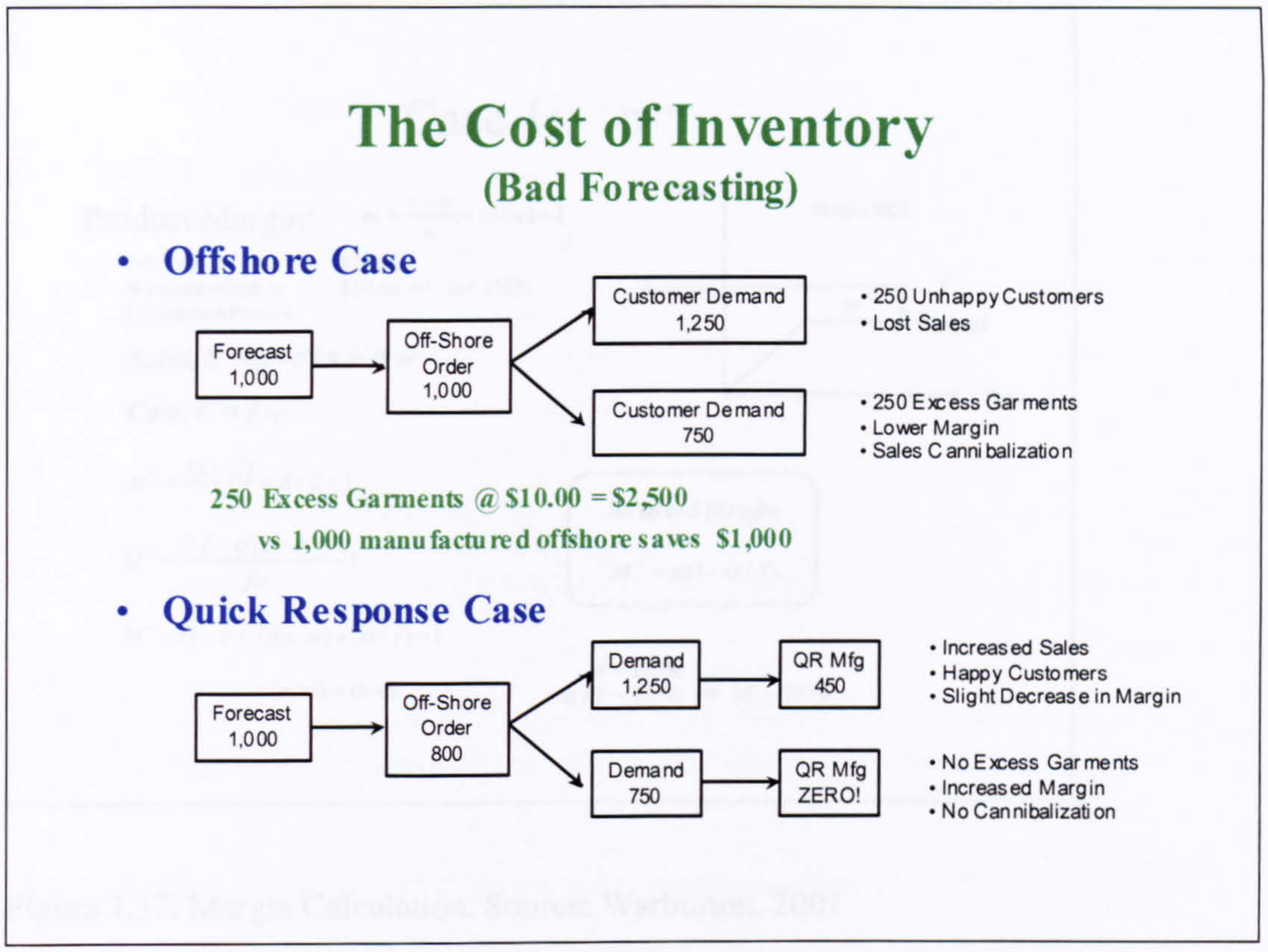



Figure 7.36: The cost of inventory. Source: Warburton, 2001

Cannibalisation of sales is where garments are sold off at lower prices.

Warburton has taken these basic concepts and developed a margin calculation model (Figure 7.37) shown below:

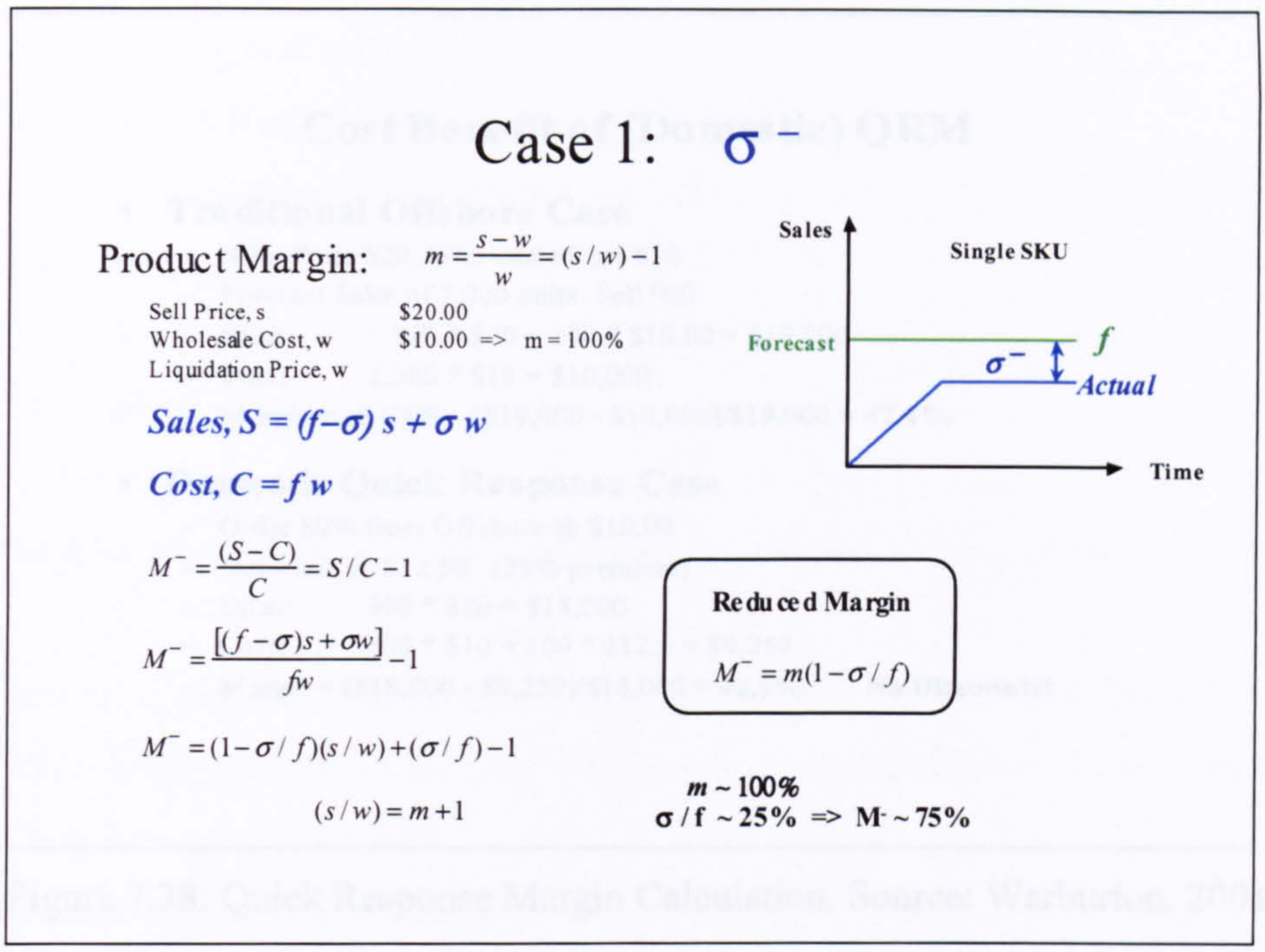



Figure 7.37: Margin Calculation. Source: Warburton, 2001

When some likely estimates of error, selling price, margin, stock write downs and purchase costs are put into this model Warburton obtains the following example (Figure 7.38) of offshore and QR domestic mix options for a 10% forecast error. The 100% offshore case is compared with a 20% split of domestic QR production.

**Cost Benefit of (Domestic) QRM**

- **Traditional Offshore Case**
  - Sales Price $20, Wholesale Cost $10
  - Forecast Sales of 1,000 units. Sell 900
  - Sales: 900 * $20 + 100 * $10.00 = $19,000
  - Cost: 1,000 * $10 = $10,000
  - Margin = (S-C)/S = ($19,000 - $10,000)/$19,000 = **47.4%**
- **Domestic Quick Response Case**
  - Order 80% from Offshore @ $10.00
  - Domestic @ $12.50 (25% premium)
  - Sales: 900 * $20 = $18,000
  - Cost: 800 * $10 + 100 * $12.5 = $9,250
  - Margin = ($18,000 - $9,250)/$18,000 = **48.6%** **No Discounts!**

Figure 7.38: Quick Response Margin Calculation. Source: Warburton, 2001

The conclusion is that the 20% QR route net margin is close to the traditional 100% offshore route and obviously offers the chance to sell more if the opportunity arose through higher consumer demand. The main issue here is the need for Retailers to use local supply for some of their orders and whilst the local supply seems more expensive at the gross margin level the situation changes for the net margin if the costs of stock write down are taken into account.

*The DyeCo Model*

In order to develop a UK model that would make sense for the Retailer supply chain more information was needed by the project team about the actual forecast errors, costs and margins used in practice. An initial model of the Retail margin was developed by the researcher and accepted by the project team.

The formula was as follows:

Actual Sales S = (F-E) x SP+E x L

Cost C = F x W

Margin M = (S-W)/W

Where F= forecast sales units

E= negative error in forecast

SP= full retail price (excluding VAT)

L= liquidation price (excluding VAT)

W= Cost to Retailer

S= Actual Sales Level

M= Target Margin

The following example roughly demonstrates the sensitivities of the formula:

Forecast sales level of 50,000 dozen Ladies Lambswool Knitwear Jumper retailing at £40 including VAT demonstrates the formula, with the retailers Gross Margin estimated at 55% and an error of 30%.

Forecast sales units F = 600,000

Error in Sales forecast E = 600,000 x 30/100 = 180,000

*Unit Costs*

Full Retail Selling Price SP = 40/1.175 = £34.04

Margin M = 34.04 x 55/100 = £15.32

Cost of garment to retailer W = 34.04 x 45/100 = £15.32

Liquidation Price L = 0.5 x (40/1/175) = £17.02

*Total Costs*

Total Target Sales income without VAT £34.04 x 600,000 = £20.424 Million

Target Margin = 55/100 x £20.424 Million = £11.223 Million

Target Cost = 600,000 x 15.32 = £9.92 Million

Total Actual Sales S = (600,000-180,000) x 34.04 +17.02 x 180,000 = £17.360 Million

Total Actual Margin = 17.360 - 9.192 = £8.168 Million

Total loss of profit 11.233 – 8.168 = £3.065 Million

Thus if forecasting error was 30% the net retailer margin is then only 40% not the expected 55% with a loss of profit of £3.065 Million. In order to convince the retailer that the more expensive local garments were worth the potential of the rise in net margin the likely cost of a domestic alternative was estimated.
For example if the Quick Response domestic route was used for 20% of the product line but this cost say £1 more per garment. If the QR route allowed perfect response to sales demand then the sales would now be at the target 600,000 with all garments sold at the full price. The costs are now as follows:

- Actual sales income excluding VAT is 600,000 x £34.04= £20.424 Million
- Actual Costs are now 80/100 x 600,000 x 15.32 + 20/100 x 600,000 x 16.32 = £9.312 Million
- Margin is now 20.424-9.312 = £1,112 Million

In percentage terms the margin is then 1112/20423 = 54.4% which is very close to the existing offshore retailers target gross margin of 55%. The project team agreed that the model was sufficiently interesting to develop. The rough figures needed more accurate confirmation regarding the actual levels of store target margins, forecast inaccuracy, inventory write downs and costs of the different offshore and local routes.

Information was then gathered by various members of the Industry Forum and project team to assist in the development of the costing model. The Managing Director of DyeCo obtained information from the retailer about a garment currently being sold. The amount of the garment line purchased by the store group was 10,000 dozens or 120,000 garments. The purchase was across six colour ways and across seven ladies sizes from size 8 to 20. The garments were a knitwear keyhole neck three quarter sleeve. The research and project team visited a number of the retailer stores in June 2001 and counted the number of garments in store in the various sizes and colours. The

chart below (Figure 7.39) shows the number of garments by colour and size across the eleven stores.

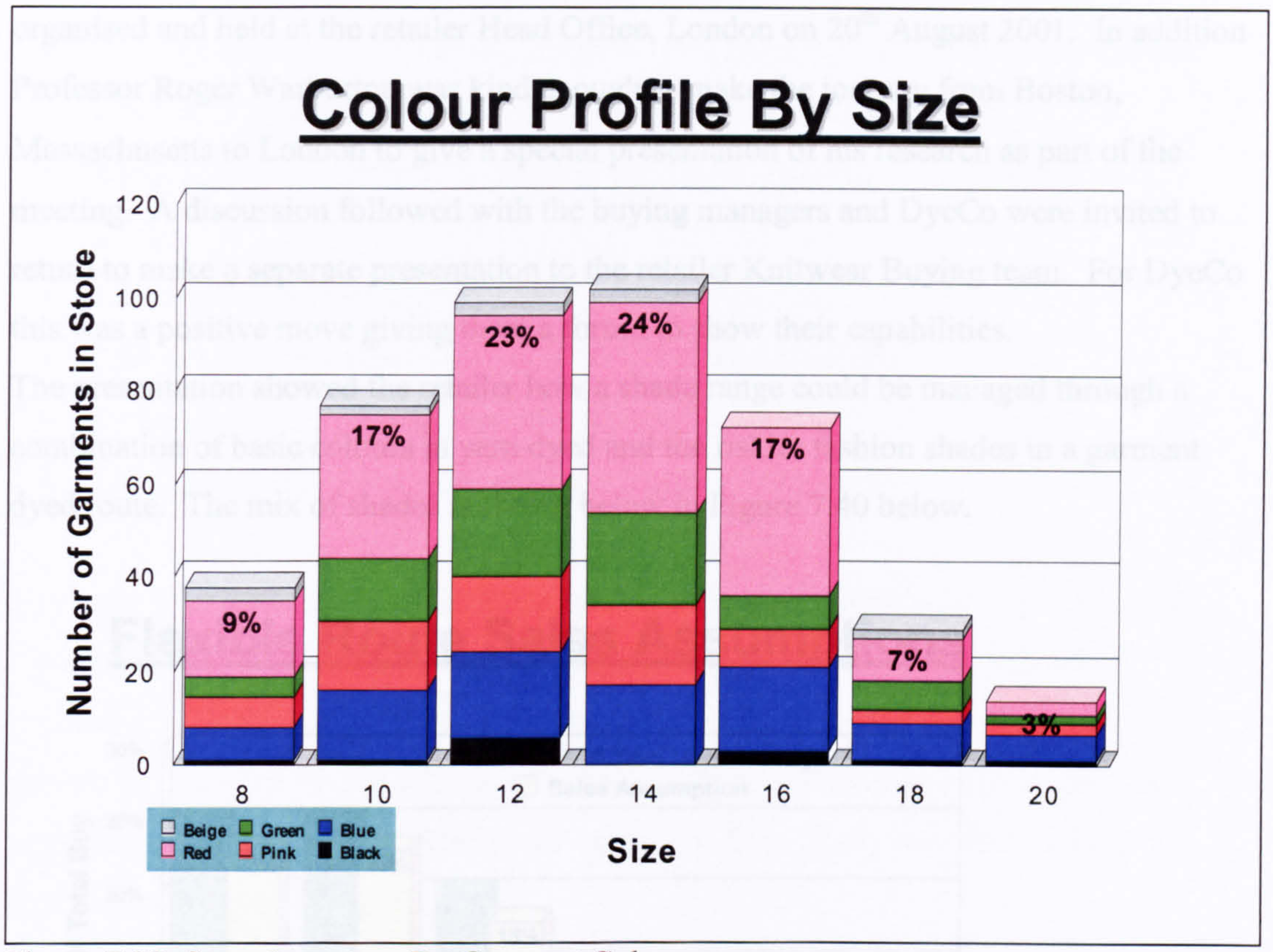



Figure 7.39: Store Inventory By Garment Colour.

The stores had clearly run out of the beige and black colour ways in most sizes and had many of the pink garments left in stock. The store was selling the garment for £30 in the period February to June 2001 and had a gross margin of 55%. The store started to quit the residual stock in July 2001 and reduced the retail price first to £20 and later to £15. Further supplies of the black and beige colour ways had been ordered from the offshore supplier but as a consequence of the extended lead times they arrived in store just as the other colour ways were being reduced in price in the store July sales. This led to the somewhat difficult situation of the garment being priced at both £30 and £20 in the same stores.

*Presentation to Retailer*

The project team worked on the cost model and a presentation for a meeting with the retail buying managers across a range of product categories. The meeting was organised and held at the retailer Head Office, London on 20th August 2001. In addition Professor Roger Warburton was kind enough to make the journey from Boston, Massachusetts to London to give a special presentation of his research as part of the meeting. A discussion followed with the buying managers and DyeCo were invited to return to make a separate presentation to the retailer Knitwear Buying team. For DyeCo this was a positive move giving them a forum to show their capabilities.

The presentation showed the retailer how a shade range could be managed through a combination of basic colours in yarn dyed and the riskier fashion shades in a garment dyed route. The mix of shades is shown below in Figure 7.40 below.

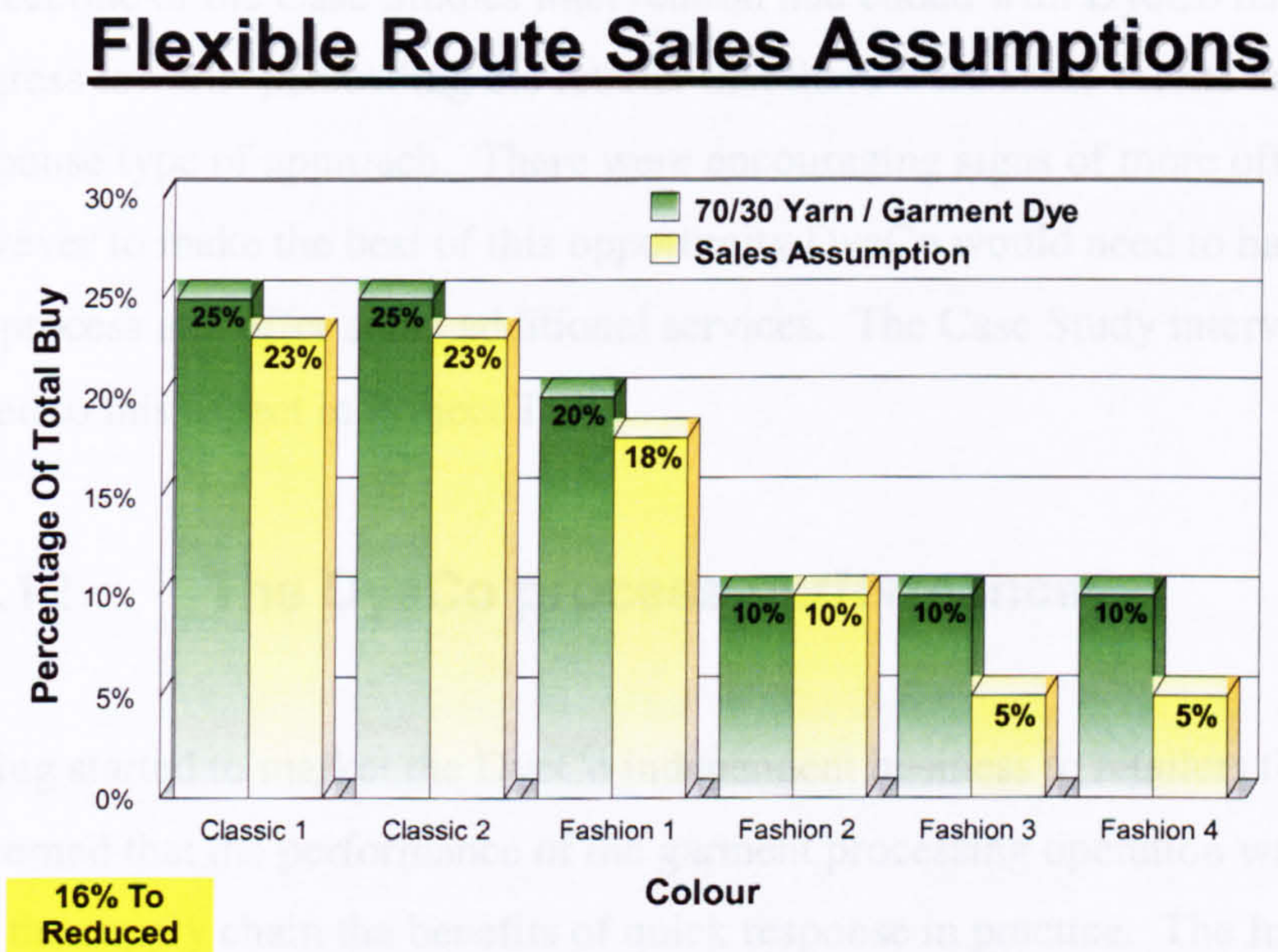



Figure 7.40: Retail Quick Response Colour Breakdown.

Once the presentation had been carried out to the major UK retailer DyeCo were able to use the store survey and cost model presentation material to market the firm to other retail supply chains. This work began to bear fruit in a short time. At a later meeting of the project team in September 2001 the DyeCo management gave details of encouraging news about a number of new potential orders and enquiries using the local garment dye route of offshore garments to offer Quick Response on colour:

- Menswear leisurewear sweatshirt tops and jogger bottoms using undyed garments manufactured in Turkey
- Ladies knitwear acrylic jumpers with garments from Poland
- Ladies knitwear cotton jumpers with garments from Cambodia and Latvia
- Ladies cotton and Lambswool jumpers from Hong Kong for the world's largest knitwear supplier with an output of 42 million pieces per annum
- Mens knitwear Lambswool slipover and Ladies Merino Wool jumpers from Turkey
- Ladies dresses from Cyprus
- Ladies knitwear cotton jumpers from China and Thailand
- Ladies Knitwear jumper from Hong Kong
- Lambswool stripe and intarsia Ladies Jumper from Turkey

Project one of the Case Studies intervention had ended with DyeCo having made some progress towards persuading the retailer that there were some merits in a Quick Response type of approach. There were encouraging signs of more offshore business. However to make the best of this opportunity DyeCo would need to have an efficient dye process and offer some additional services. The Case Study intervention project turned to this aspect in Project Two.

### 7.3.12 The DyeCo process performance

Having started to market the DyeCo independent business to retailers the firm were concerned that the performance of the garment processing operation was fast enough to give the supply chain the benefits of quick response in practice. The Industry Forum carried out a project to measure the performance of the product processing route at DyeCo and then implemented a trial using a Just in Time method called a Kanban.

## The DyeCo Product Process Route

The main steps in the process are as follows:

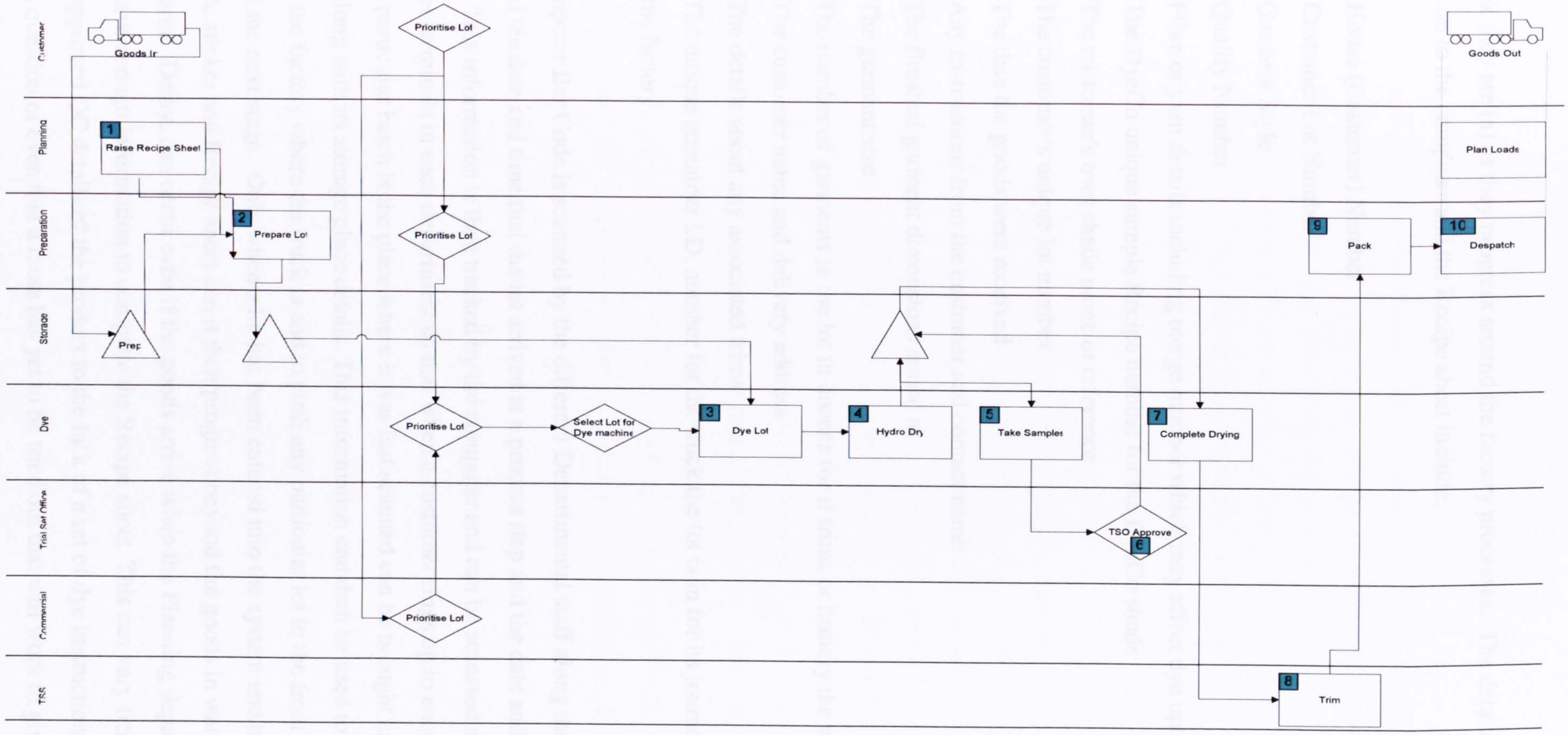
**Planning**
**Preparation**
**Dyeing**
**Testing**
**Drying**
**Trimming**
**Packing**
**Despatch**

Whilst a process map with decision points has been produced (see Figure 7.41 below), it is clear that the amount of time that an order lot spends in the system has little to do with the actual process time of for example the dye machine and more to do with the way that lots are prioritised and get stuck in the system between processes.

### Planning

Planning does not mean the traditional word for organising production. This step in the process would more accurately be called Works Order Raising. Here at Planning when the customer sends in a delivery for processing [or one of the DyeCo' lorries make a daily pick up] of trucks or boxes of garments in lots of various garment sizes to be dyed various colours (or finished), these lots are entered into the Planning Computer along with information about the goods. The computer system then generates a unique Bar Code label and prints off a Works Order called a RECIPE sheet (see appendix) with a white front copy and yellow, orange, pink and blue copies for different departments. Planning get to know about an inbound delivery either from the customer who may fax the delivery note details before the shipment arrives or by the delivery note being collected and brought to the Planning department when drivers arrive with the goods. The lot details that are entered at Planning do not take long and most lots that arrive during the day have their details entered by the end of the day or early the next day. The details on the printed recipe sheet (and copies) are then attached to the goods (or at least

Figure 7.41: DyeCo Process Map



the truck they are in) as they progress around the factory processes. The details that are entered on to the computer and the Recipe sheet include:

1. House (Customer) Number
2. Customer Lot Number
3. Garment Style
4. Quality Number
5. Fibre or yarn details including merge number which may affect dye uptake
6. The DyeCo unique sample Recipe number for the DyeCo shade
7. The customer's own shade name or reference
8. The customer's unique lot number
9. The date the goods were received
10. Any instructions from the customer and contact name
11. The finished garment dimensions aimed at
12. The garment size
13. The number of garments in the lot in dozens (or if trims or hosiery the weight)
14. The customer name and delivery address
15. The details about any associated trims
16. The unique container I.D. number for the truck the lot is in for its journey round the factory

The computer Bar Code is scanned by the different Departmental staff along the factory to record the date and time that the lot arrived at a process step and the date and time it left too. This information is then tracked by the computer and can be accessed at dumb computer terminals in each department so that when a customer rings up to enquire where a particular batch is the place where it was last scanned can be brought up on the screen along with its storage place details. This information can then be used to find the place in the factory where the truck is and to push any particular lot to the front of the queue at the next stage. Only when a lot has been entered into the system and has got a Bar Code sticker and Recipe sheet can it then progress beyond the goods in warehouse storage area. Delays can occur even if the goods arrive when the Planning department do not have enough information to complete the Recipe sheet. This can vary from not having approved QC details of the product to the lack of a set of dye instructions for the shade in question or even that a route has yet to be tried out that will work to give the required shade in an initial sample garment or hose.

## Preparation

This is the first added value stage in the process and largely involves counting the goods or weighing them to ensure that the customer has sent the right amount of each size that agrees with the delivery note details. Goods either arrive in trucks (owned by DyeCo) or in cartons. Once the Preparation Department get the Recipe Sheet with Bar Code sticker they can scan the Bar Code and begin the counting of the goods.
Hosiery goods of a particular size (e.g. large or medium) are generally sent in by the customer in a gauze bag where each bag has a colour coded thread running along its edge denoting the size of the hosiery in each bag. (e.g. Yellow for small). Shortages of any significance are reported and investigated and batches are usually made up of garments or hosiery that are to be dyed the same shade covering a number of trucks that will also include any trims such as collars that need to be dyed the same shade.
Counting 30 to 40 dozen knitwear garments into a truck is usually carried out by a single operator and takes about an hour. Some garments need a process before dyeing. For example for garments of thermosetting fibres such as Trevira (Polyesters) are pressed to avoid cockle to a standard size and shape with steam on a wire frame (First Press). Pressing a garment takes about 7 standard minutes per dozen. Some garments need turning inside out before they are dyed to avoid pilling. Those that need these extra turning processes are sent off to the trimming department in their trucks and return ready to be weighed and bagged prior to dyeing. Turning, Straightening and Sorting (TSS) takes one person about an hour for a lot of 30 dozen. Tidying up of trims such as collars also takes place in the Preparation Department where draw threads are snipped off. Once lots are counted they are stored awaiting bagging for garments (and weighed if necessary) which is carried out to ensure the garments can safely get through the dye process with no creasing or tangling. After bagging the lots are stored in trucks in the Pre-Dye storage area which has numbered locations that are entered into the accompanying Recipe sheet. Pre-Dye storage contains about 3 days of stock. This is a major area of queuing delay when one considers that the dye process takes 8 to 12 hours. This queue of trucks is largely brought about through the early processing of lots, the pushing of lots to the front of the queue and by the overproduction rates of Preparation compared to Dyeing.

**Dyeing**

Assuming that a batch of goods has a dye instruction (Recipe) for the required shade it will be dyed in date order. This short term scheduling is carried out by the use of a set of pigeon holes on a board in the Dye Office. Here the Recipe sheets are put in to a slot that corresponds to each dye machine. The shift dye supervisor and the operator of that dye machine will look in the pigeon hole to find out which lot should be dyed next on his allocated machine.

The photo (Figure 7.42) below shows a typical dye machine:

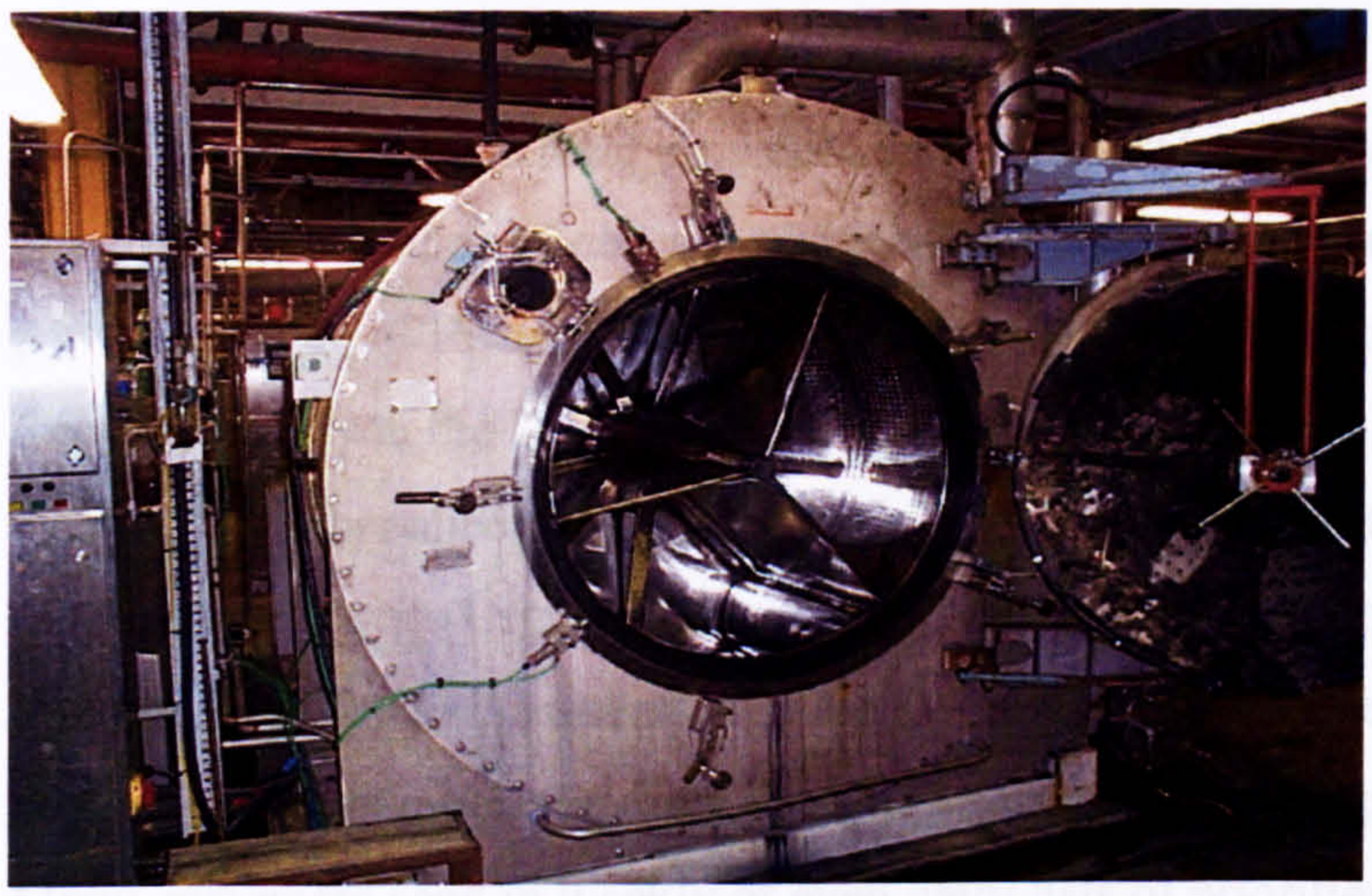


Figure 7.42: Typical Dye Machine

Dyeing Priorities

The priority of the dyeing is therefore critically dependent on the order in which the Recipe Sheets are organised in the Dye Office pigeon hole boards as shown in the photograph in Figure 7.43 below:

Figure 7.43: DyeCo Dye house Plan Board

The manager responsible for a specific area such as Hosiery will normally decide the order in which Recipe Sheets are arranged in the slots. If a customer is chasing a particular batch of Hosiery he (or she) will ring up and the batch can be progress chased through quickly at the Dyeing process by putting the Recipe Sheet for that batch the front of any other sheets in the slot. In order to highlight the urgency of the batch it is the practice to write Urgent in fluorescent highlighter on the top of the Recipe Sheet to bring the urgency to the attention of the Dyehouse. In practice the Recipe Sheets are re-organised by a number of people including commercial staff, production staff, etc. Many customers send in weekly or even daily lists of priorities and indeed are encouraged to do so. This has the effect of allowing the delivery date in to be less of a guide as to the priority for the dyehouse. The issue of delays depends to a great extent on the way the dyehouse is prioritised on a day to day basis. Dyeing is a fairly long process compared to the others and can take between 3 and 10 hours. The dye house runs three shifts on normal weekdays. In practice a long cycle time lot will not start dyeing on a Friday if will not be finished by the end of the shift. Dyers run about 4 machines each and they try to minimise cleaning by the way that colours are planned. There is no blind dyeing so the colour is checked before the end of the process and 50% of the time dye additions are made to bring the batch on shade. Re-dyes happen about 10% of the time. There may be a number of dye addition attempts made to get on shade. There is a very sophisticated automatic dye dispensing system. Usually there will have been some experience gained from the stage at which samples have been dyed in the Sample Dye lab for a customer before bulk arrives. In any case the first bulk is carefully monitored since it can provide a guide to speed future batches through.

**Hydro Drying**

Once dyed most batches are spun dry in the Hydro Machines. Some batches need more drying depending on the fibre type.

**Take Samples**

After the Hydro stage 8 garment samples are taken at random from each batch for Testing at the Trial Set Office (TSO) along with a copy of the Recipe Sheet and the bar code.

The TSO work two shifts and check the samples for level dye both within and between the samples. The shade is checked against the standard pattern at least visually in a light cabinet or instrumentally depending on the customer needs. A sample is taken for checking against previous batches and stapled to a continuity card for checking future of future batches for colour drift.

**TSO Approve**

Testing continues with dry rub test and wash tests for fastness. There are few delays as a consequence of the time it takes to actually carry out the tests and even the wash tests are finished within the day. Once a batch has passed the tests the Recipe Sheet Copy Bar code is scanned and the production areas can look up on the system if the batch can proceed. Once passed for colour a batch continues through the system but cannot be despatched unless it has passed all the tests. The schedule of tests depends on the specific customer. The Test Lab is accredited by the various Retailers, including BHS, M&S, Next. Some customers need copies of the test results. There are about 300 lots dyed per week. Unfortunately not all batches pass the tests and may need to be reprocessed in some way. This may mean a new dye recipe or more seriously a rethink on the whole process with sampling of the new process. The re-dye process is a cause of major delays for a few batches.

**Complete Drying**

Once passed by the TSO the batch can proceed to drying either in the Radio Frequency Dryer or Tunnel Oven (for Hairnets) or in a Tumble Dryer. This process takes about 1 to 2 hours.

**Pressing/Trimming**

Knitwear garments are pressed (trimmed) into the right shape on wire frames of the appropriate type for the garment style and size being processed. Some fibres require a First Press before dye to take cockle out. After dyeing and drying knitwear garments are pressed. This only takes a few seconds per garment.

**Turning and Sorting**

Some garments have to be dyed inside out and are turned before dye and again back the right way after dye. This only takes a few seconds per garment.

**Packing**

Packing of Hosiery is a question of putting a batch back in a truck with the sizes identified and then letting the planning office know that the batch is ready for despatch in a temporary storage area by sending the Recipe Sheet to the Planning Department.

**Despatch**

The planning department will make up lists of items for despatch and then the drivers will pick up the correct trucks and deliver them to the customer. The planning department make copies of the delivery note details and these used to bill the customer.

**Product Process Organization**

The diagram in Figure 7.41 shows the process map of how each department was involved in the processing. The main issues of the existing process was that orders were being re-prioritised on an almost hourly basis and this did not help the efficiency of the dye house or the level of stock in the system. As the diagram in Figure 7.41 shows there were a number of departments that seemed to have the ability to change the dye house priorities. Another concern was the need for DyeCo to address the issue of additional services to the process route. The changes that were made during the Case Study are briefly described in the following section.

### 7.3.14 DyeCo Added Services

The new offshore market required that DyeCo develop the added services required that would enable the offshore supplies of garments to arrive undyed at DyeCo and then be dyed and made ready for delivery direct to the retailer. The additional stages added by DyeCo were:

**Mending**

Minor fabric faults such as holes or seams that needed mending were attended to by a sewing machinist.

**Examination**

Garments were examined for quality, so that any faulty products could be returned to the garment manufacturer.

**Kimball (Store Security Tag)**

Attachment of the special security tags that will set off an alarm at the door of a retail store. This deters theft.

**Label Sewing**

White Labels such as the Next or St Michael Brand and Size neck label and the side seam Care Label needed to be sewn in after dyeing otherwise they would be dyed the same shade as the garment.

**Hanging**

Garments were put on the correct size labelled coat hangar and stored on rails for delivery to the Distribution Centre.

**Bagging and Sealing**

Hung garments were sealed in a polythene bag for protection during transit.

The new services added a significant cost and income stream to the DyeCo basic dyeing operation. Where the dye only route cost about £21 per dozen garments (where for example a garment weighed 6 kilos per dozen) the added services cost £18 per dozen. The Case Study Intervention was more concerned with the performance of the DyeCo Dye processing within the supply chain. In particular the main concern was the time that it took to process garments. The intervention study findings regarding performance are summarised below.

**The Process Performance**

The process mapping and performance measurement led to the collection of data about the way the business performed in terms of Quick Response. Whilst DyeCo gave a TURN ROUND (Lead Time) of 8 to 10 days to customers the actual time was longer for many batches. The charts below (Figure 7.44 and 7.45) show a typical distribution of Lead Times.

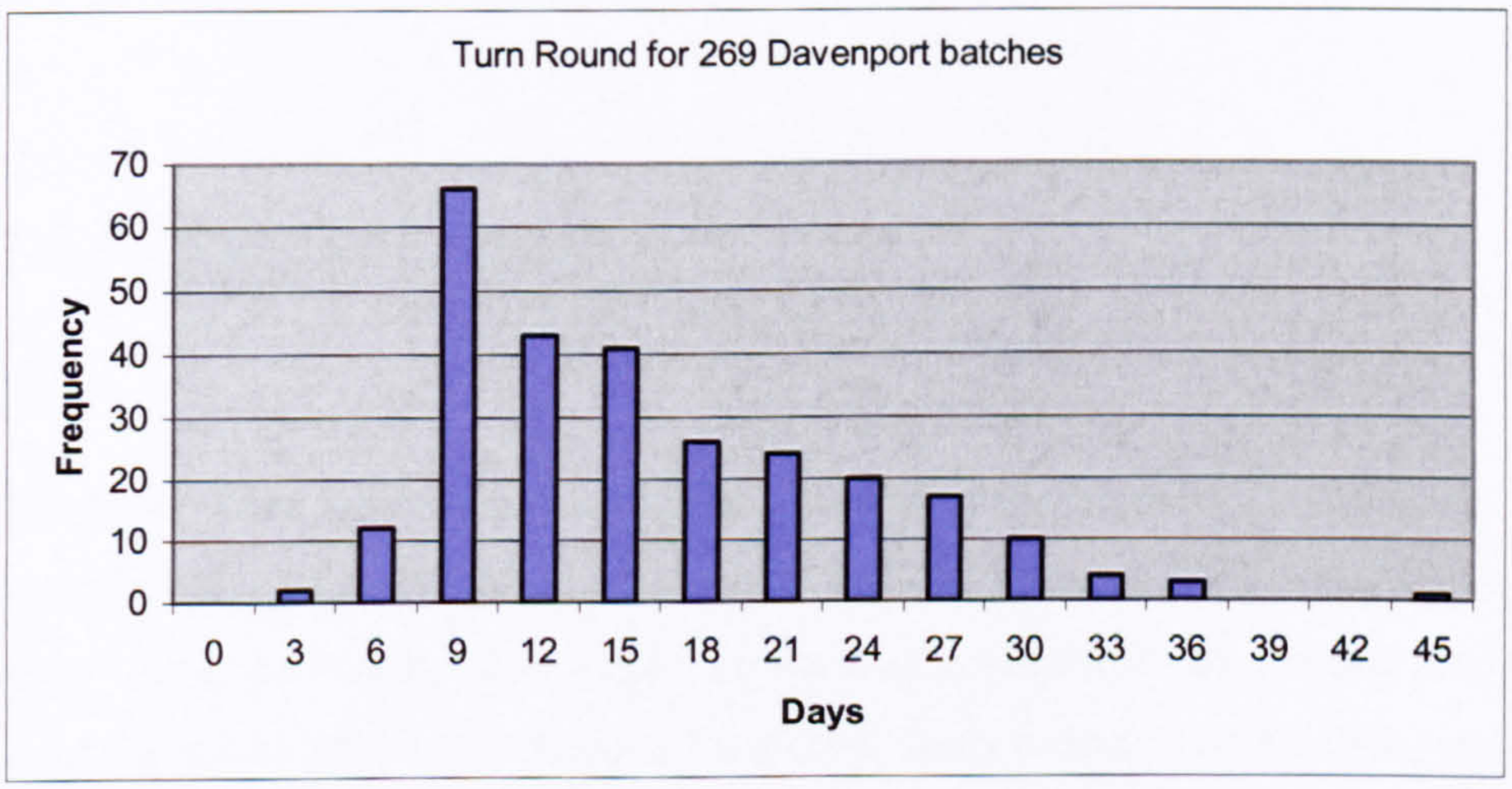



Figure 7.44: DyeCo Lead Times I

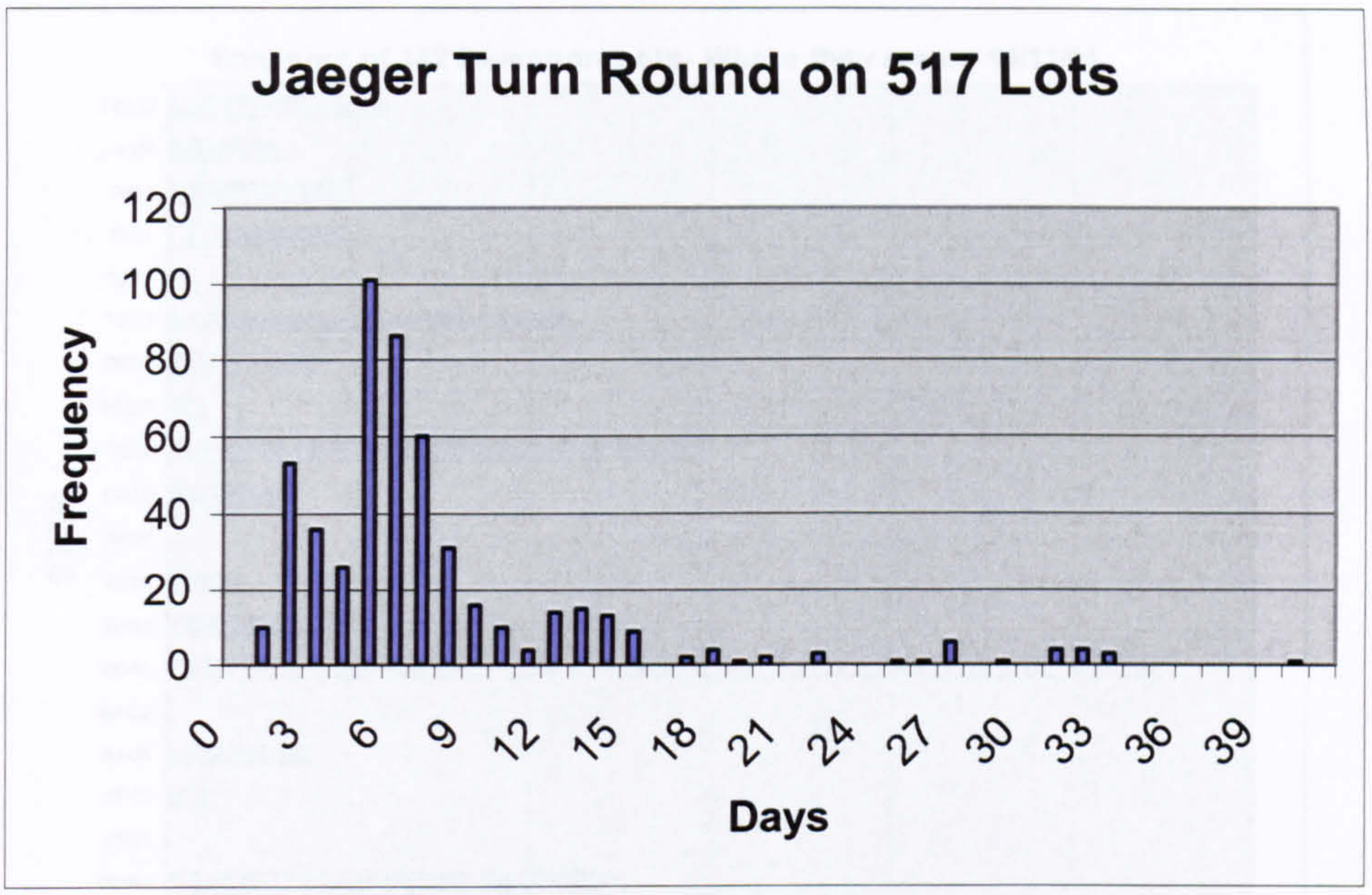



Figure 7.45: DyeCo Lead Times II

The organisation of a First In First Out system was not working since (as the process chart shows) there were various departments that could change priorities. In addition there was too much stock waiting in the system. The peaks areas are shown below in the chart in Figure 7.46 below:

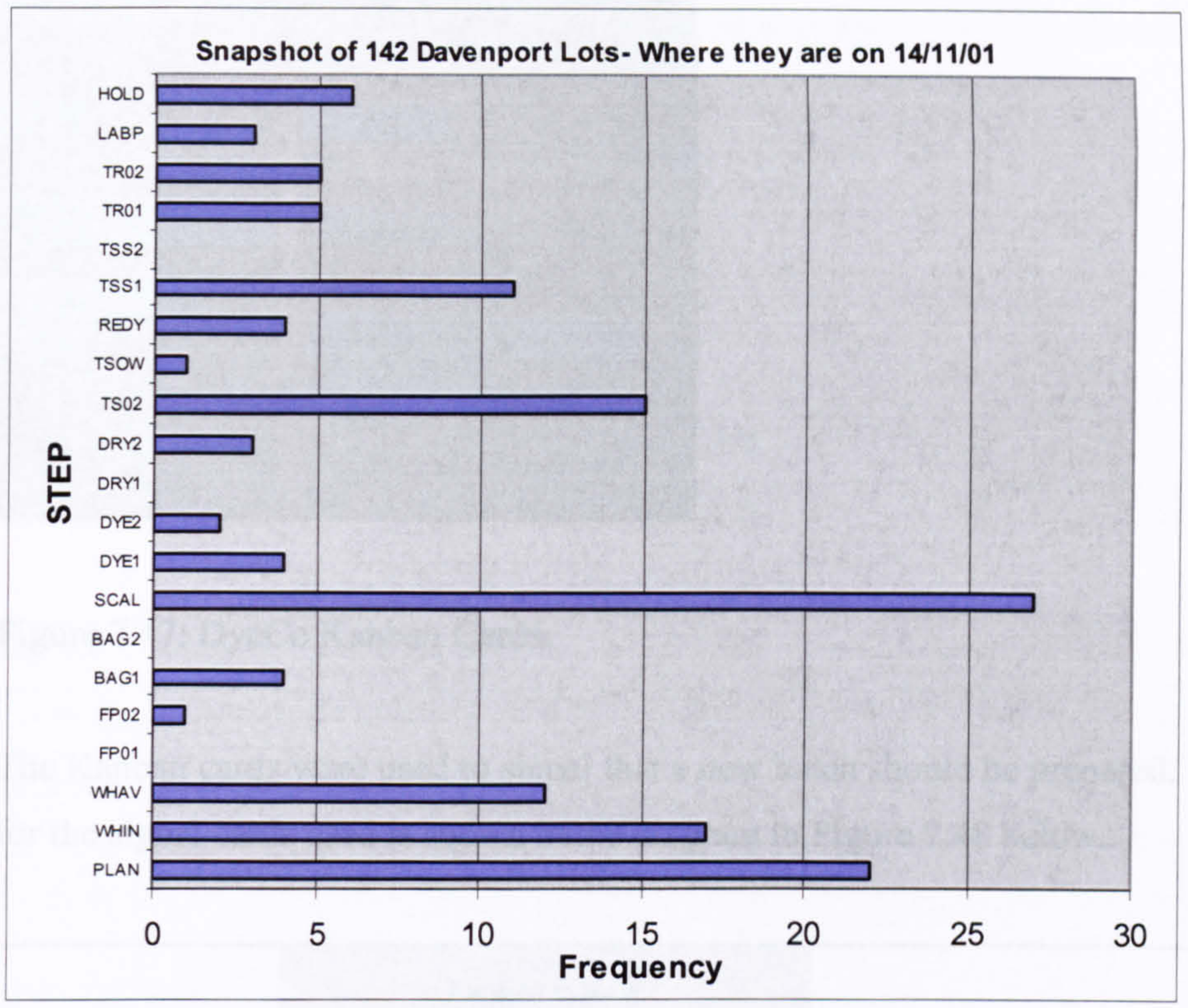



Figure 7.46: DyeCo Inventory Bottlenecks

The SCAL area is the warehouse holding area in front of the Dyeing process.

## 7.3.15 Kanban Project

The Case Study Intervention instigated a new system of Just In Time Kanban manufacturing on a trial basis for some Marks and Spencer Menswear Rugby Shirts that were knitted in Turkey. The whole project Kanban background, method and results were communicated to DyeCo in a final Case Study report. The Kanban system involved the Dye House calling on the preparation area only when it needed more stock to keep the dye machines busy. This was a change from the earlier system where the Preparation area sent batches when it had prepared them. A card is used to call stock from the previous process. i.e. Preparation. The photo in Figure 7.47 below shows how the Kanban Cards were used to identify lots in the Dye House.

Figure 7.47: DyeCo Kanban Cards.

The Kanban cards were used to signal that a new batch should be prepared. The scheme for the signal cards used is shown in the diagram in Figure 7.48 below.

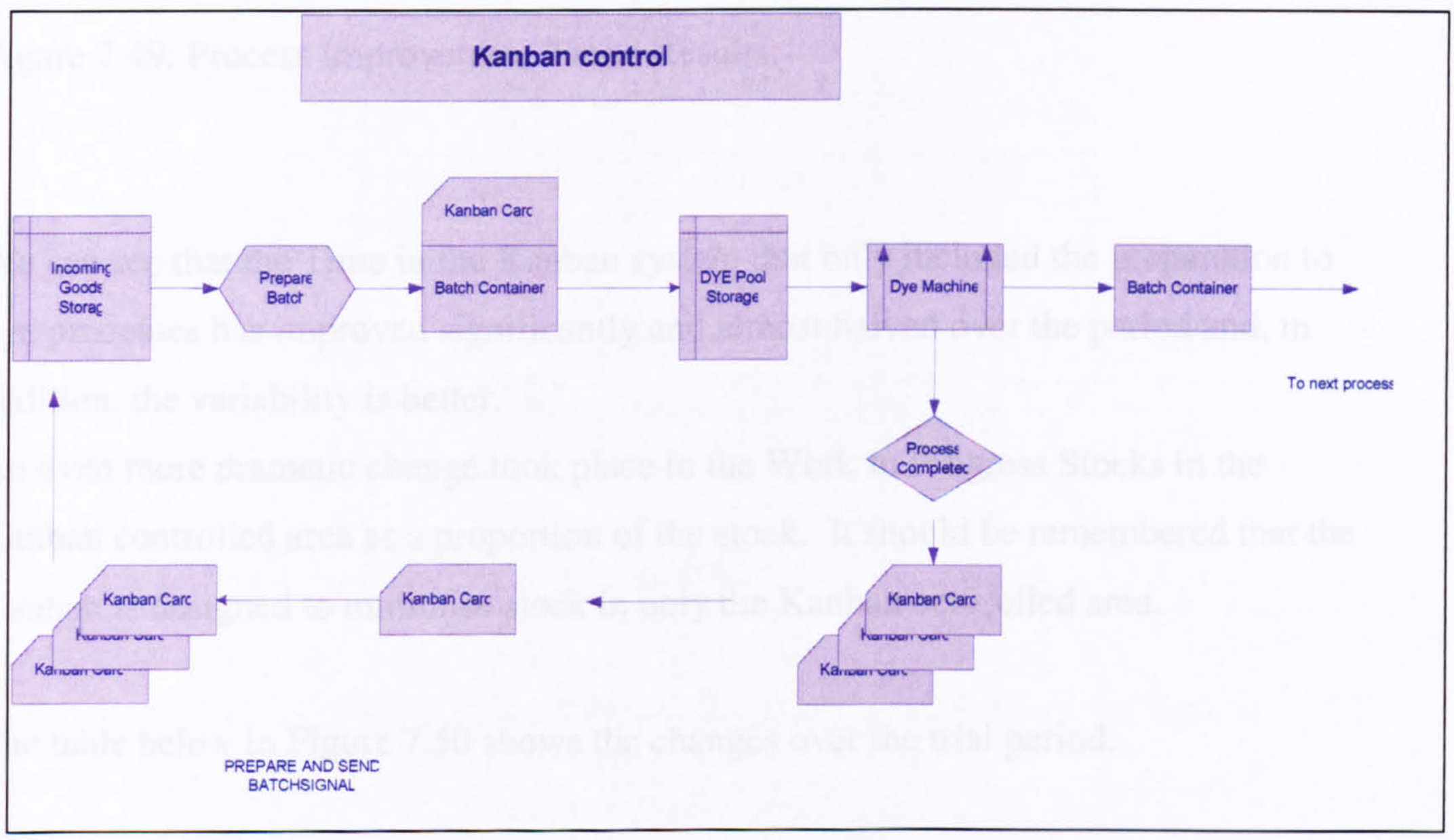



Figure 7.48: DyeCo Kanban Control Schematic

**Process Improvement Results**

The Kanban Trial had a significant effect on the time in the process and the Work In Progress stock levels on the retailer's orders. The table below in Figure 7.49 shows the improvement in lead time as the system was examined each month. The pre Kanban

period was April 2002. The Kanban started in May and was refined and improved in June and July 2002.

| No of sub batches in sample→ | 41 | 41 | 31 | 52 |
|---|---|---|---|---|
| **Month →** | **April** | **May** | **June** | **July** |
| Time arrival to complete dye | 9.95 | 5.29 | 5.71 | 5.02 |
| Standard Deviation | 6.27 | 6.60 | 3.1 | 2.05 |
| Minimum Turn Round Days | 2 | 0 | 1 | 1 |
| Maximum Turn Round Days | 26 | 40 | 13 | 8 |

Figure 7.49: Process Improvement Trend Results.

We can see that the Time in the Kanban system that only included the preparation to dye processes has improved significantly and almost halved over the period and, in addition, the variability is better.

An even more dramatic change took place in the Work In Progress Stocks in the Kanban controlled area as a proportion of the stock. It should be remembered that the Kanban is designed to minimise stock in only the Kanban controlled area.

The table below in Figure 7.50 shows the changes over the trial period.

| Date→ | 18th April | 22nd May | 13th June | 27th June | 4th July | 9th July | 13th August |
|---|---|---|---|---|---|---|---|
| | Number of sub batches at position | | | | | | |
| Position in process | | | | | | | |
| PLANNED | 20 | 23 | 1 | 10 | 4 | 0 | 30 |
| W/H WAITING FOR PREP | 0 | 80 | 59 | 1 | 28 | 12 | 0 |
| **W/H PREP COMPLETE** | **12** | **20** | **0** | **0** | **0** | **0** | **1** |
| **DYEHOUSE/ POOL STOCK** | **39** | **12** | **12** | **0** | **4** | **3** | **8** |
| **WORK IN DYE** | **4** | **8** | **0** | **0** | **4** | **4** | **1** |
| WORK DRYED | 2 | 8 | 0 | 0 | 1 | 0 | 0 |
| OUT OF DRY | 8 | 1 | 5 | 0 | 0 | 0 | 2 |
| TSO PASSED | 4 | 46 | 61 | 85 | 86 | 68 | 123 |
| ON HOLD | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| TOTAL | 89 | 116 | 139 | 96 | 127 | 87 | 165 |
| **WIP BETWEEN KANBAN STAGES** | **55** | **22** | **12** | **0** | **8** | **7** | **10** |
| **% OF TOTAL WIP** | **61%** | **19%** | **9%** | **0%** | **6%** | **6%** | **6%** |

Figure 7.50: DyeCo Kanban Inventory Reduction.

The amount of stock in the Kanban controlled area fell from 61% of the work in progress to only 6%.

**Future**

It is worth noting that the Kanban was designed only to prove that a Just In Time system could work on a small scale. The Case Study intervention process used to implement the Kanban was written up in to a report that was submitted to DyeCo and this would allow the firm to expand the Kanban system in future.

## 7.4 FibreCo Case Study Findings

**"The results of this project have exceeded our expectations, but the real value has been that we have also learned how to do it. Identifying the delighters in our product leads to a much better understanding of its value"**

**Fabric Development Manager, FibreCo, 2002**

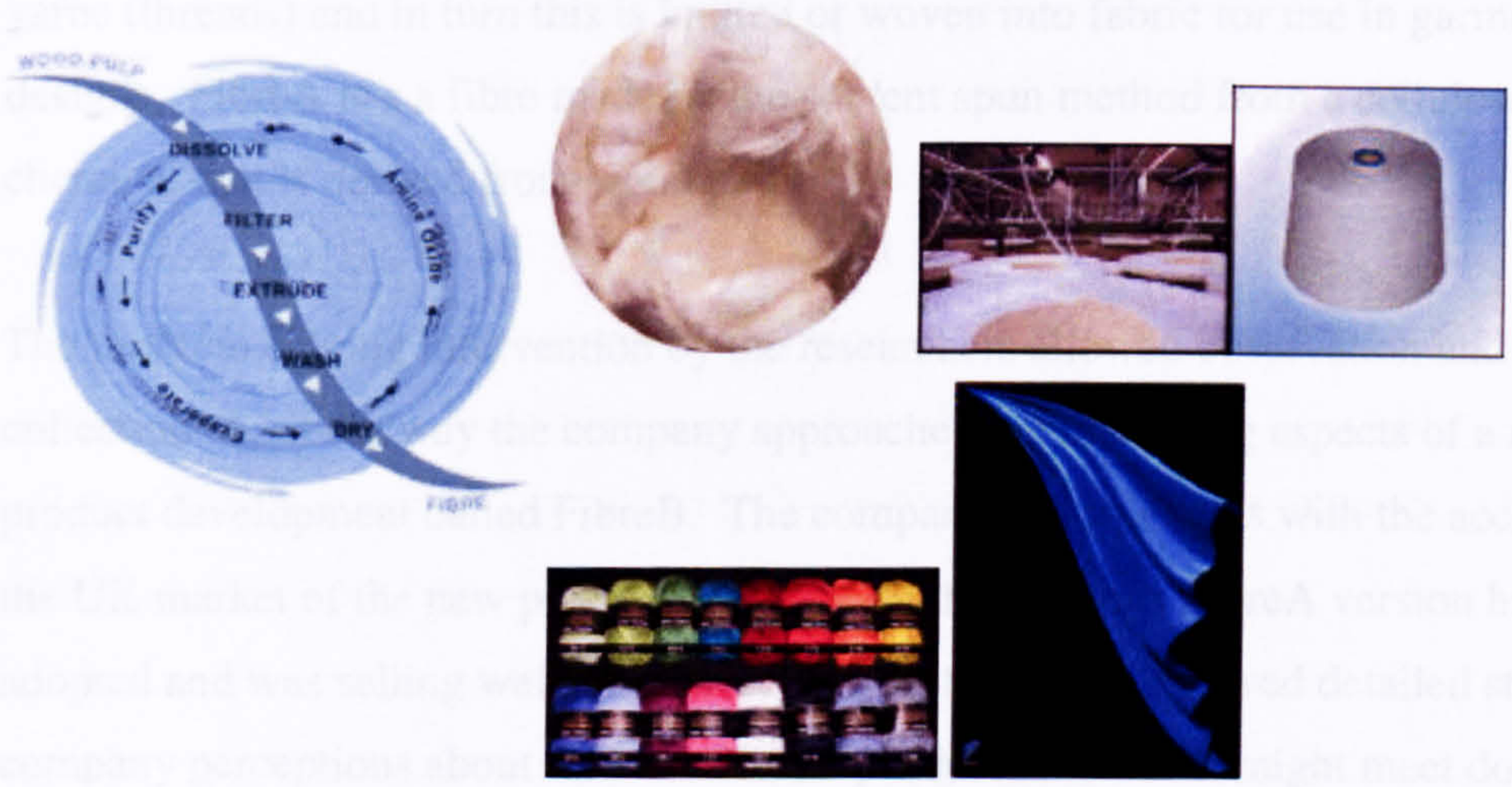



Figure 7.51: FibreCo supply chain products. Source: Google, 2004.

FibreCo products have a long journey in various supply chains before they reach the consumer (Figure 7.51). Starting with wood pulp and the chemical production extrusion process a series of transformations take place first into staple fibre, then into yarn, fabrics and garments before the retailer sells the clothes in stores. Understanding exactly what the consumer attributes to the fibre when purchasing a garment helps the fibre producer to focus marketing efforts to meeting consumer needs.

The discussion below concerns the base data collection methods and findings for the Industry Forum project intervention at FibreCo:

- The organizational situation encountered during the research
- The real world problem the organization wanted solving
- The problem solving intervention
- An account of the data gathering for the problem intervention

The I.F. project took place at a firm positioned at the start of the Textile and Clothing Supply Chain, at FibreCo who manufacture and market staple and continuous filament fibres. FibreCo Head Office was situated in the Midlands. FibreCo is part of larger fibre group who are the world's largest dedicated producer of man-made fibres. The group was recently sold to an investment trust for $877 million. FibreCo are at the start of the textile and clothing supply chain. Spinners process FibreCo staple fibre into yarns (threads) and in turn this is knitted or woven into fabric for use in garment designs. FibreA is s a fibre made by the solvent spun method from a cellulose base chemical that is derived from wood pulp.

The problem solving intervention by the researchers allowed observation and data collection about the way the company approached the marketing aspects of a new product development called FibreB. The company had problems with the acceptance in the UK market of the new product even though the previous FibreA version had been adopted and was selling well worldwide. The intervention allowed detailed study of the company perceptions about the new FibreB product and how it might meet downstream supply chain customer needs including those of consumers. The intervention also included market research and examined consumer attitudes to garment properties that can be met by fibre attributes. The general new product development process at FibreCo has been described by an earlier researcher and this unpublished information; together with the data collected during the current intervention allowed a description of the start of the UK Textile and Clothing Supply Chain to be developed and comparisons can then be made with the NPD research literature findings. The FibreCo Head Office is based in the Midlands and there are manufacturing plants in the North East and in Texas. The company was originally a spin off from a UK company fibre division. The Company's work on new fibres led to the development of a totally new fibre code named Genesis. This fibre had unique properties that did not exist in any other products anywhere in the world. After pilot plant development the fibre was renamed FibreA and new fibre plants were built to manufacture the new fibre in bulk in the USA and in the UK. Worldwide success for FibreA followed and it marketed through the world

through regional sales offices. In total world fibre consumption terms the share of FibreA in the market is currently very small at less than 1%. There is therefore in theory a great deal of scope for market penetration of new product from FibreCo.

FibreCo have recently developed a new version of FibreA, referred to here as FibreB. The new fibre is quite different to the standard FibreA product in many respects and customers in the Textile and Clothing Supply Chain have yet to adopt the new fibre in commercial quantities.
World Fibre production in 2000 was 57.7 million tonnes (International Fibre Journal, 2001). The world is steadily using more fibre. Comparing the year 2000 with 1995 the world consumption of fibre rose from 8.5kg per head to 9.5 kg per head. There are more people in the world as populations grow. There are now 6.08 billion people in the world, up from 5.69 billion in 1995. Natural fibres have been static in production terms at 22 million tonnes p.a. since 1980. Around this time man made fibres production overtook natural fibres and have now reached 35 million tonnes p.a.
This growth in textile fibre consumption is possible due to increases in the production of man made fibres to supplement the natural cotton, wool, silk, flax, hemp, jute, sisal and coir fibres. The main generic man made fibres are polyester (with half the market), acrylic, polypropylene, and cellulosic.

### 7.4.1 The FibreCo Problem Situation

FibreCo management were concerned about the poor level of adoption of the new product FibreA. The company confessed to not understanding the reasons for the poor adoption. The Industry Forum research team, were asked to assist in improving the level of understanding with a view to using the information to improve the adoption of FibreB by a UK retailer. A number of meetings were held with FibreCo staff and the Industry Forum research staff to explore the general problem and define it. Following these exploratory meetings a formal proposal (IF, 2001a) was submitted to the FibreCo project leader Tom. The proposal set out a plan of activities that would be carried out. At this stage the emphasis was on a workshop based programme within FibreCo to establish perceptions of the issues. In addition a proposed questionnaire would be developed to ascertain the needs of consumers.

## Planning the problem solving activity

The proposal sent to FibreCo set out the following plan of activities with timings in 2001:

**June/July Fact Finding**

- Industry Forum team to carry out preliminary work on gathering information about FibreA and use this to compile a company workshop set of activities and consumer questionnaires.

**July/August Understanding customer requirements workshops**

- Two workshops centred upon building a collective understanding of the key attributes of FibreB.

**July Develop Customer Focussed Questionnaire**

- The research team would design and develop a questionnaire to hear the 'voice of the customer'.

**August Administer Customer Survey**

- The research team to administer the questionnaires.

**September Review Meeting**

- Research team to analyse the results of the questionnaire and present findings to the FibreCo project team.

The intervention activity and findings are discussed in a later section below.

## 7.4.2 The Base Data Gathering Process

Gathering data regarding the current NPD practices and performance in the company involved the following methods

- Site Visits to FibreCo
- Site visit to KnitwearCo
- Interviews
- Site Workshop discussions
- Site Workshop activities results
- Internet searching
- Artefact examination of fabrics and garments
- Market Research Questionnaire administration and analysis

- Archive record examination of unpublished research

## Data Collection Methods in Practice

This section discusses how various data collection aspects were addressed including site access, informants and respondents, detailed data collection types and methods and summaries of the data collected.

### Site Visits

As discussed above the researchers presented a formal proposal document to FibreCo management that was then accepted. This proposal for working on the FibreCo problem solving project allowed access to the sites and staff involved, including FibreCo Sales Office in London and FibreCo Head Office.

### Informants and Respondents

The proposal for improvement of the marketing of FibreB involved interviews with the following staff at the sites mentioned below:

#### *Sales Office London*

Technical Director

#### *Head Office*

Technical Director

Technical Services Manager

Retail Account Manger)

Dyeing and Finishing Development Manager

Knits Development Manager

### Data Collection Types and Methods

### Internet search

An internet search was used to gather information about the existing perceptions of downstream supply chain customers of the existing and new FibreCo products.

### Workshops

The main data collection method with the respondents was through the use of participatory workshops with the FibreCo project team. The project described in the proposal took place over a period of several months in 2001. After initial meetings and interviews with FibreCo staff there followed a reconnaissance by the researcher using a desk based Internet search. Further discussions took place with the senior management to agree the timing of a number of project team workshops.

The workshops involved:

- Formal presentations of the research data investigation results
- Project team activities that captured the project team perceptions
    - Downstream customer needs
    - FibreB product attributes
- Broad Mapping of FibreB attributes
    - Customer satisfaction
    - Product performance
- Questionnaire on product attributes and satisfaction
- Guided discussion about
    - the project activities
    - Current marketing and development activities
    - Development fabrics and garments
    - Development partners such as KnitwearCo
- Presentation by FibreCo development staff about development activities
- Feedback of consumer market research results to FibreCo

The workshop data was captured using various methods of a semi-structured nature. The workshops started with a presentation by the researchers about market focus aspects of NPD. The project team were then involved in activities that tested their perceptions

about the FibreB product. The perceptions were gathered on activity forms, on flip charts and in notes taken by the researchers. The results of group discussions were also recorded on flip charts. Each workshop was summarised in a written visit report that was circulated to the project team. Questionnaire results from project team workshop respondents were recorded on forms and the group results recorded on flip charts.

### 7.4.3 FibreCo Site Visit Notes Example

The example below shows an example of the feedback notes circulated to the FibreCo project manager. The example covers one of the workshop sessions.

Industry Forum

Improving the textile & clothing supply chain from concept to customer

| | |
|---|---|
| Meeting with | Fabric Development manager<br>Knits Development manager<br>Retail Account manager<br>Dyeing and Finishing Development manager |
| IF Team Members | Research Fellow, Cranfield University<br>Research Fellow, Salford University<br>Research Assistant, Cranfield |
| Location: | FibreCo Head Office |
| Focus of Workshop | Project Start-up |

**Agenda Items:**

- Introduction by Fabric Development manager
- Group Activity led by Research Fellow 'What are Stakeholders looking for'
- Presentation 'Tools & Techniques for Product Development & Market development'
- Individual Activity 'Using the KANO model to understand Customer requirements'
- Feedback to rest of group
- Presentation 'Separating NPD winners from losers'

**Objectives:**
To improve the adoption rate of FibreB through encouraging current Knitwear fabric/garment developments into volume commercial applications in the UK.

**Introduction:**
Tom envisaged that the workshop activity would result in a collective understanding of what FibreCo products, specifically FibreB into knits, have to offer and correlate this understanding to the customer's perceptions of FibreB. Taking forward a project that would enable the team to focus on getting the FibreB into knits and to influence the market in the UK. FibreCo have approached a number of companies already regarding the adoption of FibreB into knitwear, but they believe that the message is not being understood. Tools & techniques supplied by the I.F. are to be adopted in order for the team to gain a different perspective, which in turn can be used to approach other partners in the IF, e.g. KnitwearCo.

FibreCo see the outcome of this workshop as a guide into helping them make the decision of whom they are going to approach to work with, build upon a more thorough understanding of what the customer wants, resulting in visibility for the product at the right time.

**Activity _01** ***'What are the Stakeholders looking for'***

Using the form provided each member of the team was asked to list the specific needs of each of the downstream customers that could be satisfied by the product they buy. They were asked to fill in the needs in relation to a generic product e.g. Yarn, knitted fabric or golf shirt. Each team member was asked to feedback to the group in order to identify the key needs for each category.

Listed below (Figure 7.52) are the key needs identified by the team for a retailer.

| Needs | *Retailer* |
|---|---|
| **Purpose** | Generate profit<br>Garment that will sell at right price<br>Product fits with the overall image of the retailer<br>stock in store<br>appealing to their customer base<br>Trouble free supply chain<br>To be seen to innovate- keep one step ahead of the competition |
| **Physical** | No returns - minimum returns<br>No display problems- arrive ready to display<br>Looks good in store<br>Meets performance specs<br>Fit for purpose- what they thought they wanted<br>Absorbency- moisture handling |
| **Cognitive** | Understand specific requirements of garment<br>Understand features & how to sell it - communication issue<br>Value for money<br>understand properties of raw material- part of selling point<br>Trying to meet consumer need |
| **Aesthetics** | Appeal to customers<br>Distinction on shop floor<br>meets the anticipated need/ purchase criteria<br>Colour<br>Brand<br>Consistency in colour & handle so consumer doesn't see wide variation |
| **Emotional** | Feel that the garment fits their house style & image<br>Feel good factor' solid sales generating customer loyalty<br>Trust in suppliers |

Figure 7.52: FibreCo Customer Needs.

Following the first activity Annette gave an overview of some of the tools and techniques used for product & market development and introduced the KANO model. This presentation forms the basis of the two following activities.

## Activity_02 *'What advantage does our new FibreB have?'*

Using the form provided each member of the team were asked to individually to decide where FibreB scores better or worse for product attributes against the other fibres where appropriate (Using a score of 9 for the best, 3 for the middle range & 1 for worst). The team was also asked to add any new features/attributes if they knew of any & score accordingly.

Feedback of the key advantages of FibreB was presented to the group.

The team felt that FibreB scored highly for the following attributes, giving it an advantage over the other fibres evaluated.

Depth of colour
Fluidity & movement
Easy colouring
High wet & dry break strength
Moisture absorbency
Superior dye uptake & retention
Laundering- better on colour fastness & pilling
Luxury handle
Natural in origin
`Completely bio-degradable
Value for money
Doesn't shrink

## Activity_03 'Fitting FibreB's Features to a Kano Model'

Thinking specifically of FibreB into Knits the team was asked to map the above attributes onto a KANO model (Figure 7.53) to identify which product features fit into the three distinct categories of *must-be attributes, linear attributes & delighter attributes.*

| ***Must-be attributes*** | ***Linear attributes*** | ***Delighted attributes*** |
|---|---|---|
| Doesn't shrink<br>Moisture absorbency<br>Excellent laundering | natural in origin<br>easy to dye<br><br>value for money | Depth of colour<br>superior uptake & retention<br>completely bio-degradable<br>Luxury handle |

Figure 7.53: FibreCo Kano Mapping.

Interestingly the four 'delighter' functions are the features of FibreA that have been used previously to promote the FibreB.

## Next Steps

Very positive feedback on workshop content and structure, providing to date a better analysis of the attributes of FibreB. Some concerns raised that the story of the package is recognised, - but how do they really get the message across to their customers & to what extent do they believe their customers will arrive at the same conclusions. The IF proposes to draft a KANO questionnaire based on some of the key attributes highlighted above. FibreCo are to determine which of the partners of the IF they would like us to approach by the next meeting, scheduled for 18/12/01. Caroline to present current product promotional tools at this meeting.

Other Activities for Exploration

- IF team to put forward a proposal to run focus groups aimed at understanding the voice of the consumer.

- IF to review the potential use of REPORATORY GRID analysis in order to clarify product differentiation
- Determine correlation between attributes and adoption in Business to Business environment.

Appendices to visit report

1. Activity 1 Form
2. Activity 2 Form
3. Activity 3 Form
4. Kano Chart (Figure 7.57.)

Activity1

Activity: Buyers Needs

# Synthesised Stakeholder Needs

Individually spend the next 15 minutes filling in the forms (Figures 7.57, 7.58 & 7.59) below. Write in each box what you think are the possible needs of each of the Stakeholders in the product they buy.

Fill in the needs for different stakeholders in relation to products from the following stakeholders:

- ❑ Fabrics Inc who dye and finish Knitted Fabric in their own dye facility. Product they buy is Yarn that they have knitted on commission.
- ❑ GolfCo who make and sell cut and sew golf shirts. Product they buy is dyed Knitted Fabric.
- ❑ M'n'S who are a retail seller of Golf Shirts. Product they buy is Knitted Shirt.
- ❑ You. A consumer who plays golf and wants to buy a golf shirt. Product you buy is a golf shirt.

Fill in the boxes of needs in relation to a generic product e.g. Yarn, Knitted Fabric or Golf Shirt made from any fibre or mix.

| ***User-→*** | **Fabrics In**<br><br>**Knitting and Dyeing** | **GolfCo**<br><br>**Sewing, logo print and Embroidery** | **M'n'S**<br><br>**Retailer** | **You**<br><br>**Golfer** |
|---|---|---|---|---|
| ***Needs*** | | | | |
| **Purpose** | e.g. Raw material for fabric production | | | e.g. Keeps body and arms warm and dry |
| **Physical** | e.g. Strong enough to knit with low end breaks and few holes to mend | | | e.g. Does not shrink |
| **Cognitive** | | | | e.g. Understand care label instructions on how to wash correctly |
| **Aesthetics** | e.g. Soft garment required | | | e.g. Design or colour is appealing |
| **Emotional** | e.g. Feel comfortable in knowledge about how to process the yarn and fabric easily | | | e.g. Feel stylish in company of other players on the course or in the clubhouse |

Figure 7.54: FibreCo Stakeholder Needs.

Activity 2: Please rate FibreB against the other Fibres in terms of attributes.

| **Product Attributes** | **Fibre B** | **Cotton** | **Modal** | **Wool** |
|---|---|---|---|---|
| 100% natural cellulose | | | | |
| Moisture absorbing | | | | |
| High dry and wet breaking strength | | | | |
| Low shrinkage during finishing and washing | | | | |
| Completely biodegradable | | | | |
| Circular cross sections and a smooth fibre surface | | | | |
| Easy colouring using traditional cellulosic dyestuffs | | | | |
| Natural in origin | | | | |
| Depth of colour | | | | |
| Softness and drape | | | | |
| Pronounced stitch definition in knits | | | | |
| Luxurious handle | | | | |
| Fluidity and movement | | | | |
| Breathability and comfort | | | | |
| Discrete lustre | | | | |
| Durable | | | | |
| Garments machine washable | | | | |
| Suppleness | | | | |
| Excellent laundering performance | | | | |
| High burst strength in knits | | | | |
| Superior dye uptake and retention | | | | |
| High tear strength in wovens | | | | |
| Retention of 3D character in wash and wear | | | | |
| Full soft handle | | | | |
| Deep clear colour | | | | |
| Excellent print definition | | | | |
| Durable garment pressing | | | | |
| Fibrillation free fabric surface | | | | |
| Fabrics for garment processing | | | | |
| Piece dyed fabrics | | | | |
| Yam dyed fabrics | | | | |
| Price | | | | |
| Availability | | | | |
| Reliability | | | | |
| Conformance | | | | |
| Serviceability | | | | |
| Durability | | | | |
| Aesthetics | | | | |
| Performance | | | | |
| ***Other Features*** | | | | |
| | | | | |

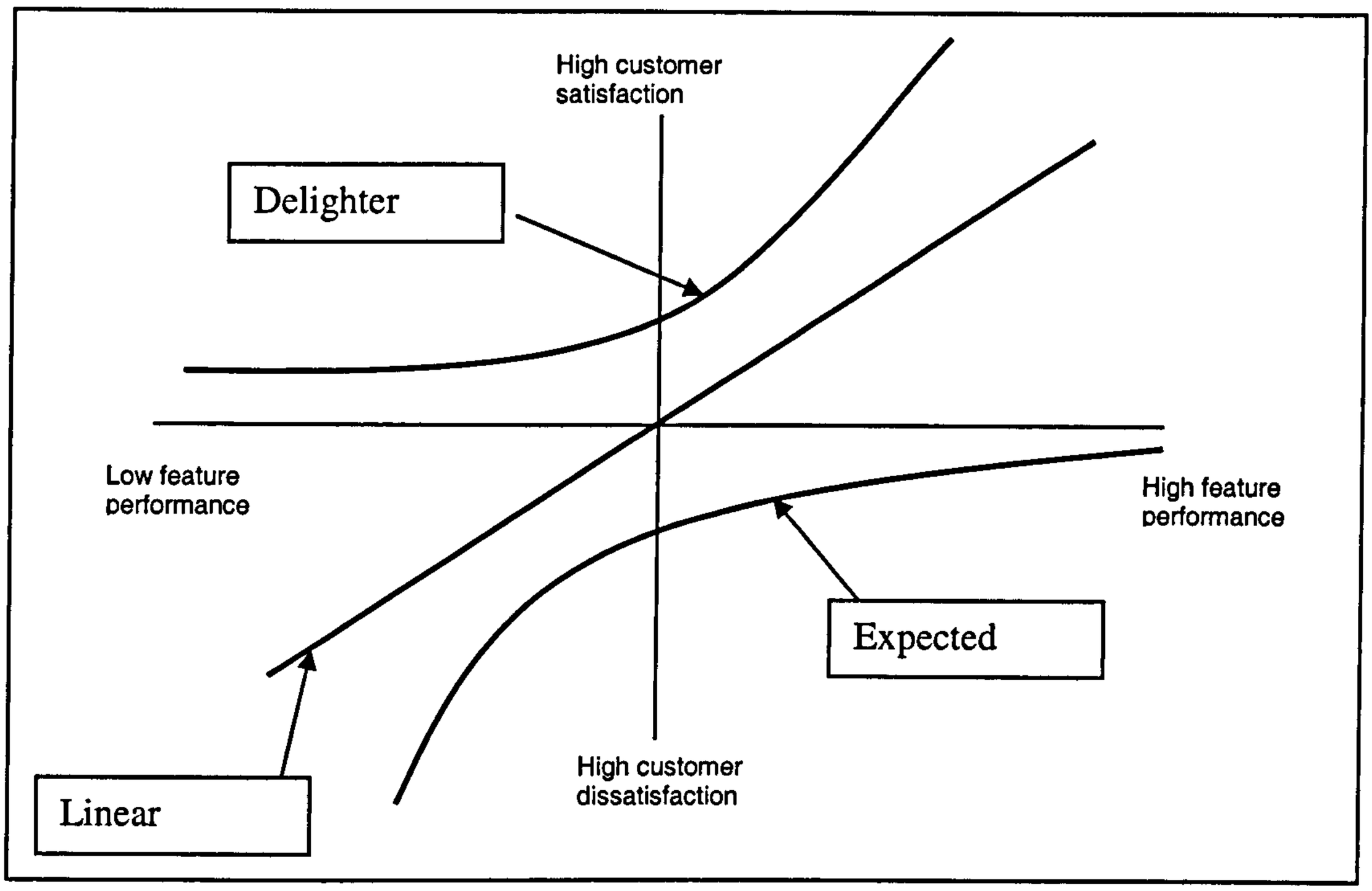
Figure 7.55: FibreCo Competitor Comparison.

Activity 3: Please place the FibreB attributes against the three Kano Model Choices with particular reference to the knits market.

| **Fibre B** | **Must Be** | **Linear Quality** | **Delighter** |
|---|---|---|---|
| 100% natural cellulose | | | |
| Moisture absorbing | | | |
| High dry and wet breaking strength | | | |
| Low shrinkage during finishing and washing | | | |
| Completely biodegradable | | | |
| Circular cross sections and a smooth fibre surface | | | |
| Easy colouring using traditional cellulosic dyestuffs | | | |
| Natural in origin | | | |
| Depth of colour | | | |
| Softness and drape | | | |
| Pronounced stitch definition in knits | | | |
| Luxurious handle | | | |
| Fluidity and movement | | | |
| Breathability and comfort | | | |
| Discrete lustre | | | |
| Durable | | | |
| Garments machine washable | | | |
| Suppleness | | | |
| Excellent laundering performance | | | |
| High burst strength in knits | | | |
| Superior dye uptake and retention | | | |
| High tear strength in wovens | | | |
| Retention of 3D character in wash and wear | | | |
| Full soft handle | | | |
| Deep clear colour | | | |
| Excellent print definition | | | |
| Durable garment pressing | | | |
| Fibrillation free fabric surface | | | |
| Fabrics for garment processing | | | |
| Piece dyed fabrics | | | |
| Yam dyed fabrics | | | |
| Price | | | |
| Availability | | | |
| Reliability | | | |
| Conformance | | | |
| Serviceability | | | |
| Durability | | | |
| Aesthetics | | | |
| Performance | | | |

Figure 7.56: FibreCo Product Attribute Mapping

Figure 7.57: Kano Chart




## Market Research

The study also involved a market research pilot study capturing the opinions about clothing attributes of a small convenience sample of consumers. Questionnaires forms were distributed to 30 administrative and research staff at two universities. Responses were available and collected from half those staff and the data entered into an Excel spreadsheet for analysis and then mapped on to the Kano Model (Figure 7.57). Notes were taken of all meetings and these were summarised and issued to FibreCo.

## Supply Chain Manufacturers

An interview took place at a target knitwear manufacturer (KnitwearCo) to investigate existing opinions about the brand and to organise a trial of the new product Development alongside competing products. An interview took place at a target knitwear dyer (DyeCo) to investigate the possibility of developing the FibreB product as a garment dyed product.

## Management Review

A FibreCo management project review took place and the findings of the project intervention including consumer market research were presented by the researchers.

## Documentation

Documents collected included:

Exploratory discussion meetings minutes circulated by the researcher to the management

Project proposal

Website HTML files for supply chain product users

Workshop activity forms and flipcharts

- Supply Chain Stakeholder needs
- Product competitive advantages and attributes
- Mapping product attributes to customer satisfaction
- Mapping Customer needs to products attributes

Emails from FibreCo

Emails to FibreCo

Workshop notes

Questionnaire responses from FibreCo project team

Questionnaire responses from consumer pilot study

FibreCo presentation at Industry Forum Annual Conference

## Archive Material

Unpublished Salford University research document on FibreCo development

NPD chart

NPD activity timetable

### Observations

Observations took place at the workshops about project team discussions and activities. Observations also took place at the FibreCo Workshops of the FibreCo Product Development Presentation. The recording method used was through researcher's notes.

### Artefact Examination

Garments constructed using FibreA and FibreB

Fabrics constructed using FibreA and FibreB

FibreCo promotional material booklets

### Management Reports and Presentations

In addition to the site visit reports a Workshop was held with the project team and a FibreCo senior manager where the results of the intervention process and consumer research were presented. The FibreCo Project Team champion gave a presentation at the Industry Forum Annual Conference.

## 7.4.4 Relevance of the Data Collection to the research questions

The FibreCo Case Study intervention offered good levels of data collection about the opinions of the management of the company about the market focus aspects of the New Product Development process. In addition the web sites of downstream users were analysed and finally consumer market research was carried out to determine the general product attributes that consumers valued. An overall view of the methods used for NPD has been produced with an emphasis on the way that developers can fit the needs of a supply chain and consumers.

## 7.4.5 Intervention Project Findings

This Case Study has largely concerned examining the different 'voices' in the supply chain concerned with the production and use of FibreB. FibreCo had developed a marketing approach over many years for the original FibreA product. However this approach was not working for the new product FibreB. Downstream, along the supply chain, there were other views about FibreCo products. The Project team was encouraged to explore these varying perceptions in two workshops. Consumer views were also investigated for comparison purposes and to ensure that the project focus was on the market and the consumer. The NPD process at FibreCo has been mapped in previous unpublished research and this is used to help understanding of the issues surrounding a technology push system that FibreCo use. The results of the Case Study data collection follows and covers the following main topic areas:

- Marketing at FibreCo
- Supply Chain Stakeholder Perceptions regarding FibreCo products
- Project Team Perceptions of supply chain needs and FibreB attributes
- Consumer Perceptions regarding garment attributes performance and feelings of satisfaction
- The FibreCo NPD Process

These areas are discussed in turn below.

## Marketing at FibreCo

At the first meeting in the parent group London Office, representatives of the Industry Forum Project management met with the FibreCo Technical Director, who outlined a 'wish list' of potential New Product Development areas. He explained that the world market for FibreA was currently suffering a downturn following a swing to a more formal fashion look. FibreA was a fibre more suited to casual fashion trends. Sales of FibreA fibre were 40% below those of last year. He went on to announce that FibreCo marketing staffs were being re-organised and the global strategy was to have small

regional teams. He was shortly moving to Hong Kong to look after the Asia Pacific region and he would be replaced. The central technical service team would remain based at Coventry led his successor with a new Brand Director. Before he went to the Far East he would brief his team at the FibreCo Head Office including the Fabric Development Manager who was responsible for knitwear development and the manager who looked after jersey developments and was based at the London office. He thought FibreA was "an ingredient brand not a consumer brand". About 30% of FibreA went into garments with the FibreCo Brand name swing tags. On another 25% of garments FibreA shared the garment label with the retailer as for example with Marks & Spencer and Next.

The discussion identified a number of possible issues:

1. Retail Pull

FibreCo needed to get closer to clothing brands and high street retailers. There were already 30 projects globally trying to get FibreA products in stores, but the process tended to work with individual yarn spinners at the start of the supply chain on particular FibreA yarn blends. FibreCo felt that the focus should be more garment specific, (e.g. ladies trousers), and driven more by the other end of the supply chain with retailers like Next and Marks & Spencer in the UK who were part of the Industry Forum.

"We need to get ourselves in a better position to have an influence on the supply chain. We need to get further up the supply chain," Technical Director, FibreCo

2. New Fabric Product Push

FibreCo also needed to work further along the supply chain (past the spinners) with fabric producers. One example was Chilton (a knitted jersey fabric producer in Scotland supplying Marks & Spencer garment makers) who was an Industry Forum member. A knitted jersey mix of FibreA and Lycra had already been very successful in the USA in ladies casual top garments sold by the Banana Republic (part of Gap) retail group. The new fabric product was a heavyweight stretch jersey rib that had been

produced with a competitive price point. It would be useful to be able to develop a similar fabric with Chilton for the Marks & Spencer UK casual wear consumer.

3. New Fibre Development

FibreCo had a new fibre version called FibreA that offered new characteristics and benefits. The new fibre was unfortunately not getting into commercial programmes quickly enough and there was little feedback from the market about it.
FibreB had some unique product features:

- It was especially suited to knit fabrics.
- It did not fibrillate like standard FibreA.
- It could achieve very good depth of shade compared to other fibres.
- Dye uptake for a particular depth of shade was more efficient with less dyeing time needed, less dyestuff used and less water consumed in washing off.
- Colour was long lasting so that when garments were washed the colour did not fade. This was a good selling point for dark shade garments such as black.
- Colours were brighter.

However the FibreB product did have many similarities with a competitor fibre called Modal and there was a need to differentiate FibreB.

4. Customer Perceptions of FibreA Processing

FibreA had a reputation as a niche product that was difficult to get into the larger more commodity markets. It was seen as technically difficult to dye and finish by downstream customers. Given these areas of opportunity and concern outlined by FibreCo, a number of potential projects in the knitted fabric sector with Industry Forum partners were suggested:

- Knitwear

Earlier work with an Industry Forum partner DyeCo (A management buyout) had been started on blends of FibreA with Cashmere before the buyout. It might be possible to restart this for the retailer Next or Marks and Spencer who were both involved in the earlier trials.

- Jersey

There was potential to work with Pringle following some success with a similar fabric development for the retailer Banana Republic in the USA in men's golf shirts. Some work had been carried out by the FibreCo technical staff to produce sample fabrics that could be shown to potential customers. The meeting concluded with an agreement that FibreCo staff would meet internally to prioritise the potential projects and agree the necessary time and staff resources. The Industry Forum would contact Pringle, Chilton and Textured Jersey to determine their level of interest and carry out some preliminary investigations

A more detailed meeting was arranged shortly afterwards at the FibreCo Head Office. The potential projects were further discussed with the researcher.

- Jersey Knits in FibreA

It was thought that DyeCo would be a useful partner [An Industry Forum Case Study associate]. Next Retail were already interested in the development of a FibreA Lycra mix of 28 gauge Double Jersey fabric. There would need to be an intermediate garment maker identified.

There was also perhaps potential to work with DyeCo on seam free FibreA garments.

- Knitwear

The issue here was about targeting the right segment of the market since designer knitwear brands such as Lyle and Scott and Pringle see FibreB as both an opportunity and a problem. FibreB is an opportunity when blended with Cashmere in Branded Knitwear since it is cheaper than Cashmere and performs better. On the other hand the target consumer who buys Cashmere Knitwear probably does not care much about the price or the performance. FibreCo thought that there was an opportunity to work with Lyle and Scott on a possible co-ordinated range of FibreB Knitwear, FibreB Jersey Polo shirts and FibreA woven Chino trousers. Some contact had already been made with *Lyle and Scott.*

Globally FibreB had been successful in knitwear in China amongst high earning consumers who also appreciate the cheaper blends of FibreB with Cashmere and the softness, drape and vibrant colours of the garments.

- Banana Republic Jersey based FibreB Garment

An example of the garment was obtained that was constructed from 28 gauge Knitted single jersey fabric of 92% FibreB and 8% Lycra. Some product development had taken place with Long Eaton Fabrics but they were not a volume supplier who could meet the capacity needs of a retailer such as Marks & Spencer. It was interesting to know which fabric supply routes M&S and Next would prefer. Price was likely to be an issue. The Banana Republic brand offered premium prices and this was not likely through a mass-market retailer like M&S. The product had been running for a number of seasons with the Banana Republic. The main problem according to FibreCo is one of supply chain customer perceptions about FibreB being too expensive. Whilst the fibre was more expensive than Modal fibre it does have some cost benefits:

  - FibreB takes less dye to get the same shade. This is demonstrated on the small fabric samples that compare FibreB with Modal and Cotton dyed at the same time. FibreB is much deeper in shade.

- Wash Performance is better than other fibres in terms of less fading. This is shown with samples of FibreB fabric dyed black that have been washed 20 times with no loss of colour compared to before they are washed.

- FibreB can be dyed to exceptionally strong and vibrant colours. Examples were shown in black (above) and candy pink.

- FibreB is less prone to creasing than viscose fibre and needs less scouring after dye giving better levels of first quality product.

- FibreB is ecologically kind in terms of its fibre production route. FibreB is also made from natural materials (wood pulp).

Overall FibreCo management felt that there was a perception along the downstream supply chain that the fibre is technically difficult and requires a premium sales margin. The latter makes costing in for major consumer garment very difficult. FibreB had shown the cost advantages listed above in small-scale product development trials but needed an opportunity to prove these with larger scale trials.

FibreA is the first new fibre for 30 years and was by definition new and innovative. However FibreCo were finding it difficult to get FibreA past the development stage and in to volume in the UK in spite of volume success elsewhere. Potential partners were Marks and Spencer with garment makers such as Martin International and jersey fabric producers such as Chilton or Textured Jersey. It was agreed that the challenge for FibreCo is first to understand the perceptions and requirements of the stakeholders in the supply chain and then to work with supply chain members to develop fabrics and garments that satisfy those needs. The FibreCo team were keen to learn some new techniques that can help in this process of understanding customer needs. FibreCo also wanted to get some feedback via Industry Forum partners about their perceptions about the product. The next step however required that the researcher gathered information about the views of external stakeholder along the supply chain.

## Supply Chain Stakeholder Perceptions regarding FibreCo products

In order to structure the workshop meetings with the FibreCo project team some reconnaissance was necessary by the researcher to better understand some of the issues surrounding the product and brand FibreCo. In particular there was a need to gain an appreciation of those product features important to product users. Data was gathered through secondary research and started with an investigation of the FibreCo brand by examining the FibreCo web site to gain an understanding of the way that FibreCo viewed the company products.

To find out what downstream stakeholders views were, the Internet research was widened by using search words of FibreCo. FibreA, FibreB and FibreA Knitwear with Meta search engines called Vivisimo.com and Webferret.com. These Meta engines combine the usual yahoo, google, etc search engine results.

Results of Internet search

The FibreCo Brand name is known to some consumers through the brand Logo

FibreCo use the following descriptions of FibreA on their web site:

*Fluid, flowing drapes in soft gentle folds*

*Fabrics caress the contours with an ease of motion that says its luxury*

*There is colour. And then there is FibreA colour – different, denser and more dramatic*

*FibreA was engineered to accept colour more readily. The colour goes deep down into the fibre*

*FibreA can be engineered to wash down to create an assortment of hues and shades. From the palest tints, through medium tones, to vibrant, deep darks*
*The range of fabric types that can be created with FibreA is extraordinary: from crepes and twills to chambrays, poplins and more.*

*Blended with other fibres, FibreA enhances drape, comfort, absorption and strength*

*FibreA holds colour so it won't fade even after repeated washing. Next time you want a perfect black T- shirt, look for FibreA. It dyes to a really deep colour and stays that way*

*If it is mixed with cotton, it feels like cotton but you can also feel a relaxed softness. When you've worn it for a while you'll understand what we are talking about*

*With FibreA you have a garment that is as comfortable as if you'd had it for years but still looks new*

**FibreB** has its own marketed attributes. Below are some of the straplines used by FibreCo:

Smooth lustrous FibreB, the other type, will not make a peachskin fabric. It is very silky and lustrous. This shows off the richness of the colour, which will not fade. Both types are very soft and strong

*Clear, vibrant colours without fading are possible*

*Brilliant dyed colours in cost-saving fabrics are available*

*Clean finishes without any stiffness or inferior comfort are attainable*

*FibreB extends the FibreCo portfolio to offer even more possibilities in knitted, jersey and woven applications*

*Sweater knits benefit too, not only from the extra benefits and simple production techniques required for the yarn, but also from the minimal susceptibility to pilling*

The Internet search continued and some of the opinions of downstream customers about FibreA can be found on the web sites listed below. There were 500 hits using Vivisimo.com

| Name of stakeholder | Position in supply chain | Website address | Access date |
|---|---|---|---|
| Ge-Ray Fabrics | Knitter | www.geray.com | 6/07/01 |
| Tianello | Knitter | www.tianello.com | 6/07/01 |
| Jeffrey Scott | Shirt Retailer | www.jeffreyscott.com | 6/07/01 |
| Ecofashion | Apparel Retailer | www.underthecanopy.com | 6/07/01 |
| Silk Road | Fabric Merchant | www.srfabrics.com | 30/08/01 |
| Milinea | | www.thebensolgroup.com | 30/08/01 |
| Lucire | Fashion Magazine | www.lucire.com | 30/08/01 |
| Inner Harbor | Golf Shirt Retailer | www.aaaspec.com | 30/08/01 |
| Woodwise | Consumer Guide Group | www. | 30/08/01 |
| Moxy | Golf Shirt Retailer | www.moxytrucks.com | 30/08/01 |
| Bowlingindex.com | Shirt Retailer | www.bowlingindex.com | 31/08/01 |
| Corporateboyz.com | Corporate apparel retailer | www.Corporateboyz.com | 31/08/01 |
| Union House | Golf Shirt Retailer | www.unionmadeinusa.com | 31/08/01 |
| Business Images | Corporate Gifts Retailer | www.b-images.com | 31/08/01 |
| Banana Republic | Apparel Retailer | www.bananarepublic.com | 31/08/01 |
| Golfing Gals | Golf Shirt Retailer | www.golfngals.com | 6/07/01 |
| Nebfacts | University Dept of Agriculture | www.ianr.unl.edu | 6/07/01 |
| Nordstrom | Apparel Retailer | http://store.nordstrom.com | 6/07/01 |
| Eartheasy | Environmental group | www.eartheasy.com | 6/07/01 |
| LLBean | Apparel Retailer | www.llbean.com | 30/08/01 |
| De Licacy Co Ltd | Fabric Retailer | www.tsfa.com | 30/08/01 |
| Jonathan Cory | Garment Retailer | www.jonathoncorey.com | 31/08/01 |
| Golfers Choice | Corporate Gifts Retailer | www.outsourcepromo.com | 31/08/01 |
| Rock International Textiles | Fabric manufacturer | www.rockinterantional.com | 6/07/01 |
| Sportswear America | Sportswear retailer | www.sportswear-america.com | 31/08/01 |
| Strictly Corporate | Corporate Gifts Retailer | www.strictlycorporate.com | 31/08/01 |

Typical FibreA features mentioned on the www by some downstream users, commentators and supply chain members are:

Example 1 – Weaver

- Strength – Dry or Wet, FibreA is an incredibly strong fibre
- Touch – Soft and delicate touch
- Drape – Refinement and elegance
- Sharp colouring of high standard
- It's a natural fibre and is 100% biodegradable
- Used in blends with cotton, nylon and polyester

*Example 2* – Corporate Golfwear

- A unique touch with a soft handle and drape
- Breathability
- Light weight comfort
- Easy care
- Wrinkle resistant
- Low shrinkage

Example 3 – University Agriculture Department Fact File

- FibreA is made from natural cellulose found in trees
- As trees are harvested, new trees are planted (This claim is refuted elsewhere)
- FibreA has many of the desirable properties of rayon, including comfort, absorbency, excellent drape and abrasion resistance. It excels rayon in that it has these additional characteristics; High wet strength, resistance to shrinkage, easy care
- FibreA is more costly to produce than rayon, cotton and polyester. Garments will cost more in retail stores
- Some garments may have a dry clean label because of the way they have been constructed and finished

[The rest of the facts are a straight quote from the FibreCo literature]

Example 4 – International Textile Mail Order Retailer

- With it's rich feel and drape of an expensive silk, you'd never suspect that FibreA is manufactured from natural wood pulp cellulose
- A man made and biodegrade able fabric, FibreA looks attractive in skirts and dressy trousers in the workplace as it does in casual shorts by the poolside
- Easy to care for it wrinkles less than cotton and yet is softer and stronger
- When blended with cotton, FibreA adds wrinkle resistance and the luxurious feel of silk
- Similar in strength and durability to a synthetic fibre
- Worry-free – wrinkle resistant, shrink resistant and static resistant
- Little ironing required

Example 5 – Ecology Group

- Soft, fluid, natural
- FibreA is known for its "drape". It flatters the human form
- The look is luxurious and refined
- The new fibre represents a milestone in the development of environmentally sustainable textiles
- The fibre is produced via an advanced 'closed loop' solvent spinning process, with minima impact on the environmental and economical use of energy and water. It uses non-toxic solvent, which is continually recycled during the production process. Production plant emissions are significantly lower in comparison to other man made fibre operations
- One of the properties of FibreA is its ability to fibrillate. Fibrillation is where the wet fibre, through abrasive action, develops tiny micro-fibrils on its surface. By manipulating or controlling fibrillation, a variety of finishes may be achieved
- A more recently developed fibre. FibreB has a non-fibrillated surface finish. Developed primarily for knitwear, FibreB has a subtle surface lustre, excellent print definition and high tear and burst strength for woven and knitted fabrics. FibreB also enhances laundering performance and shape retention using this fibre

Example 6 – Knitwear supplier

- A luxurious look and feel coupled with easy care is what makes FibreA shirts and sweaters rank amongst our best selling styles
- Unique high performance, luxury fabric
- Machine washable and dryable and have low shrinkage and resistance to wrinkling
- A new natural fibre that creates fabrics with a soft silk like handle and easy drape
- Due to the inherent silky properties of FibreA it is more susceptible to pills

Example 7 – Wood Ecology Pressure Group

- Turning wood into rayon is wasteful and dirty, because lots of water and chemicals are needed to extract usable *fibres from trees. Only about a third of* the pulp from a tree ends up in finished rayon thread and the resulting fabric will usually require dry cleaning, which is an environmental concern
- Much of our rayon comes from developing countries where environmental and labour laws are weak
- There is mounting evidence that rayon manufacturing contributes to significant forest destruction and pollution
- FibreA is made using a newer closed-loop process that is more efficient and much less polluting
- FibreA fabric would be an even better environmental choice if the wood used were certified under the Forestry Stewardship Council, without which there is no guarantee that their wood comes from a sustainable source

Example 8 – Clothing retailer

- To wear clothing of FibreA is to evoke a range of feelings: a sense of comfort confidence and class
- They are soft and sensuous with the indefinable touch that says quality, luxury and prestige
- Take the FibreA Touch Test. Slide your fingers across the fabrics. Feel them in the palm of your hand. It is an experience in pure pleasure

- Fluid and Flowing. FibreA drapes in soft gentle folds. Moving across the body or in harmony with it.
- FibreA is durable and wrinkles less so your clothes look better longer
- Incorporate it into your wardrobe, for work and play, here, right now!

From the above comments we can come to some fairly clear conclusions about FibreA in the eyes of those who sell the product in its various forms:

- The soft and silky feel of the fabrics made from FibreA
- The environmental credentials
- The way the product shows and holds colour.

There are also hints about some of the problems that have limited the adoption rate of FibreB, particularly in knits -

- Pilling (bobbling of fabric).
- The cost is high.
- Rayon shares many of its attributes and is cheaper.
- FibreB makes processing 'simple' by comparison to the techniques that have to be employed Standard FibreA to 'control' fibrillation.
- FibreB has lustre and this makes it less appealing to men.
- FibreB is the 'other' FibreA, the one **without** the fibrillation that makes FibreA feel luxurious with its silk like 'peachskin' touch.

Much of the commentary is couched in terms of technical jargon that is alien to many consumers:

Drape, handle, fluidity, resistance to wrinkling, burst strength, wet strength, breathability, durability, absorption, colour, biodegradable and fibrillation itself. These are not the terms used by the average shopper for clothes.

# FibreCo Project Team Perceptions

FibreCo Project Team Perceptions of supply chain needs and FibreB attributes were investigated in a series of workshops.

## Workshop One

There was a short delay in the project at this stage when FibreCo underwent further re-organisation. At one stage FibreCo suggested that they withdraw from the project and a meeting had to be held with FibreCo management and the Industry Forum. Fortunately the FibreCo managers decided to carry on with the project starting with a Workshop. The research earlier outlined above had given some facts about FibreB that helped to prepare a Workshop for the FibreCo project team. The workshop was held in Derby on 29th November 2001.

The FibreCo project team was:

Fabric Development manager
Retail Account Manager
Technical Supervisor
Knits Development Manager

From the Industry Forum we had a project manager, two research fellows and a research assistant from Cranfield. The workshop was designed with three activities for the FibreCo team designed to discover the new product features that were superior to other products and how the features met stakeholder needs. In addition some NPD research background was presented including a summary of success factors for NPD from Cooper (1994), the Kano Model and Innovation Adoption.

*Workshop Activity One - Synthesised Stakeholder Needs*

For a fibre producer like FibreCo there is a need to appreciate the needs of those further down the Textile and Clothing Supply Chain, including spinners, fabric and garment makers, retailers and consumers. Appreciating the needs of these stakeholders requires

contact with them and the use of techniques such as interviews, questionnaires and focus groups. However in order to plan the use of these techniques it is useful to try to think like a customer first. The Project Team carried out an analysis of supposed or synthetic stakeholder needs using five categories and four downstream stakeholders in relation to FibreB and a cut and sew golf shirt garment.

| **Type of Stakeholder Need** |
|---|
| Purpose |
| Physical |
| **Cognitive** |
| Aesthetics |
| Emotional |

| **Type of Supply Chain Stakeholder** | **Product purchased** |
|---|---|
| Knitter and Dyer | Yarn |
| Garment maker | Fabric |
| Retailer | Garment |
| Consumer | Garment |

The Project Team examined the potential needs from the product/service offering of the downstream textile and clothing supply chain and consumers through the example of a knitted golf shirt.

*Results*

The team were able to reach agreement about the stakeholder needs for members of the downstream supply chain, including yarn spinners, knitters, garment makers, retailers and consumers.

Tables showing the results from two stakeholders are shown below in Figures 7.58 and 7.59.

*A Yarn Supplier*

| Needs | Yarn Supplier |
|---|---|
| ***Purpose*** | Primarily to make profit<br>To meet fashion trends<br>To meet the functional requirements of the fabric<br>To have enough quantity to keep the Supply Chain happy<br>To maintain the business cycle |
| ***Physical*** | The right count for the gauge and fabric weight<br>Strong enough to knit without breakages<br>Dyes evenly. i.e. level<br>Consistent physical properties. E.g. evenness, count variation, RKM, stitch clarity<br>On time delivery |
| ***Cognitive*** | Know capability of supplying mill<br>Know capability of yarn in relation to fabric/products produced<br>Know the potential of the yarn – how to get the best out of it<br>Recognise the distinctive features of a fibre with more potential<br>Understand knitting requirements of the yarn<br>Understand what it is about the product that makes it desirable<br>Understand and have confidence about the dyeing/knitting requirements of the fabric<br>Understand what leads customers to make a repeat purchase<br>Understand what customers like about the product<br>How to target different parts of the supply chain<br>Know how to get feedback from the supply chain |
| ***Aesthetics*** | Understand what the market needs are for aesthetics for the seasonal fashions<br>A range of textures<br>Reasonable cost<br>Versatile yarn – able to offer more variety of product<br>A base level yarn – capable of producing the required aesthetics of the garment<br>The needs of the end user (consumer) of the garment |
| ***Emotional*** | Confidence and trust in the supplier<br>Trust in the suppliers quality and delivery performance<br>Concern about price stability from season to season<br>Feel trusted as a supplier<br>Confidence that yarn and constituents are right to achieve the desired end product<br>Confidence that the product is right for the application |

Figure 7.58: Customer Stakeholder Needs I

**A Retailer**

| Needs | Retailer |
|---|---|
| **Purpose** | Generate profit<br>Garments that will sell at the right price<br>Product fits with the overall image of the retailer<br>stock in store<br>appealing to their customer base<br>Trouble free supply chain<br>To be seen to innovate- keep one step ahead of the competition |
| **Physical** | No returns - minimum returns<br>No display problems- arrive ready to display<br>Looks good in store<br>Meets performance specs<br>Fit for purpose- what they thought they wanted<br>Absorbency- moisture handling |
| **Cognitive** | Understand specific requirements of garment<br>Understand features & how to sell it - communication issue<br>Value for money<br>understand properties of raw material- part of selling point<br>Trying to meet consumer need |
| **Aesthetics** | Appeal to customers<br>Distinction on shop floor<br>Meets the anticipated need/ purchase criteria<br>Colour<br>Brand<br>Consistency in colour & handle so consumer doesn't see wide variation |
| **Emotional** | Feel that the garment fits their house style & image<br>Feel good factor<br>Trust in suppliers<br>Solid sales generating customer loyalty |

Figure 7.59: Customer Stakeholder Needs II

Different stakeholders have very different needs and that there are some tangible and some less tangible needs that need to be met by the product/service offering. So for example the purpose of a fibre, fabric, yarn or garment is different, and a retailer has a different need from a garment than a consumer. For a textile raw material supplier these different needs should be taken into account. As far as FibreB is concerned we need to

explore the product attributes and try to decide how each might satisfy different stakeholder needs. The issue for the fibre manufacturer is how to meet these needs and work out which product/service features matters more or less to customers and stakeholder.

*Workshop Activity Two - Product Competitive Advantages*

The Project team examined the various attributes that FibreB had compared to other fibres such as Cotton, Modal and Wool. The table (Figure 7.60) below shows the total scores in terms of ranking with high numbers for top rankings. The attributes in bold are the ones that FibreB scored top for that attribute by most respondents:

| Product Attributes | FibreB | Cotton | Modal | Wool |
|---|---|---|---|---|
| **100% natural cellulose** | 12 | 12 | 8 | 4 |
| ***Moisture absorbing*** | 11 | 6 | 4 | 7 |
| **High dry and wet breaking strength** | 14 | 7 | 4 | 5 |
| Low shrinkage during finishing and washing | 8 | 8 | 5 | 5 |
| Completely biodegradable | 4 | 3 | 3 | 4 |
| **Circular cross sections and a smooth fibre surface** | 11 | 4 | 8 | 4 |
| Easy colouring using traditional cellulosic Dyestuffs | 9 | 9 | 8 | 3 |
| Natural in origin | 7 | 9 | 4 | 10 |
| **Depth of colour** | 12 | 4 | 4 | 8 |
| **Softness and drape** | 14 | 5 | 12 | 4 |
| **Pronounced stitch definition in knits** | 13 | 5 | 6 | 4 |
| **Luxurious handle** | 14 | 4 | 10 | 8 |
| **Fluidity and movement** | 11 | 4 | 9 | 4 |
| Breathability and comfort | 10 | 7 | 6 | 8 |
| Discrete lustre | 14 | 5 | 11 | 5 |
| Durable | 9 | 6 | 3 | 9 |
| Garments machine washable | 9 | 9 | 6 | 4 |
| ***Suppleness*** | 14 | 5 | 10 | 4 |
| ***Excellent laundering performance*** | 13 | 6 | 6 | 6 |
| High burst strength in knits | 5 | 6 | 2 | 1 |
| ***Superior dye uptake and retention*** | 14 | 4 | 4 | 8 |
| **Retention of 3D character in wash and wear** | 14 | 6 | 4 | 9 |
| **Full soft handle** | 16 | 5 | 12 | 8 |
| ***Deep clear colour*** | 15 | 4 | 6 | 7 |
| Excellent print definition | 9 | 5 | 5 | 2 |
| Durable garment pressing | 5 | 5 | 3 | 3 |
| Fibrillation free fabric surface | 11 | 7 | 6 | 6 |
| Fabrics for garment processing | 4 | 4 | 1 | 5 |
| Piece dyed fabrics | 5 | 5 | 3 | 4 |
| Yam dyed fabrics | 3 | 5 | 2 | 5 |

Figure 7.60: Comparisons scores for related products

It is worth noting that the Price of FibreB is a weakness compared to other fibres. The project team thought that FibreB represented good value for the attributes it possessed. The key attributes where FibreB is best in a knitted Polo Shirt are considered to be:

*100% natural cellulose*
*Moisture absorbing*
*High dry and wet breaking strength*
*Circular cross sections and a smooth fibre surface*
*Depth of colour*
*Softness and drape*
*Pronounced stitch definition in knits*
*Luxurious handle*
*Fluidity and movement*
*Suppleness*
*Excellent laundering performance*
*Superior dye uptake and retention*
*Retention of 3D character in wash and wear*
*Full soft handle*
*Deep clear colour*

The workshop team also tried to map the key FibreB attributes on to the Kano model. [This Kano model is described in more detail in the section that follows]. The table in Figure 7.61 below shows the general consensus about the key attributes:

| ***Must-be attributes*** | ***Linear attributes*** | ***Delighter attributes*** |
|---|---|---|
| Doesn't shrink<br>Moisture absorbency<br>Excellent laundering | Natural in origin<br>Easy to dye<br><br>Value for money | Depth of colour<br>Superior dye uptake & retention<br>Completely bio-degradable<br>Luxury handle |

Figure 7.61: FibreCo Product Attributes

The quick 'ad hoc' mappings of attributes on to the Kano dimensions shows that the Delighter attributes are those that FibreCo have been using previously to promote FibreB. FibreCo were interested to know how the consumer feels about FibreB and this requires a more robust questionnaire procedure for exact mapping of attributes on to the Kano dimensions.

A first version of a Kano Questionnaire was presented. A typical type of question is presented as both a positive question and a negative version in the following example:

*Q1. If your garment shows no signs of wear and pilling after a few washes, how do you feel?*

[ ] I would be delighted
[ ] I expect it to be like that
[ ] I do not feel anything
[ ] I would live with it
[ ] I would not like it

*Q2. If your garment has signs of wear or pilling after a few washes, how do you feel?*

[ ] I would be delighted
[ ] I expect it to be like that
[ ] I do not feel anything
[ ] I would live with it
[ ] I would not like it

It was agreed that we would run another workshop where we would plan how the questionnaire would be administered and the possible use of consumer focus groups and wearer trials. In the meantime a revised Kano questionnaire would be designed that reflected the key attributes that the team thought were important. The questionnaire would be circulated for to the FibreCo team.

## Workshop Two

The second workshop continued the theme of developing the customer focus.

Activities included:

- The revised Kano questionnaire was tried out by the whole project team
- Some of the questionnaire results were analysed using to illustrate how the delighter scoring of a Kano questionnaire worked
- Customer satisfaction indices were explained
- The pilot study Kano questionnaires, wearer trials and focus groups were planned
- The garments for the pilot study wearer trials and focus group were planned by FibreCo

The Project Team had been helped to develop a clear view about how the stakeholders in the market might view products manufactured from FibreB. Those attributes of FibreB that the project team considered were important were:

- Depth of colour
- Superior dye uptake & retention
- Completely bio-degradable
- Luxury handle

These attributes may not be perceived as important by consumers and the next stage was to carry out market research to discover any differences.

### *Consumer Perceptions regarding garment attributes performance and feelings of satisfaction*

One suggested questionnaire technique (Matzler & Hinterhuber, 1998) uses the Kano Model to discover which product features are 'delighters', which are linear attributes and which are 'must-be' features. The Kano Model is a structured method of obtaining feedback from customers (Shen *et al*, 2000) that draws on the notion of delighters. Developed by N. Kano in Japan in the mid eighties, the model maps customer satisfaction with key product feature performance and categorises product features in three ways:

*Firstly*, expected features, *where the customer dislikes an absence of the feature and is also neither delighted by it nor dislikes it when it is present.*

Expected features are only mentioned by customers when they are missing or poorly executed and are recognised through collecting data about complaints and returns.

*Secondly*, delighter features, *which are those where the customer is delighted if the feature is present but does not actively dislike it when the feature is absent and is (clearly) not delighted by its absence.*

Delighter features are more likely to be the type that separates products from their competitors in terms of product uniqueness. Delighters are hard to find through traditional market research.

*Thirdly*, linear features, *which are more straightforward in that they cause delight when present and dislike when absent.*

Linear features are generally of a technical nature and can be easily measured by the customer. Linear features can be determined by traditional market research techniques.

The Kano Model Diagram

The three types of feature can be mapped on to a two dimensional chart (Figure 7.62).

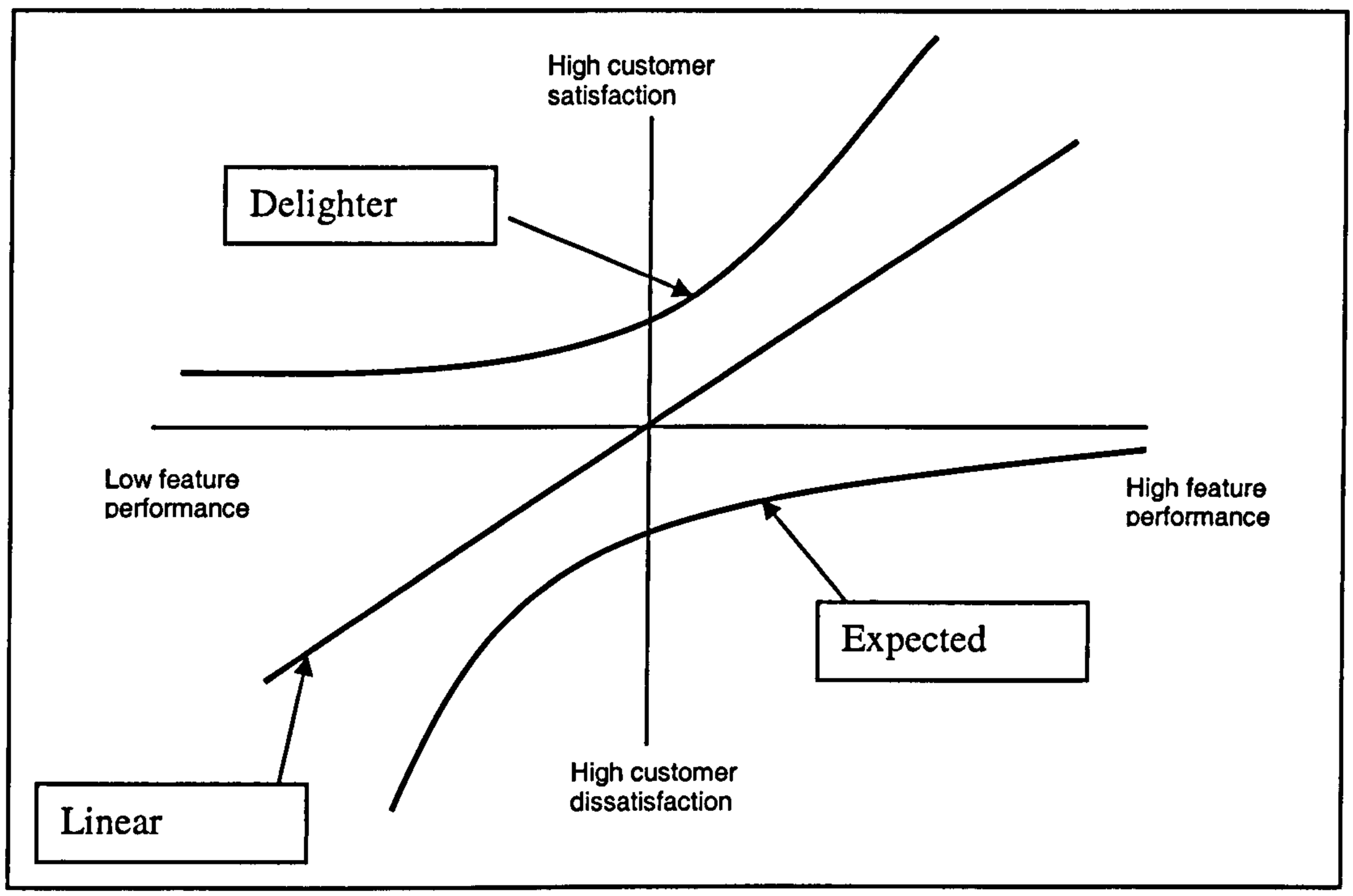



Figure 7.62: The Kano Model

The value of the Kano Model over traditional attitude surveys is that the data provides a richer understanding of attitudes to product features than a scale where answers range from 'Highly Important to Highly Unimportant'.

Information from a Kano survey can give new product developers detailed feedback on the relationship between a product feature and customer satisfaction. This information is particularly useful at the initial stage of the new product development process.

*The Results of the Kano Questionnaires - Analysis of Results*

Each pair of questions about the same feature are linked are analysed together. A matrix of the 25 possible answers and the relevant Kano types answers and Indifference answers is shown in the Figure 7.63 below.

| | | Negative Question Version | | | | |
|---|---|---|---|---|---|---|
| | | ***Delighted*** | ***Expect it*** | ***Neutral*** | ***Live With*** | ***Dislike*** |
| **Positive Question Version** | ***Delighted*** | N/A | Delighter | Delighter | Delighter | Linear |
| | ***Expect it*** | N/A | Indifferent | Indifferent | Indifferent | Expected |
| | ***Neutral*** | N/A | Indifferent | Indifferent | Indifferent | Expected |
| | ***Live With*** | N/A | Indifferent | Indifferent | Indifferent | Expected |
| | ***Dislike*** | N/A | N/A | N/A | N/A | N/A |

Figure 7.63: Kano Answers Matrix

Figure 7.64 below shows the level of agreement amongst respondents about garment ownership features and the majority view Kano category.

| **Product Feature** | **Delighter** | **Linear** | **Expected** | **Indifferent** | **Category** |
|---|---|---|---|---|---|
| Beautiful soft feel | 92.3% | 7.7% | 0.0% | 0.0% | Delighter |
| Luxury feel at a lower price | 76.9% | 15.4% | 0.0% | 7.7% | Delighter |
| Luxury Feel | 76.9% | 0.0% | 7.7% | 15.4% | Delighter |
| Wash Performance - Creasing | 53.9% | 46.2% | 0.0% | 0.0% | Delighter |
| I feel stylish | 46.2% | 38.5% | 0.0% | 15.4% | Delighter |
| | | | | | |
| I look good | 7.7% | 76.9% | 15.4% | 0.0% | Linear |
| I feel good | 0.0% | 69.2% | 15.4% | 15.4% | Linear |
| Fits well | 30.8% | 46.2% | 23.1% | 0.0% | Linear |
| Hardwearing and kept looks | 38.5% | 38.5% | 23.1% | 0.0% | Linear |
| | | | | | |
| Wash Performance - Shrinkage | 0.0% | 7.7% | 92.3% | 0.0% | Expected |
| Wash Performance - Pilling | 30.8% | 0.0% | 61.5% | 7.7% | Expected |
| Wash Performance - Colour retention | 7.7% | 0.0% | 61.5% | 30.8% | Expected |
| | | | | | |
| A branded Raw Material | 7.7% | 0.0% | 0.0% | 92.3% | Indifferent |
| Biodegradable Raw material | 23.1% | 7.7% | 0.0% | 69.2% | Indifferent |
| Bright fashion colour | 0.0% | 38.5% | 0.0% | 61.5% | Indifferent |
| Soft and flexible drape | 0.0% | 38.5% | 0.0% | 61.5% | Indifferent |
| Keeps me feeling dry and cool | 7.7% | 0.0% | 30.8% | 61.5% | Indifferent |

Figure 7.64: Kano Survey Results

Delighter Features

Delighters amongst the small pilot sample of participants were:

Beautiful soft feel

Luxury feel at a lower price

Luxury feel

Low creasing in wash performance

Feeling stylish

Linear Features

Looking good was a linear feature for a clear majority of participants who judged that they would like it if they looked good in a garment and dislike it if they did not look good. Feeling good in a garment, fitting well and durability were also linear features.

Expected Features

The other wash performance features were expected by consumers who would be dissatisfied with poor performance, particularly on shrinkage.

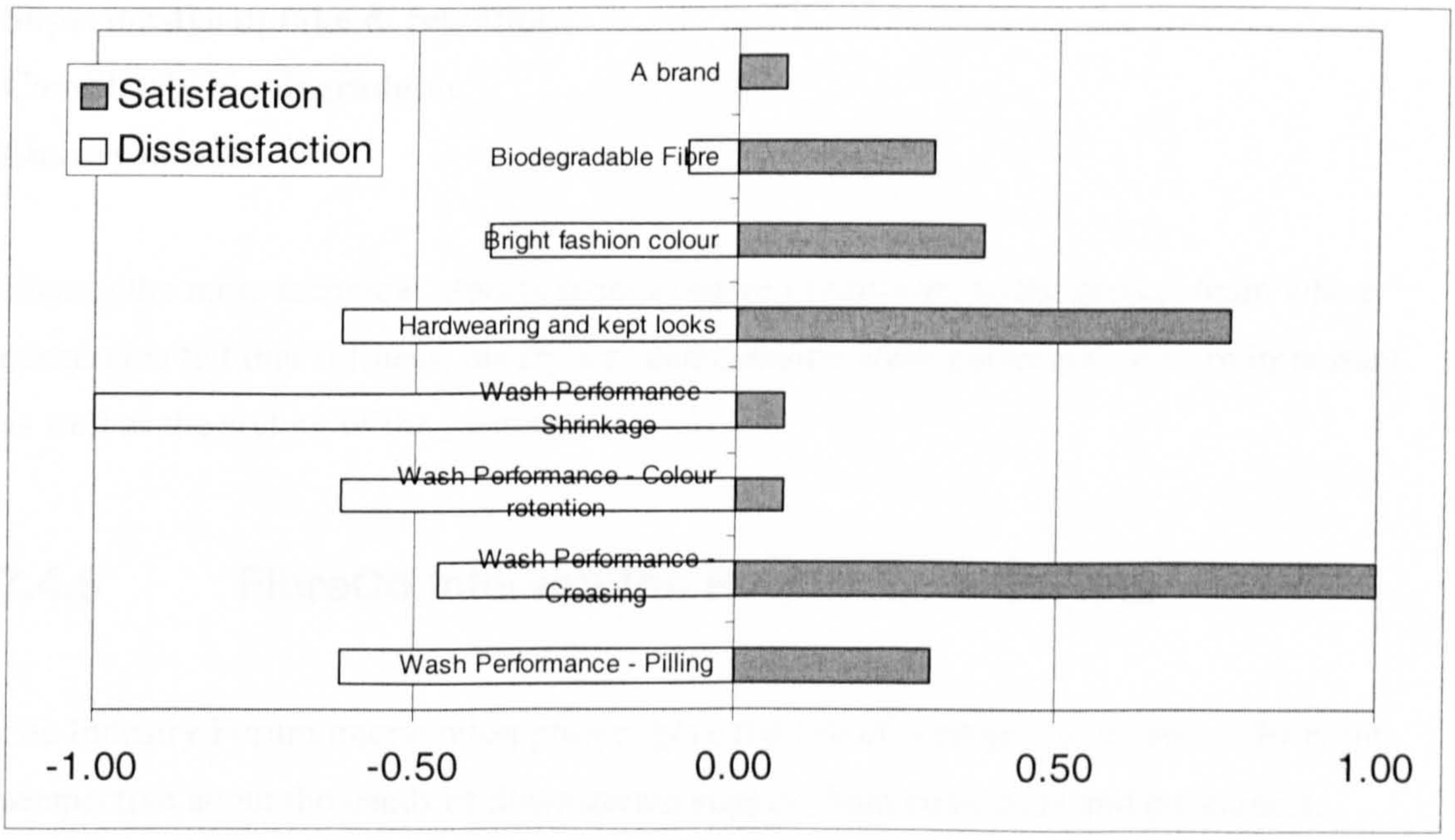



Figure 7.65: Satisfaction Index Results.

When the dissatisfaction and satisfaction results for product features are considered together use is made of more of the data from the Kano questionnaire and core product features that can cause dissatisfaction to a proportion of consumers if poorly executed can be pinpointed. The Figure 7.65 illustrates some of the satisfaction results. Wash performance on creasing can be seen to cause dissatisfaction for some respondents.

*Summary*

The consumer results demonstrate that the key delighters are different from those that the project team thought were important.
Consumers consider that the following are delighters:

**Beautiful soft feel**
**A luxury feel at a lower price**
**Luxury feel**
**Low creasing in wash performance**
**Feeling stylish**

The Project Team considered the following were Kano delighters:

**Depth of colour**
**Superior dye uptake & retention**
**Completely bio-degradable**
**Luxury handle**

Clearly the more technical aspects seem of more importance to the project team where consumers felt that softness, luxury feel and creasing wash performance were important as well as the styling of the garment.

### 7.4.6 FibreCo Intervention Project Conclusions

The Industry Forum intervention project gave the FibreCo project managers a different perspective about the needs of downstream supply chain customers and consumers. Consumers were less interested in the technical aspects of the new FibreB product. The project was followed by garment wearer trials involving consumers where comparison

garments in FibreB and a competing fibre were manufactured for FibreCo by another I.F. partner KnitwearCo. Consumers were given garments to wear and comment on in this blind test.

The data collected during the Industry Forum project and the earlier unpublished findings gave some useful information regarding management perceptions, product attributes and the issues surrounding a new innovation that has attributes of uncertain benefits to downstream users. The FibreCo development of new product samples of fabric is also interesting in that is shows the need to work with products that the customer will be familiar with in order to demonstrate raw material properties.

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